STATA DATA MANAGEMENT REFERENCE MANUAL
RELEASE 19

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Contents

Cross-referencing the documentation

When reading this manual, you will find references to other Stata manuals, for example, **[U] 27 Overview of Stata estimation commands**; [R] **regress**; and [D] **reshape**. The first example is a reference to chapter 27, *Overview of Stata estimation commands*, in the *User's Guide*; the second is a reference to the `regress` entry in the *Base Reference Manual*; and the third is a reference to the `reshape` entry in the *Data Management Reference Manual*.

All the manuals in the Stata Documentation have a shorthand notation:

[GSM]	*Getting Started with Stata for Mac*
[GSU]	*Getting Started with Stata for Unix*
[GSW]	*Getting Started with Stata for Windows*
[U]	*Stata User's Guide*
[R]	*Stata Base Reference Manual*
[ADAPT]	*Stata Adaptive Designs: Group Sequential Trials Reference Manual*
[BAYES]	*Stata Bayesian Analysis Reference Manual*
[BMA]	*Stata Bayesian Model Averaging Reference Manual*
[CAUSAL]	*Stata Causal Inference and Treatment-Effects Estimation Reference Manual*
[CM]	*Stata Choice Models Reference Manual*
[D]	*Stata Data Management Reference Manual*
[DSGE]	*Stata Dynamic Stochastic General Equilibrium Models Reference Manual*
[ERM]	*Stata Extended Regression Models Reference Manual*
[FMM]	*Stata Finite Mixture Models Reference Manual*
[FN]	*Stata Functions Reference Manual*
[G]	*Stata Graphics Reference Manual*
[H2OML]	*Machine Learning in Stata Using H2O: Ensemble Decision Trees Reference Manual*
[IRT]	*Stata Item Response Theory Reference Manual*
[LASSO]	*Stata Lasso Reference Manual*
[XT]	*Stata Longitudinal-Data/Panel-Data Reference Manual*
[META]	*Stata Meta-Analysis Reference Manual*
[ME]	*Stata Multilevel Mixed-Effects Reference Manual*
[MI]	*Stata Multiple-Imputation Reference Manual*
[MV]	*Stata Multivariate Statistics Reference Manual*
[PSS]	*Stata Power, Precision, and Sample-Size Reference Manual*
[P]	*Stata Programming Reference Manual*
[RPT]	*Stata Reporting Reference Manual*
[SP]	*Stata Spatial Autoregressive Models Reference Manual*
[SEM]	*Stata Structural Equation Modeling Reference Manual*
[SVY]	*Stata Survey Data Reference Manual*
[ST]	*Stata Survival Analysis Reference Manual*
[TABLES]	*Stata Customizable Tables and Collected Results Reference Manual*
[TS]	*Stata Time-Series Reference Manual*
[I]	*Stata Index*
[M]	*Mata Reference Manual*

Intro — Introduction to data management reference manual

Description

This manual documents most of Stata's data management features and is referred to as the [D] manual. Some specialized data management features are documented in such subject-specific reference manuals as [MI] *Stata Multiple-Imputation Reference Manual*, [SEM] *Stata Structural Equation Modeling Reference Manual*, [TS] *Stata Time-Series Reference Manual*, [ST] *Stata Survival Analysis Reference Manual*, and [XT] *Stata Longitudinal-Data/Panel-Data Reference Manual*.

Following this entry, [D] **Data management** provides an overview of data management in Stata and of Stata's data management commands. The other parts of this manual are arranged alphabetically. If you are new to Stata's data management features, we recommend that you read the following first:

[D] **Data management** — Introduction to data management commands

[U] 12 Data

[U] 13 Functions and expressions

[U] 11.5 by varlist: construct

[U] 22 Entering and importing data

[U] 23 Combining datasets

[U] 24 Working with strings

[U] 26 Working with categorical data and factor variables

[U] 25 Working with dates and times

[U] 16 Do-files

You can see that most of the suggested reading is in [U]. That is because [U] provides overviews of most Stata features, whereas this is a reference manual and provides details on the usage of specific commands. You will get an overview of features for combining data from **[U] 23 Combining datasets**, but the details of performing a match-merge (merging the records of two files by matching the records on a common variable) will be found here, in [D] **merge**.

Stata is continually being updated, and Stata users are always writing new commands. To ensure that you have the latest features, you should install the most recent official update; see [R] **update**.

Also see

[U] 1.3 What's new

[R] **Intro** — Introduction to base reference manual

Description References Also see

Description

This manual, called [D], documents Stata's data management features. See Mitchell (2020) for additional information and examples on data management in Stata.

Data management for statistical applications refers not only to classical data management—sorting, merging, appending, and the like—but also to data reorganization because the statistical routines you will use assume that the data are organized in a certain way. For example, statistical commands that analyze longitudinal data, such as `xtreg`, generally require that the data be in long rather than wide form, meaning that repeated values are recorded not as extra variables, but as extra observations.

Here are the basics everyone should know:

[D] **use**	Load Stata dataset
[D] **sysuse**	Use shipped dataset
[D] **webuse**	Use dataset from Stata website
[D] **save**	Save Stata dataset
[D] **describe**	Describe data in memory or in a file
[D] **codebook**	Describe data contents
[D] **inspect**	Display simple summary of data's attributes
[D] **count**	Count observations satisfying specified conditions
[D] **Data types**	Quick reference for data types
[D] **Missing values**	Quick reference for missing values
[D] **Datetime**	Date and time values and variables
[D] **list**	List values of variables
[D] **edit**	Browse or edit data with Data Editor
[D] **varmanage**	Manage variable labels, formats, and other properties
[D] **rename**	Rename variable
[D] **format**	Set variables' output format
[D] **label**	Manipulate labels
[D] **frames intro**	Introduction to frames

To work with multiple datasets in memory, see

[D] **frames intro**	Introduction to frames
[D] **frames**	Data frames
[D] **frame change**	Change identity of current (working) frame
[D] **frame copy**	Make a copy of a frame
[D] **frame create**	Create a new frame
[D] **frame drop**	Drop frames from memory
[D] **frame prefix**	The frame prefix command
[D] **frame put**	Copy selected variables or observations to a new frame
[D] **frame pwf**	Display name of current (working) frame
[D] **frame rename**	Rename existing frame
[D] **frames dir**	Display names of all frames in memory
[D] **frames reset**	Drop all frames from memory
[D] **frames save**	Save a set of frames on disk
[D] **frames modify**	Modify a set of frames on disk
[D] **frames use**	Load a set of frames from disk
[D] **frames describe**	Describe frames in memory or in a file
[D] **frget**	Copy variables from linked frame
[D] **frlink**	Link frames

You will need to create and drop variables, and here is how:

[D] **generate**	Create or change contents of variable
[D] **egen**	Extensions to generate
[D] **drop**	Drop variables or observations
[D] **clear**	Clear memory

For inputting or importing data, see

[D] **use**	Load Stata dataset
[D] **sysuse**	Use shipped dataset
[D] **webuse**	Use dataset from Stata website
[D] **input**	Enter data from keyboard
[D] **import**	Overview of importing data into Stata
[D] **import dbase**	Import and export dBase files
[D] **import delimited**	Import and export delimited text data
[D] **import excel**	Import and export Excel files
[D] **import fred**	Import data from Federal Reserve Economic Data
[D] **import haver**	Import data from Haver Analytics databases
[D] **import haverdirect**	Import data from Haver Analytics cloud servers
[D] **import sas**	Import SAS files
[D] **import sasxport5**	Import and export data in SAS XPORT Version 5 format
[D] **import sasxport8**	Import and export data in SAS XPORT Version 8 format
[D] **import spss**	Import and export SPSS files
[D] **infile (fixed format)**	Import text data in fixed format with a dictionary
[D] **infile (free format)**	Import unformatted text data
[D] **infix (fixed format)**	Import text data in fixed format
[D] **jdbc**	Load, write, or view data from a database with a Java API
[D] **odbc**	Load, write, or view data from ODBC sources
[D] **hexdump**	Display hexadecimal report on file
[D] **icd9**	ICD-9-CM diagnosis codes
[D] **icd9p**	ICD-9-CM procedure codes
[D] **icd10**	ICD-10 diagnosis codes
[D] **icd10cm**	ICD-10-CM diagnosis codes
[D] **icd10pcs**	ICD-10-PCS procedure codes

and for exporting data, see

[D] **save**	Save Stata dataset
[D] **export**	Overview of exporting data from Stata
[D] **outfile**	Export dataset in text format
[D] **import dbase**	Import and export dBase files
[D] **import delimited**	Import and export delimited text data
[D] **import excel**	Import and export Excel files
[D] **import sasxport5**	Import and export data in SAS XPORT Version 5 format
[D] **import sasxport8**	Import and export data in SAS XPORT Version 8 format
[D] **import spss**	Import and export SPSS files
[D] **jdbc**	Load, write, or view data from a database with a Java API
[D] **odbc**	Load, write, or view data from ODBC sources

The ordering of variables and observations (sort order) can be important; see

[D] **order**	Reorder variables in dataset
[D] **sort**	Sort data
[D] **gsort**	Ascending and descending sort

To reorganize or combine data, see

[D] **append**	Append datasets
[D] **merge**	Merge datasets
[D] **frlink**	Link frames
[D] **frget**	Copy variables from linked frame
[D] **reshape**	Convert data from wide to long form and vice versa
[D] **collapse**	Make dataset of summary statistics
[D] **contract**	Make dataset of frequencies and percentages
[D] **fillin**	Rectangularize dataset
[D] **expand**	Duplicate observations
[D] **expandcl**	Duplicate clustered observations
[D] **stack**	Stack data
[D] **joinby**	Form all pairwise combinations within groups
[D] **xpose**	Interchange observations and variables
[D] **cross**	Form every pairwise combination of two datasets

In the above list, we particularly want to direct your attention to [D] **reshape**, a useful command that beginners often overlook.

For random sampling, see

[D] **sample**	Draw random sample
[D] **splitsample**	Split data into random samples
[D] **drawnorm**	Draw sample from multivariate normal distribution

For file manipulation, see

[D] **type**	Display contents of a file
[D] **erase**	Erase a disk file
[D] **copy**	Copy file from disk or URL
[D] **cd**	Change directory
[D] **dir**	Display filenames
[D] **mkdir**	Create directory
[D] **rmdir**	Remove directory
[D] **cf**	Compare two datasets
[D] **changeeol**	Convert end-of-line characters of text file
[D] **filefilter**	Convert ASCII or binary patterns in a file
[D] **checksum**	Calculate checksum of file
[D] **zipfile**	Compress and uncompress files and directories in zip archive format

For handling Unicode strings, see

[D] **unicode**	Unicode utilities
[D] **unicode translate**	Translate files to Unicode
[D] **unicode encoding**	Unicode encoding utilities
[D] **unicode locale**	Unicode locale utilities
[D] **unicode collator**	Language-specific Unicode collators
[D] **unicode convertfile**	Low-level file conversion between encoding

The entries above are important. The rest are useful when you need them:

[D] **datasignature**	Determine whether data have changed
[D] **type**	Display contents of a file
[D] **notes**	Place notes in data
[D] **label language**	Labels for variables and values in multiple languages
[D] **labelbook**	Label utilities
[D] **encode**	Encode string into numeric and vice versa
[D] **recode**	Recode categorical variables
[D] **ipolate**	Linearly interpolate (extrapolate) values
[D] **destring**	Convert string variables to numeric variables and vice versa
[D] **mvencode**	Change missing values to numeric values and vice versa
[D] **pctile**	Create variable containing percentiles
[D] **range**	Generate numerical range
[D] **by**	Repeat Stata command on subsets of the data
[D] **statsby**	Collect statistics for a command across a by list
[D] **dyngen**	Dynamically generate new values of variables
[D] **compress**	Compress data in memory
[D] **recast**	Change storage type of variable
[D] **Datetime display formats**	Display formats for dates and times
[D] **Datetime conversion**	String to numeric date conversion functions
[D] **Datetime durations**	Obtaining and working with durations
[D] **Datetime relative dates**	Datetime relative dates
[D] **Datetime values from other software**	Date and time conversion from other software
[D] **bcal**	Business calendar file manipulation
[D] **Datetime business calendars**	Business calendars
[D] **Datetime business calendars creation**	Business calendars creation

[D] **assert**	Verify truth of claim
[D] **assertnested**	Verify variables nested
[D] **clonevar**	Clone existing variable
[D] **compare**	Compare two variables
[D] **corr2data**	Create dataset with specified correlation structure
[D] **ds**	Compactly list variables with specified properties
[D] **duplicates**	Report, tag, or drop duplicate observations
[D] **insobs**	Add or insert observations
[D] **isid**	Check for unique identifiers
[D] **lookfor**	Search for string in variable names and labels
[D] **memory**	Memory management
[D] **putmata**	Put Stata variables into Mata and vice versa
[D] **obs**	Increase the number of observations in a dataset
[D] **rename group**	Rename groups of variables
[D] **separate**	Create separate variables
[D] **shell**	Temporarily invoke operating system
[D] **snapshot**	Save and restore data snapshots
[D] **split**	Split string variables into parts
[D] **vl**	Manage variable lists
[D] **vl create**	Create and modify user-defined variable lists
[D] **vl drop**	Drop variable lists or variables from variable lists
[D] **vl list**	List contents of variable lists
[D] **vl rebuild**	Rebuild variable lists
[D] **vl set**	Set system-defined variable lists

There are some real jewels in the above, such as [D] **notes**, [D] **compress**, and [D] **assert**, which you will find particularly useful.

References

Hoffmann, J. P. 2017. *Principles of Data Management and Presentation*. Oakland, CA: University of California Press.

Mitchell, M. N. 2020. *Data Management Using Stata: A Practical Handbook*. 2nd ed. College Station, TX: Stata Press.

Also see

[D] **Intro** — Introduction to data management reference manual

[R] **Intro** — Introduction to base reference manual

append — Append datasets

Description	Quick start	Menu	Syntax
Options	Remarks and examples	Reference	Also see

Description

append appends Stata-format datasets stored on disk to the end of the dataset in memory. If any *filename* is specified without an extension, .dta is assumed.

Stata can also join observations from two datasets into one; see [D] **merge**. See **[U] 23 Combining datasets** for a comparison of append, merge, and joinby.

Quick start

Append mydata2.dta to mydata1.dta with no data in memory

```
append using mydata1 mydata2
```

Same as above, but with mydata1.dta in memory

```
append using mydata2
```

Same as above, and generate newv to indicate source dataset

```
append using mydata2, generate(newv)
```

Same as above, but do not copy value labels or notes from mydata2.dta

```
append using mydata2, generate(newv) nolabel nonotes
```

Only keep v1, v2, and v3 from mydata2.dta

```
append using mydata2, keep(v1 v2 v3)
```

Menu

Data > Combine datasets > Append datasets

Syntax

append using *filename* [*filename* [...]] [, *options*]

You may enclose *filename* in double quotes and must do so if *filename* contains blanks or other special characters.

options	Description
generate(*newvar*)	*newvar* marks source of resulting observations
keep(*varlist*)	keep specified variables from appending dataset(s)
nolabel	do not copy value-label definitions from dataset(s) on disk
nonotes	do not copy notes from dataset(s) on disk
force	append string to numeric or numeric to string without error

Options

generate(*newvar*) specifies the name of a variable to be created that will mark the source of observations. Observations from the master dataset (the data in memory before the append command) will contain 0 for this variable. Observations from the first using dataset will contain 1 for this variable; observations from the second using dataset will contain 2 for this variable; and so on.

keep(*varlist*) specifies the variables to be kept from the using dataset. If keep() is not specified, all variables are kept.

The *varlist* in keep(*varlist*) differs from standard Stata varlists in two ways: variable names in *varlist* may not be abbreviated, except by the use of wildcard characters, and you may not refer to a range of variables, such as price-weight.

nolabel prevents Stata from copying the value-label definitions from the disk dataset into the dataset in memory. Even if you do not specify this option, label definitions from the disk dataset never replace definitions already in memory.

nonotes prevents notes in the using dataset from being incorporated into the result. The default is to incorporate notes from the using dataset that do not already appear in the master data.

force allows string variables to be appended to numeric variables and vice versa, resulting in missing values from the using dataset. If omitted, append issues an error message; if specified, append issues a warning message.

Remarks and examples

The disk dataset must be a Stata-format dataset; that is, it must have been created by save (see [D] **save**).

▷ Example 1

We have two datasets stored on disk that we want to combine. The first dataset, called even.dta, contains the sixth through eighth positive even numbers. The second dataset, called odd.dta, contains the first five positive odd numbers. The datasets are

```
. use even
(6th through 8th even numbers)

. list
```

	number	even
1.	6	12
2.	7	14
3.	8	16

```
. use odd
(First five odd numbers)

. list
```

	number	odd
1.	1	1
2.	2	3
3.	3	5
4.	4	7
5.	5	9

We will append the even data to the end of the odd data. Because the odd data are already in memory (we just used them above), we type `append using even`. The result is

```
. append using even

. list
```

	number	odd	even
1.	1	1	.
2.	2	3	.
3.	3	5	.
4.	4	7	.
5.	5	9	.
6.	6	.	12
7.	7	.	14
8.	8	.	16

Because the `number` variable is in both datasets, the variable was extended with the new data from the file `even.dta`. Because there is no variable called `odd` in the new data, the additional observations on `odd` were forward-filled with *missing* (`.`). Because there is no variable called `even` in the original data, the first observations on `even` were back-filled with missing.

◁

▷ Example 2

The order of variables in the two datasets is irrelevant. Stata always appends variables by name:

```
. use https://www.stata-press.com/data/r19/odd1
(First five odd numbers)

. describe

Contains data from https://www.stata-press.com/data/r19/odd1.dta
 Observations:             5                  First five odd numbers
    Variables:             2                  9 Jan 2024 08:41
────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
────────────────────────────────────────────────────────────────────────────────
odd             float   %9.0g                 Odd numbers
number          float   %9.0g
────────────────────────────────────────────────────────────────────────────────
Sorted by: number

. describe using https://www.stata-press.com/data/r19/even

Contains data                                 6th through 8th even numbers
 Observations:             3                  9 Jan 2024 08:43
    Variables:             2
────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
────────────────────────────────────────────────────────────────────────────────
number          byte    %9.0g
even            float   %9.0g                 Even numbers
────────────────────────────────────────────────────────────────────────────────
Sorted by: number

. append using https://www.stata-press.com/data/r19/even

. list

     +----------------------+
     | odd   number    even |
     |----------------------|
  1. |   1        1       . |
  2. |   3        2       . |
  3. |   5        3       . |
  4. |   7        4       . |
  5. |   9        5       . |
     |----------------------|
  6. |   .        6      12 |
  7. |   .        7      14 |
  8. |   .        8      16 |
     +----------------------+
```

The results are the same as those in the first example.

◁

When Stata appends two datasets, the definitions of the dataset in memory, called the *master* dataset, override the definitions of the dataset on disk, called the *using* dataset. This extends to value labels, variable labels, characteristics, and date–time stamps. If there are conflicts in numeric storage types, the more precise storage type will be used regardless of whether this storage type was in the *master* dataset or the *using* dataset. If a variable is stored as a string in one dataset that is longer than in the other, the longer `str#` storage type will prevail. If a variable is stored as a `strL` in one dataset and a `str#` in another dataset, the `strL` storage type will prevail.

❑ Technical note

If a variable is a string in one dataset and numeric in the other, Stata issues an error message unless the `force` option is specified. If `force` is specified, Stata issues a warning message before appending the data. If the using dataset contains the string variable, the combined dataset will have numeric missing values for the appended data on this variable; the contents of the string variable in the using dataset are ignored. If the using dataset contains the numeric variable, the combined dataset will have empty strings for the appended data on this variable; the contents of the numeric variable in the using dataset are ignored.

❑

▷ Example 3

Because Stata has five numeric variable types—`byte`, `int`, `long`, `float`, and `double`—you may attempt to append datasets containing variables with the same name but of different numeric types; see **[U] 12.2.2 Numeric storage types**.

Let's `describe` the datasets in the example above:

```
. describe using https://www.stata-press.com/data/r19/odd

Contains data                                  First five odd numbers
 Observations:             5                   9 Jan 2024 08:50
    Variables:             2
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
number          float   %9.0g
odd             float   %9.0g                 Odd numbers
--------------------------------------------------------------------------------
Sorted by:

. describe using https://www.stata-press.com/data/r19/even

Contains data                                  6th through 8th even numbers
 Observations:             3                   9 Jan 2024 08:43
    Variables:             2
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
number          byte    %9.0g
even            float   %9.0g                 Even numbers
--------------------------------------------------------------------------------
Sorted by: number

. describe using https://www.stata-press.com/data/r19/oddeven

Contains data                                  First five odd numbers
 Observations:             8                   9 Jan 2024 08:53
    Variables:             3
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
number          float   %9.0g
odd             float   %9.0g                 Odd numbers
even            float   %9.0g                 Even numbers
--------------------------------------------------------------------------------
Sorted by:
```

The number variable was stored as a float in odd.dta but as a byte in even.dta. Because float is the more precise storage type, the resulting dataset, oddeven.dta, had number stored as a float. Had we instead appended odd.dta to even.dta, number would still have been stored as a float:

```
. use https://www.stata-press.com/data/r19/even, clear
(6th through 8th even numbers)

. append using https://www.stata-press.com/data/r19/odd
(variable number was byte, now float to accommodate using data's values)

. describe

Contains data from https://www.stata-press.com/data/r19/even.dta
 Observations:             8                  6th through 8th even numbers
    Variables:             3                  9 Jan 2024 08:43
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
number          float   %9.0g
even            float   %9.0g                 Even numbers
odd             float   %9.0g                 Odd numbers
--------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

◁

▷ Example 4

Suppose that we have a dataset in memory containing the variable educ, and we have previously given a label variable educ "Education Level" command so that the variable label associated with educ is “Education Level”. We now append a dataset called newdata.dta, which also contains a variable named educ, except that its variable label is “Ed. Lev”. After appending the two datasets, the educ variable is still labeled “Education Level”. See [U] 12.6.2 Variable labels.

◁

▷ Example 5

Assume that the values of the educ variable are labeled with a value label named educlbl. Further assume that in newdata.dta, the values of educ are also labeled by a value label named educlbl. Thus there is one definition of educlbl in memory and another (although perhaps equivalent) definition in newdata.dta. When you append the new data, you will see the following:

```
. append using newdata
label educlbl already defined
```

If one label in memory and another on disk have the same name, append warns you of the problem and sticks with the definition currently in memory, ignoring the definition in the disk file.

◁

❑ Technical note

When you append two datasets that both contain definitions of the same value label, the codings may not be equivalent. That is why Stata warns you with a message like "label educlbl already defined". If you do not know that the two value labels are equivalent, you should convert the value-labeled variables into string variables, append the data, and then construct a new coding. `decode` and `encode` make this easy:

```
. use newdata, clear
. decode educ, gen(edstr)
. drop educ
. save newdata, replace
. use basedata
. decode educ, gen(edstr)
. drop educ
. append using newdata
. encode edstr, gen(educ)
. drop edstr
```

See [D] **encode**.

You can specify the `nolabel` option to force `append` to ignore all the value-label definitions in the incoming file, whether or not there is a conflict. In practice, you will probably never want to do this.

❑

▷ Example 6

Suppose that we have several datasets containing the populations of counties in various states. We can use `append` to combine these datasets all at once and use the `generate()` option to create a variable identifying from which dataset each observation originally came.

```
. use https://www.stata-press.com/data/r19/capop
. list

     +-----------------------+
     |      county       pop |
     |-----------------------|
  1. | Los Angeles   9878554 |
  2. |      Orange   2997033 |
  3. |     Ventura    798364 |
     +-----------------------+

. append using https://www.stata-press.com/data/r19/ilpop
> https://www.stata-press.com/data/r19/txpop, generate(state)
. label define statelab 0 "CA" 1 "IL" 2 "TX"
. label values state statelab
```

```
. list

     +-------------------------------+
     |      county       pop   state |
     |-------------------------------|
  1. | Los Angeles   9878554      CA |
  2. |      Orange   2997033      CA |
  3. |     Ventura    798364      CA |
  4. |        Cook   5285107      IL |
  5. |      DeKalb    103729      IL |
     |-------------------------------|
  6. |        Will    673586      IL |
  7. |      Brazos    152415      TX |
  8. |     Johnson    149797      TX |
  9. |      Harris   4011475      TX |
     +-------------------------------+
```

◁

Video example

How to append files into a single dataset

Reference

Chatfield, M. D. 2015. precombine: A command to examine $n \geq 2$ datasets before combining. *Stata Journal* 15: 607–626.

Also see

[D] **cross** — Form every pairwise combination of two datasets

[D] **joinby** — Form all pairwise combinations within groups

[D] **merge** — Merge datasets

[D] **save** — Save Stata dataset

[D] **use** — Load Stata dataset

[U] 23 Combining datasets

assert — Verify truth of claim

Description Quick start Syntax Options Remarks and examples
Reference Also see

Description

`assert` verifies that *exp* is true. If it is true, the command produces no output. If it is not true, `assert` informs you that the "assertion is false" and issues a return code of 9; see **[U] 8 Error messages and return codes**.

Quick start

Confirm that `v1` only takes values 0 or 1

```
assert v1==0 | v1==1
```

Verify that `v2` is between 100 and 200 and never missing

```
assert inrange(v2,100,200)
```

Verify that `v2` is between 100 and 200 for all nonmissing values

```
assert inrange(v2,100,200) if !missing(v2)
```

Verify that `v2` is between 100 and 200 and never missing when `catvar` equals 2 or 3

```
assert inrange(v2,100,200) if (catvar==2 | catvar==3)
```

Verify that there are 5 observations per cluster identified by `cvar`

```
by cvar: assert _N==5
```

Same as above, but stop checking after the first cluster has fewer than or more than 5 observations

```
by cvar: assert _N==5, fast
```

Syntax

<u>as</u>sert *exp* [*if*] [*in*] [, <u>r</u>c0 <u>n</u>ull <u>f</u>ast]

by is allowed; see [D] **by**.

Options

rc0 forces a return code of 0, even if the assertion is false.

null forces a return code of 8 on null assertions. A null assertion occurs when an if condition excludes all observations from being checked by assert. By default, the return code is 0 for null assertions.

fast forces the command to exit at the first occurrence that *exp* evaluates to false.

Remarks and examples

assert verifies that the expression provided is true. It is useful because it tells Stata not only what to do but also what you can expect to find. Groups of assertions are often combined in a do-file to certify data. If the do-file runs all the way through without complaining, every assertion in the file is true. Otherwise, assert will provide a count of the contradictions when an assertion is false. It will also issue an error message along with a return code of 9; see **[U] 8 Error messages and return codes**.

assert is seldom used interactively because it is easier to use inspect, summarize, or tabulate to look for evidence of errors in the dataset. These commands, however, require you to review the output to spot the error.

▷ Example 1: Observation-level assertions

You and a colleague are analyzing union membership among women. Your colleague imported data from the National Longitudinal Survey of young women for the years 1968 to 1988. You plan to include the woman's age, total work experience, and whether or not she graduated from college in your model.

Your colleague tells you that the cleaned dataset is called nlswork and that the following things are true: that the variables recording union membership, age, total experience, and education level are not missing for any of the observations; that observations taken before a woman turned 18 have been removed; that total experience is always greater than or equal to 0; and that all college graduates have at least 14 years of education. Before you begin your analysis, you should verify the accuracy of these data. To test that the statements above are true, you create a do-file named check.do:

begin check.do, example 1

```
assert age>=18 & !missing(age)
assert !missing(union)
assert ttl_exp>=0 & !missing(ttl_exp)
assert grade>=14 & !missing(grade) if collgrad==1
```

end check.do, example 1

You save the above file, read in the data, and then issue the do command to check the assertions:

```
. use https://www.stata-press.com/data/r19/nlswork
(National Longitudinal Survey of Young Women, 14-24 years old in 1968)
. do check
```

The output is as follows:

```
. assert age>=18 & !missing(age)
159 contradictions in 28,534 observations
assertion is false
r(9);
end of do-file
r(9);
```

The do-file did not run to completion because it encountered a false assertion—that age is never missing and always at least 18 years.

You should resolve this and any other discrepancies before analyzing the data. You run the do-file again, this time with the `nostop` option, which tells Stata to continue executing the do-file despite any errors.

```
. do check, nostop
```

Once it runs in its entirety, you will have a list of all the data discrepancies to discuss with your colleague. The output is as follows:

```
. assert age>=18 & !missing(age)
159 contradictions in 28,534 observations
assertion is false
r(9);
. assert !missing(union)
9,296 contradictions in 28,534 observations
assertion is false
r(9);
. assert ttl_exp>=0 & !missing(ttl_exp)
. assert grade>=14 & !missing(grade) if collgrad==1
42 contradictions in 4,795 observations
assertion is false
r(9);
.
end of do-file
```

The output from the false assertions above is helpful. First, the number of contradictions can serve as a clue; a few contradictions may suggest data entry errors, whereas a large number may motivate further investigation. Second, you get a straightforward message that the assertion is false. Finally, you get a return code of 9, which makes it easy to write code based on whether or not an assertion is true.

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▷ Example 2: Speeding up assert

In example 1, we obtained a count of the number of observations where each assertion was false. However, if all you wanted to know was whether or not an assertion was true, you could reduce the amount of time required to check that assertion by specifying the `fast` option, as shown below:

```
. assert age>=18 & !missing(age), fast
assertion is false
r(9);
```

The `fast` option tells Stata to stop checking the assertion when it encounters the first case where it is false, which is why you do not get a count of the contradictions.

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▷ Example 3: Assertions by groups

Your assertions in the previous examples were tested in each observation. You spoke with your colleague regarding those assertions, and she has sent you a revised version of the dataset. The next goal is to make sure that age has been recorded correctly over time. Women in the study were observed once per year, and in some years, they were not observed at all. Therefore, you know that age must be increasing with every time period.

Thus, now you want to assess the characteristics of each woman over time, and you can do so with the `by:` prefix. You include the `sort` option with the `by` prefix because the data have not been sorted by woman (`idcode`) and `year` already; see [U] **11.5 by varlist: construct**. Now you can assert that for each woman, the value of `age` is greater than it was in the previous year for all years except the first.

You add the following line to `check.do`:

begin check.do, example 3

```
by idcode (year), sort: assert age>=age[_n-1]+1 if _n>1
```

end check.do, example 3

Upon reissuing the the `do check, nostop` command, the following output is shown:

```
. by idcode (year), sort: assert age>=age[_n-1]+1 if _n>1
171 contradictions in 23,823 observations
assertion is false
r(9);

.
end of do-file
```

Again, we have found a few errors in the dataset. We might want to check the source of the dataset for any notes on data discrepancies.

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❑ Technical note

`assert` is smart in how it evaluates expressions. When you type something like `assert _N==522` or `assert work[_N]>0`, `assert` knows that the expression needs to be evaluated only once. When you type `assert female==1 | female==0`, `assert` knows that the expression needs to be evaluated once for each observation in the dataset.

Here are some more examples demonstrating `assert`'s intelligence.

```
by female: assert _N==100
```

asserts that there should be 100 observations for every unique value of `female`. The expression is evaluated once per by-group.

```
by female: assert work[_N]>0
```

asserts that the last observation on `work` in every by-group should be greater than zero. It is evaluated once per by-group.

```
by female: assert work>0
```

is evaluated once for each observation in the dataset and, in that sense, is formally equivalent to `assert work>0`.

❑

Reference

Gould, W. W. 2001. Statistical software certification. *Stata Journal* 1: 29–50.

Also see

[D] **assertnested** — Verify variables nested

[P] **capture** — Capture return code

[P] **confirm** — Argument verification

[U] 16 Do-files

assertnested — Verify variables nested

Description Quick start Syntax Options Remarks and examples Also see

Description

`assertnested` verifies that the values of variables are nested within the values of other variables. If they are nested, the command produces no output. If they are not nested, `assertnested` informs you that they are not and issues an error return code of 459; see **[U] 8 Error messages and return codes**.

Quick start

Confirm that the values of `psu` are nested within `stratum`

`assertnested stratum psu`

Confirm that the values of IDs in `student` are nested within `school`, which is nested within `district`

`assertnested district school student`

For panel data, where panels are individuals with IDs stored in `panelid`, check that values of `age` and `income` are the same for all observations in each panel

`assertnested panelid, within(age income)`

Same as above, but treat any missing values the same as nonmissing values

`assertnested panelid, within(age income) missing`

Syntax

`assertnested` *varlist* [*if*] [*in*] [, `within(`*withinvars*`)` `missing`]

The variables in *varlist* are given in the order of biggest grouping to smallest grouping.

`by` is allowed; see [D] **by**.

Options

`within(`*withinvars*`)` asserts that the values of *varlist* are nested within each of the variables in *withinvars*. That is, `assertnested` *varlist*`, within(`*w1 w2* ...`)` will issue an error if any of `assertnested` *w1 varlist*, `assertnested` *w2 varlist*, ... issue an error.

`missing` specifies that missing values in *varlist* and *withinvars* are to be treated the same as nonmissing values.

Remarks and examples

assertnested is a convenience command for checking whether variables are nested. We say that v2 is nested within v1 if for all observations that have the same value of v2, the observations also have the same value of v1.

Here are data that are nested.

```
. list v1 v2, sepby(v1)

     +---------+
     | v1   v2 |
     |---------|
  1. |  0    1 |
  2. |  0    1 |
  3. |  0    2 |
  4. |  0    2 |
     |---------|
  5. |  1    3 |
  6. |  1    3 |
  7. |  1    4 |
  8. |  1    4 |
     +---------+

. assertnested v1 v2
```

assertnested succeeds.

Here are data that are not nested.

```
. list v1 v3, sepby(v1)

     +---------+
     | v1   v3 |
     |---------|
  1. |  0    1 |
  2. |  0    2 |
  3. |  0    3 |
  4. |  0    4 |
     |---------|
  5. |  1    1 |
  6. |  1    2 |
  7. |  1    3 |
  8. |  1    4 |
     +---------+

. assertnested v1 v3
v3 not nested within v1
r(459);
```

assertnested fails.

Running

```
assertnested v1 v2 v3
```

is the same as running

```
assertnested v1 v2
assertnested v2 v3
```

Variables must be specified with the biggest nested grouping first, then the second biggest nested grouping, and so on, to the smallest nested grouping.

▷ Example 1: Nested variables

We have a dataset consisting of two school districts in Texas: the district for the city of College Station and the district for the city of Richardson. The dataset contains the actual names of all the public schools in the variable school in these districts, given by variable district. The dataset contains fictitious student IDs in the variable student.

We want to assert that student is nested within school and that school is nested within district.

```
. use https://www.stata-press.com/data/r19/schools
. assertnested district school student
school not nested within district
r(459);
```

Schools are not nested within district! Are some schools in both districts? That is impossible. But it is possible that both districts have one or more schools with the same name. Let's find them.

We use egen's tag() function to tag one observation for each distinct value of district for each school. Then we sum up the number of tags in each school. If the schools were nested within district, there would be only one tag per school. We list the districts and schools with more than one tag.

```
. egen tag_district = tag(school district)
. bysort school: egen ndistrict = sum(tag_district)
. list district school if tag_district == 1 & ndistrict > 1, noobs
```

district	school
Richardson	Spring Creek Elementary School
College Station	Spring Creek Elementary School

Both College Station and Richardson have schools named Spring Creek Elementary School. If we want to check that students are nested within schools, we need to do the check separately by district.

```
. bysort district: assertnested school student
```

Or else Texans need to get more creative about naming their schools.

◁

▷ Example 2: Variables constant within panels

Commands that work with panel data in Stata require the data to be in long form. That is, multiple Stata observations for each panel. Saying a variable is constant within each panel is the same as saying the panels are nested within that variable. assertnested allows you to assert that variables are constant within each panel.

We illustrate this with choice model data. Choice model data are stored like panel data in that each individual has multiple observations, one for each possible choice. Characteristics of the individual should be constant across observations for an individual.

We load a dataset with consumer choices for purchasing a new car (see [CM] **Intro 2** for a description of these data). Then we check that gender and income are constant for the observations with the same consumerid by using the within() option.

```
. use https://www.stata-press.com/data/r19/carchoice, clear
(Car choice data)
. assertnested consumerid, within(gender income)
```

The `within()` option is a convenient way to do multiple assertions. The above is the same as running

```
. assertnested gender consumerid
. assertnested income consumerid
```

The option `missing` can be specified to treat missing values the same as any other value.

```
. assertnested consumerid, within(gender income) missing
consumerid not nested within gender
r(459);
```

We see that `gender` is not constant for some consumers when we treat missing values like any other value. Let's list one person who has missing values for `gender`:

```
. list consumerid gender if consumerid == 142, abbrev(10)
```

	consumerid	gender
509.	142	.
510.	142	Male
511.	142	Male
512.	142	Male

This person has a missing value for `gender` for one observation and nonmissing values for other observations. For the data to pass `assertnested` with the option `missing`, the variable would have to be either all missing or all nonmissing (and the same value) for each individual.

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Also see

[D] **assert** — Verify truth of claim

[CM] **Intro 2** — Data layout

[P] **capture** — Capture return code

[SVY] **Survey** — Introduction to survey commands

[XT] **xt** — Introduction to xt commands

[U] 16 Do-files

bcal — Business calendar file manipulation

Description

See [D] **Datetime business calendars** for an introduction to business calendars and dates.

`bcal check` lists the business calendars used by the data in memory, if any.

`bcal dir` *pattern* lists filenames and directories of all available business calendars matching *pattern*, or all business calendars if *pattern* is not specified.

`bcal describe` *calname* presents a description of the specified business calendar.

`bcal load` *calname* loads the specified business calendar. Business calendars load automatically when needed, and thus use of `bcal load` is never required. `bcal load` is used by programmers writing their own business calendars. `bcal load` *calname* forces immediate loading of a business calendar and displays output, including any error messages due to improper calendar construction.

`bcal create` *filename*`, from(`*varname*`)` creates a business calendar file based on dates in *varname*. Business holidays are inferred from gaps in *varname*. The qualifiers `if` and `in`, as well as the option `excludemissing()`, can also be used to exclude dates from the new business calendar.

Quick start

Create business calendar file `mycal.stbcal` from date variable `tvar` in the dataset in memory

```
bcal create mycal, from(tvar)
```

Same as above, and generate business date variable `newt` formatted as `%tbmycal`

```
bcal create mycal, from(tvar) generate(newt)
```

List directories and filenames of available business calendars

```
bcal dir
```

Describe range, center date, and number of omitted days in business calendar `mycal.stbcal`

```
bcal describe mycal
```

Report any `%tb` formats applied to the variables in memory

```
bcal check
```

Menu

Data > Other utilities > Create a business calendar

Data > Other utilities > Manage business calendars

Data > Variables Manager

Syntax

List business calendars used by the data in memory

`bcal check [varlist] [, rc0]`

List filenames and directories of available business calendars

`bcal dir [pattern]`

Describe the specified business calendar

`bcal describe calname`

Load the specified business calendar

`bcal load calname`

Create a business calendar from the current dataset

`bcal create filename [if] [in], from(varname) [bcal_create_options]`

where

varlist is a list of variable names to be checked for whether they use business calendars. If not specified, all variables are checked.

pattern is the name of a business calendar possibly containing wildcards * and ?. If *pattern* is not specified, all available business calendar names are listed.

calname is the name of a business calendar either as a name or as a datetime format; for example, *calname* could be `simple` or `%tbsimple`.

filename is the name of the business calendar file created by `bcal create`.

bcal_create_options	Description
Main	
* `from(varname)`	specify date variable for calendar
`generate(newvar)`	generate *newvar* containing business dates
`excludemissing(varlist [, any])`	exclude observations with missing values in *varlist*
`personal`	save calendar file in your `PERSONAL` directory
`replace`	replace file if it already exists
Advanced	
`purpose(text)`	describe purpose of calendar
`dateformat(ymd | ydm | myd | mdy | dym | dmy)`	specify date format in calendar file
`range(fromdate todate)`	specify range of calendar
`centerdate(date)`	specify center date of calendar
`maxgap(#)`	specify maximum gap allowed; default is 10 days

*`from(varname)` is required.

`collect` is allowed with all `bcal` commands; see **[U] 11.1.10 Prefix commands**.

Option for bcal check

Main

`rc0` specifies that `bcal check` is to exit without error (return 0) even if some calendars do not exist or have errors. Programmers can then access the results `bcal check` stores in `r()` to get even more details about the problems. If you wish to suppress `bcal dir`, precede the `bcal check` command with `capture` and specify the `rc0` option if you wish to access the `r()` results.

Options for bcal create

Main

`from(`*varname*`)` specifies the date variable used to create the business calendar. Gaps between dates in *varname* define business holidays. The longest gap allowed can be set with the `maxgap()` option. `from()` is required.

`generate(`*newvar*`)` specifies that *newvar* be created. *newvar* is a date variable in `%tb`*calname* format, where *calname* is the name of the business calendar derived from *filename*.

`excludemissing(`*varlist* [`, any`]`)` specifies that the dates of observations with missing values in *varlist* are business holidays. By default, the dates of observations with missing values in all variables in *varlist* are holidays. The `any` suboption specifies that the dates of observations with missing values in any variable in *varlist* are holidays.

`personal` specifies that the calendar file be saved in the `PERSONAL` directory. This option cannot be used if *filename* contains the pathname of the directory where the file is to be saved.

`replace` specifies that the business calendar file be replaced if it already exists.

Advanced

`purpose(`*text*`)` specifies the purpose of the business calendar being created. *text* cannot exceed 63 characters.

`dateformat(ymd | ydm | myd | mdy | dym | dmy)` specifies the date format in the new business calendar. The default is `dateformat(ymd)`. `dateformat()` has nothing to do with how dates will look when variables are formatted with `%tb`*calname*; it specifies how dates are typed in the calendar file.

`range(`*fromdate todate*`)` defines the date range of the calendar being created. *fromdate* and *todate* should be in the format specified by the `dateformat()` option; if not specified, the default `ymd` format is assumed.

`centerdate(`*date*`)` defines the center date of the new business calendar. If not specified, the earliest date in the calendar is assumed. *date* should be in the format specified by the `dateformat()` option; if not specified, the default `ymd` format is assumed.

`maxgap(`*#*`)` specifies the maximum number of consecutive business holidays allowed by `bcal create`. The default is `maxgap(10)`.

Remarks and examples

`bcal check` reports on any `%tb` formats used by the data in memory:

```
. bcal check
       %tbsimple:  defined, used by variable
                    mydate
```

`bcal dir` reports on business calendars available:

```
. bcal dir
  1 calendar file found:
          simple:  C:\Program Files\Stata19\ado\base\s\simple.stbcal
```

`bcal describe` reports on an individual calendar.

```
. bcal describe simple
  Business calendar simple (format %tbsimple):
    purpose:  Example for manual
      range:  01nov2011  30nov2011
                 18932      18961    in %td units
                     0         19    in %tbsimple units
     center:  01nov2011
                 18932               in %td units
                     0               in %tbsimple units
    omitted:        10               days
                 121.8               approx. days/year
   included:        20               days
                 243.5               approx. days/year
```

`bcal load` is used by programmers writing new stbcal-files. See [D] **Datetime business calendars creation**.

`bcal create` creates a business calendar file from the current dataset and describes the new calendar. For example, `sp500.dta` is a dataset installed with Stata that has daily records on the S&P 500 stock market index in 2001. The dataset has observations only for days when trading took place. A business calendar for stock trading in 2001 can be automatically created from this dataset as follows:

```
. sysuse sp500
(S&P 500)
. bcal create sp500, from(date) purpose(S&P 500 for 2001) generate(bizdate)
  Business calendar sp500 (format %tbsp500):
    purpose:  S&P 500 for 2001
      range:  02jan2001  31dec2001
                 14977      15340  in %td units
                     0        247  in %tbsp500 units
     center:  02jan2001
                 14977             in %td units
                     0             in %tbsp500 units
    omitted:       116             days
                 116.4             approx. days/year
   included:       248             days
                 248.9             approx. days/year
  Notes:
    business calendar file sp500.stbcal saved
    variable bizdate created; it contains business dates in %tbsp500 format
```

The business calendar file created:

begin sp500.stbcal
```
* Business calendar "sp500" created by -bcal create-
* Created/replaced on 02 Apr 2021

version 19
purpose "S&P 500 for 2001"
dateformat ymd

range 2001jan02 2001dec31
centerdate 2001jan02

omit dayofweek (Sa Su)
omit date 2001jan15
omit date 2001feb19
omit date 2001apr13
omit date 2001may28
omit date 2001jul04
omit date 2001sep03
omit date 2001sep11
omit date 2001sep12
omit date 2001sep13
omit date 2001sep14
omit date 2001nov22
omit date 2001dec25
```
end sp500.stbcal

`bcal create` *filename*, `from()` can save the calendar file anywhere in your directory system by specifying a path in *filename*. It is assumed that the directory where the file is to be saved already exists. The pattern of *filename* should be [*path*]*calname*[`.stbcal`]. Here *calname* should be without the `%tb` prefix; *calname* has to be a valid Stata name but limited to 10 characters. If *path* is not specified, the file is saved in the current working directory. If the `.stbcal` extension is not specified, it is added.

Save the file in a directory where Stata can find it. Stata automatically searches for stbcal-files in the same way it searches for ado-files. Stata looks for ado-files and stbcal-files in the official Stata directories, your site's directory (`SITE`), your current working directory, your personal directory (`PERSONAL`), and your directory for materials written by other users (`PLUS`). The option `personal` specifies that the calendar file be saved in your `PERSONAL` directory, which ensures that the created calendar can be easily found in future work.

Stored results

`bcal check` stores the following in `r()`:

Macros

`r(defined)`	business calendars used, stbcal-file exists, and file contains no errors
`r(undefined)`	business calendars used, but no stbcal-files exist for them
`r(varlist_`*calname*`)`	list of variable names that use business calendar *calname*

Warning to programmers: Specify the `rc0` option to access these returned results. By default, `bcal check` returns code 459 if a business calendar does not exist or if a business calendar exists but has errors; in such cases, the results are not stored.

`bcal dir` stores the following in `r()`:

Macros

`r(calendars)`	business calendars available
`r(fn_`*calname*`)`	stbcal-file for business calendar *calname*

bcal describe and bcal create store the following in r():

Scalars	
r(min_date_td)	calendar's minimum date in %td units
r(max_date_td)	calendar's maximum date in %td units
r(ctr_date_td)	calendar's zero date in %td units
r(min_date_tb)	calendar's minimum date in %tb units
r(max_date_tb)	calendar's maximum date in %tb units
r(omitted)	total number of days omitted from calendar
r(included)	total number of days included in calendar
r(omitted_year)	approximate number of days omitted per year from calendar
r(included_year)	approximate number of days included per year in calendar
Macros	
r(name)	pure calendar name (for example, nyse)
r(purpose)	short description of calendar's purpose
r(fn)	name of stbcal-file

bcal load stores the same results in r() as bcal describe, except it does not store r(omitted), r(included), r(omitted_year) and r(included_year).

Reference

Rajbhandari, A. 2016. Handling gaps in time series using business calendars. *The Stata Blog: Not Elsewhere Classified.* https://blog.stata.com/2016/02/04/handling-gaps-in-time-series-using-business-calendars/.

Also see

[D] **Datetime** — Date and time values and variables

[D] **Datetime business calendars** — Business calendars

[D] **Datetime business calendars creation** — Business calendars creation

by — Repeat Stata command on subsets of the data

Description | Quick start | Syntax | Options
Remarks and examples | References | Also see

Description

Most Stata commands allow the by prefix, which repeats the command for each group of observations for which the values of the variables in *varlist* are the same. by without the sort option requires that the data be sorted by *varlist*; see [D] **sort**.

Stata commands that work with the by prefix indicate this immediately following their syntax diagram by reporting, for example, "by is allowed; see [D] **by**" or "bootstrap, by, etc., are allowed; see [U] **11.1.10 Prefix commands**".

by and bysort are really the same command; bysort is just by with the sort option.

The *varlist*$_1$ (*varlist*$_2$) syntax is of special use to programmers. It verifies that the data are sorted by *varlist*$_1$ *varlist*$_2$ and then performs a by as if only *varlist*$_1$ were specified. For instance,

```
by pid (time): generate growth = (bp - bp[_n-1])/bp
```

performs the generate by values of pid but first verifies that the data are sorted by pid and time within pid.

Quick start

Generate newv as an observation number within each level of catvar

```
by catvar: generate newv = _n
```

Same as above, but sort data by catvar first

```
by catvar, sort: generate newv = _n
```

Same as above

```
bysort catvar: generate newv = _n
```

Same as above, but sort by v within values of catvar

```
bysort catvar (v): generate newv = _n
```

Generate newv as an observation number for each observation in levels of catvar and v

```
bysort catvar v: generate newv = _n
```

Note: Any command that accepts the by prefix may be substituted for generate above.

Syntax

by *varlist* : *stata_cmd*

bysort *varlist* : *stata_cmd*

The above diagrams show by and bysort as they are typically used.
The full syntax of the commands is

by *varlist*$_1$ [(*varlist*$_2$)] [, sort rc0] : *stata_cmd*

bysort *varlist*$_1$ [(*varlist*$_2$)] [, rc0] : *stata_cmd*

Options

sort specifies that if the data are not already sorted by *varlist*, by should sort them.

rc0 specifies that even if the *stata_cmd* produces an error in one of the by-groups, then by is still to run the *stata_cmd* on the remaining by-groups. The default action is to stop when an error occurs. rc0 is especially useful when *stata_cmd* is an estimation command and some by-groups have insufficient observations.

Remarks and examples

▷ Example 1

```
. use https://www.stata-press.com/data/r19/autornd
(1978 automobile data)
. keep in 1/20
(54 observations deleted)
. by mpg: egen mean_w = mean(weight)
not sorted
r(5);
. sort mpg
. by mpg: egen mean_w = mean(weight)
```

```
. list

     ┌──────────────────────────────────────────────┐
     │ make                weight   mpg     mean_w  │
     ├──────────────────────────────────────────────┤
  1. │ Cad. Eldorado         4000    15   3916.667  │
  2. │ AMC Pacer             3500    15   3916.667  │
  3. │ Chev. Impala          3500    15   3916.667  │
  4. │ Buick Electra         4000    15   3916.667  │
  5. │ Buick Riviera         4000    15   3916.667  │
     ├──────────────────────────────────────────────┤
  6. │ Cad. Deville          4500    15   3916.667  │
  7. │ AMC Spirit            2500    20       3350  │
  8. │ Chev. Monte Carlo     3000    20       3350  │
  9. │ Chev. Malibu          3000    20       3350  │
 10. │ Buick Skylark         3500    20       3350  │
     ├──────────────────────────────────────────────┤
 11. │ Buick Regal           3500    20       3350  │
 12. │ Buick LeSabre         3500    20       3350  │
 13. │ AMC Concord           3000    20       3350  │
 14. │ Chev. Nova            3500    20       3350  │
 15. │ Cad. Seville          4500    20       3350  │
     ├──────────────────────────────────────────────┤
 16. │ Buick Century         3500    20       3350  │
 17. │ Buick Opel            2000    25       2500  │
 18. │ Chev. Monza           3000    25       2500  │
 19. │ Dodge Colt            2000    30       2000  │
 20. │ Chev. Chevette        2000    30       2000  │
     └──────────────────────────────────────────────┘
```

by requires that the data be sorted. In the above example, we could have typed by mpg, sort: egen mean_w = mean(weight) or bysort mpg: egen mean_w = mean(weight) rather than the separate sort; all would yield the same results.

◁

For more examples, see **[U] 11.1.2 by varlist:**, **[U] 11.5 by varlist: construct**, and **[U] 13.7 Explicit subscripting**. For extended introductions with detailed examples, see Cox (2002) and Mitchell (2020, chap. 8).

❑ Technical note

by repeats the *stata_cmd* for each group defined by *varlist*. If *stata_cmd* stores results, only the results from the last group on which *stata_cmd* executes will be stored.

❑

References

Cox, N. J. 2002. Speaking Stata: How to move step by: step. *Stata Journal* 2: 86–102.

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Huber, C. 2014. How to simulate multilevel/longitudinal data. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2014/07/18/how-to-simulate-multilevellongitudinal-data/.

Mitchell, M. N. 2020. *Data Management Using Stata: A Practical Handbook*. 2nd ed. College Station, TX: Stata Press.

Also see

[D] **sort** — Sort data

[D] **statsby** — Collect statistics for a command across a by list

[P] **byable** — Make programs byable

[P] **foreach** — Loop over items

[P] **forvalues** — Loop over consecutive values

[P] **while** — Looping

[U] 11.1.2 by varlist:

[U] 11.1.10 Prefix commands

[U] 11.4 varname and varlists

[U] 11.5 by varlist: construct

Description Quick start Syntax Remarks and examples Also see

Description

Stata for Windows: `cd` changes the current working directory to the specified drive and directory. `pwd` is equivalent to typing `cd` without arguments; both display the name of the current working directory. Note: You can shell out to a Windows command prompt; see [D] **shell**. However, typing `!cd` *directory_name* does not change Stata's current directory; use the `cd` command to change directories.

Stata for Mac and Stata for Unix: `cd` (synonym `chdir`) changes the current working directory to *directory_name* or, if *directory_name* is not specified, the home directory. `pwd` displays the path of the current working directory.

Quick start

Change working directory in Stata for Windows to `C:\mydir\myfolder`

```
cd c:\mydir\myfolder
```

Change working directory in Stata for Windows to `C:\my dir\my folder`

```
cd "c:\my dir\my folder"
```

Change working directory in Stata for Mac or Unix to `mydir/myfolder`

```
cd mydir/myfolder
```

Move up one level in the directory structure

```
cd ..
```

Move to `myfolder` from `mydir`

```
cd myfolder
```

View current working directory

```
pwd
```

Go to home directory in Stata for Mac or Unix

```
cd
```

Syntax

Stata for Windows

cd

cd ["]*directory_name*["]

cd ["]*drive*:["]

cd ["]*drive*:*directory_name*["]

pwd

Stata for Mac and Stata for Unix

cd

cd ["]*directory_name*["]

pwd

If your *directory_name* contains embedded spaces, remember to enclose it in double quotes.

Remarks and examples

Remarks are presented under the following headings:

Stata for Windows

When you start Stata for Windows, your current working directory is set to the *Start in* directory specified in **Properties**. If you want to change this, see [GSW] **B.1 The Windows Properties Sheet**. You can always see what your working directory is by looking at the status bar at the bottom of the Stata window.

Once you are in Stata, you can change your directory with the cd command.

```
. cd
c:\data

. cd city
c:\data\city

. cd d:
D:\

. cd kande
D:\kande

. cd "additional detail"
D:\kande\additional detail

. cd c:
C:\

. cd data\city
C:\data\city
```

```
. cd \a\b\c\d\e\f\g
C:\a\b\c\d\e\f\g
. cd ..
C:\a\b\c\d\e\f
. cd ...
C:\a\b\c\d
. cd ....
C:\a
```

When we typed `cd d:`, we changed to the current directory of the `D` drive. We navigated our way to `d:\kande\additional detail` with three commands: `cd d:`, then `cd kande`, and then `cd "additional detail"`. The double quotes around "additional detail" are necessary because of the space in the directory name. We could have changed to this directory in one command: `cd "d:\kande\additional detail"`.

Notice the last three `cd` commands in the example above. You are probably familiar with the `cd ..` syntax to move up one directory from where you are. The last two `cd` commands above let you move up more than one directory: `cd ...` is shorthand for "`cd ..\..`" and `cd ....` is shorthand for "`cd ..\..\..`". These shorthand `cd` commands are not limited to Stata; they will work in your Command window under Windows as well.

You can see the current directory (where Stata saves files and looks for files) by typing `pwd`. You can change the current directory by using `cd` or by selecting **File > Change working directory...**. Stata's `cd` command understands "~" as an abbreviation for the home directory, so you can type things like `cd ~\data`.

```
. pwd
C:\Users\bill\proj
. cd "~\data\city"
C:\Users\bill\data\city
. _
```

If you now wanted to change to `"C:\Users\bill\data\city\ny"`, you could type `cd ny`. If you wanted instead to change to `"C:\Users\bill\data"`, you could type "`cd ..`".

Stata for Mac

Read [U] 11.6 Filenaming conventions for a description of how filenames are written in a command language before reading this entry.

Invoking an application and then changing folders is an action foreign to most Mac users. If it is foreign to you, you can ignore `cd` and `pwd`. However, they can be useful. You can see the current folder (where Stata saves files and looks for files) by typing `pwd`. You can change the current folder by using `cd` or by selecting **File > Change working directory...**. Stata's `cd` command understands "~" as an abbreviation for the home directory, so you can type things like `cd ~/data`.

```
. pwd
/Users/bill/proj
. cd "~/data/city"
/Users/bill/data/city
. _
```

If you now wanted to change to `"/Users/bill/data/city/ny"`, you could type `cd ny`. If you wanted instead to change to `"/Users/bill/data"`, you could type "`cd ..`".

Stata for Unix

cd and pwd are equivalent to Unix's cd and pwd commands. Like csh, Stata's cd understands "~" as an abbreviation for the home directory $HOME, so you can type things like cd ~/data; see [U] 11.6 Filenaming conventions.

```
. pwd
/usr/bill/proj
. cd ~/data/city
/usr/bill/data/city
. _
```

If you now wanted to change to /usr/bill/data/city/ny, you could type cd ny. If you wanted instead to change to /usr/bill/data, you could type "cd ..".

Also see

[D] **copy** — Copy file from disk or URL

[D] **dir** — Display filenames

[D] **erase** — Erase a disk file

[D] **mkdir** — Create directory

[D] **rmdir** — Remove directory

[D] **shell** — Temporarily invoke operating system

[D] **type** — Display contents of a file

[U] 11.6 Filenaming conventions

cf — Compare two datasets

Description | Quick start | Menu | Syntax | Options
Remarks and examples | Stored results | Acknowledgment | Also see

Description

cf compares *varlist* of the dataset in memory (the master dataset) with the corresponding variables in *filename* (the using dataset). cf returns nothing (that is, a return code of 0) if the specified variables are identical and a return code of 9 if there are any differences. Only the variable values are compared. Variable labels, value labels, notes, characteristics, etc., are not compared.

Quick start

Compare values of v1 and v2 from mydata1.dta in memory to mydata2.dta

```
cf v1 v2 using mydata2
```

Same as above, but give a detailed listing of the differences

```
cf v1 v2 using mydata2, verbose
```

Same as above, but for all variables in memory

```
cf _all using mydata2, verbose
```

Menu

Data > Data utilities > Compare two datasets

Syntax

`cf` *varlist* `using` *filename* [`, all verbose`]

Options

`all` displays the result of the comparison for each variable in *varlist*. Unless `all` is specified, only the results of the variables that differ are displayed.

`verbose` gives a detailed listing, by variable, of each observation that differs.

Remarks and examples

`cf` produces messages having the following form:

```
varname: does not exist in using
varname: ___ in master but ___ in using
varname: ___ mismatches
varname: match
```

An example of the second message is "str4 in master but float in using". Unless `all` is specified, the fourth message does not appear—silence indicates matches.

▷ Example 1

We think the dataset in memory is identical to `mydata.dta`, but we are unsure. We want to understand any differences before continuing:

```
. cf _all using mydata
. _
```

All the variables in the master dataset are in `mydata.dta`, and these variables are the same in both datasets. We might see instead

```
. cf _all using mydata
             mpg:  2 mismatches
        headroom:  does not exist in using
    displacement:  does not exist in using
      gear_ratio:  does not exist in using
r(9);
```

Two changes were made to the `mpg` variable, and the `headroom`, `displacement`, and `gear_ratio` variables do not exist in `mydata.dta`.

To see the result of each comparison, we could append the `all` option to our command:

```
. cf _all using mydata, all
            make:  match
           price:  match
             mpg:  2 mismatches
           rep78:  match
        headroom:  does not exist in using
           trunk:  match
          weight:  match
          length:  match
            turn:  match
    displacement:  does not exist in using
      gear_ratio:  does not exist in using
         foreign:  match
r(9);
```

For more details on the mismatches, we can use the `verbose` option:

```
. cf _all using mydata, verbose
             mpg:  2 mismatches
                   obs  1. 22 in master; 33 in using
                   obs  2. 17 in master; 33 in using
        headroom:  does not exist in using
    displacement:  does not exist in using
      gear_ratio:  does not exist in using
r(9);
```

This example shows us exactly which two observations for `mpg` differ, as well as the value stored in each dataset.

◁

▷ Example 2

We want to compare a group of variables in the dataset in memory against the same group of variables in `mydata.dta`.

```
. cf mpg headroom using mydata
             mpg: 2 mismatches
        headroom: does not exist in using
r(9);
```

◁

Stored results

`cf` stores the following in `r()`:

Macros
- `r(Nsum)` number of differences

Acknowledgment

Speed improvements in `cf` were based on code written by David Kantor.

Also see

[D] **compare** — Compare two variables

changeeol — Convert end-of-line characters of text file

Description Quick start Syntax Options Remarks and examples Also see

Description

`changeeol` converts text file *filename1* to text file *filename2* with the specified Windows/Unix/Mac/classic Mac-style end-of-line characters. `changeeol` changes the end-of-line characters from one type of file to another.

Quick start

Create `mytext2.txt` with Windows end-of-line characters from `mytext1.txt`

```
changeeol mytext1.txt mytext2.txt, eol(windows)
```

Same as above, but convert to Mac-style end-of-line characters

```
changeeol mytext1.txt mytext2.txt, eol(mac)
```

Same as above, but convert to Unix-style end-of-line characters

```
changeeol mytext1.txt mytext2.txt, eol(unix)
```

Syntax

`changeeol` *filename1* *filename2* `, eol(`*platform*`)` [*options*]

filename1 and *filename2* must be filenames.

Note: Double quotes may be used to enclose the filenames, and the quotes must be used if the filename contains embedded blanks.

options	Description
* `eol(windows)`	convert to Windows-style end-of-line characters (`\r\n`)
* `eol(dos)`	synonym for `eol(windows)`
* `eol(unix)`	convert to Unix-style end-of-line characters (`\n`)
* `eol(mac)`	convert to Mac-style end-of-line characters (`\n`)
* `eol(classicmac)`	convert to classic Mac-style end-of-line characters (`\r`)
`replace`	overwrite *filename2*
`force`	force to convert *filename1* to *filename2* if *filename1* is a binary file

*`eol()` is required.

Options

`eol(windows | dos | unix | mac | classicmac)` specifies to which platform style *filename2* is to be converted. `eol()` is required.

`replace` specifies that *filename2* be replaced if it already exists.

`force` specifies that *filename1* be converted if it is a binary file.

Remarks and examples

changeeol uses hexdump to determine whether *filename1* is text or binary. If it is binary, changeeol will refuse to convert it unless the force option is specified.

Examples

Windows:

```
. changeeol orig.txt newcopy.txt, eol(windows)
```

Unix:

```
. changeeol orig.txt newcopy.txt, eol(unix)
```

Mac:

```
. changeeol orig.txt newcopy.txt, eol(mac)
```

Classic Mac:

```
. changeeol orig.txt newcopy.txt, eol(classicmac)
```

Also see

[D] **filefilter** — Convert ASCII or binary patterns in a file

[D] **hexdump** — Display hexadecimal report on file

checksum — Calculate checksum of file

Description | Quick start | Syntax | Options
Remarks and examples | Stored results | Also see

Description

checksum creates *filename*.sum files for later use by Stata when it reads files over a network. These optional files are used to reduce the chances of corrupted files going undetected. Whenever Stata reads file *filename.suffix* over a network, whether by use, net, update, etc., it also looks for *filename*.sum. If Stata finds that file, Stata reads it and uses its contents to verify that the first file was received without error. If there are errors, Stata informs the user that the file could not be read.

Quick start

Calculate checksum of mydata.dta

```
checksum mydata.dta
```

Same as above, and save results to mydata.sum

```
checksum mydata.dta, save
```

Same as above, but save results to mycheck.sum

```
checksum mydata.dta, saving(mycheck.sum)
```

Same as above, but replace mycheck.sum if it exists

```
checksum mydata.dta, saving(mycheck.sum, replace)
```

Syntax

checksum *filename* [, *options*]

options	Description
save	save output to *filename*.sum; default is to display a report
replace	may overwrite *filename*.sum; use with save
saving(*filename2* [, replace])	save output to *filename2*; alternative to save

❑ Technical note

checksum calculates a CRC checksum following the POSIX 1003.2 specification and displays the file size in bytes. checksum produces the same results as the Unix cksum command. Comparing the checksum of the original file with the received file guarantees the integrity of the received file.

When comparing Stata's checksum results with those of Unix, do not confuse Unix's sum and cksum commands. Unix's cksum and Stata's checksum use a more robust algorithm than that used by Unix's sum. In some Unix operating systems, there is no cksum command, and the more robust algorithm is obtained by specifying an option with sum.

❑

Options

save saves the output of the checksum command to the text file *filename*.sum. The default is to display a report but not create a file.

replace is for use with save; it permits Stata to overwrite an existing *filename*.sum file.

saving(*filename2* [, replace]) is an alternative to save. It saves the output in the specified filename. You must supply a file extension if you want one, because none is assumed.

Remarks and examples

▷ Example 1

Say that you wish to put a dataset on your homepage so that colleagues can use it over the internet by typing

```
. use http://www.myuni.edu/department/~joe/mydata
```

mydata.dta is important, and even though the chances of the file mydata.dta being corrupted by the internet are small, you wish to guard against that. The solution is to create the checksum file named mydata.sum and place that on your homepage. Your colleagues need type nothing different, but now Stata will verify that all goes well. When they use the file, they will see either

```
. use http://www.myuni.edu/department/~joe/mydata
(important data from joe)
```

or

```
. use http://www.myuni.edu/department/~joe/mydata
file transmission error (checksums do not match)
http://www.myuni.edu/department/~joe/mydata.dta not downloaded
r(639);
```

To make the checksum file, change to the directory where the file is located and type

```
. checksum mydata.dta, save
Checksum for mydata.dta = 263508742, size = 4052
file mydata.sum saved
```

◁

▷ Example 2

Let's use checksum on auto.dta that is shipped with Stata. We will load the dataset and save it to our current directory.

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. save auto
file auto.dta saved

. checksum auto.dta
Checksum for auto.dta = 108935638, size = 12765
```

We see the report produced by checksum, but we decide to save this information to a file.

```
. checksum auto.dta, save

. type auto.sum
1 12765 108935638
```

The first number is the version number (possibly used for future releases). The second number is the file's size in bytes, which can be used with the checksum value to ensure that the file transferred without corruption. The third number is the checksum value. Although two different files can have the same checksum value, two files with the same checksum value almost certainly could not have the same file size.

This example is admittedly artificial. Typically, you would use checksum to verify that no file transmission error occurred during a web download. If you want to verify that your own data are unchanged, using datasignature is better; see [D] **datasignature**.

◁

Stored results

checksum stores the following in r():

Scalars

r(version)	checksum version number
r(filelen)	length of file in bytes
r(checksum)	checksum value

Also see

[R] **net** — Install and manage community-contributed additions from the internet

[D] **use** — Load Stata dataset

[D] **datasignature** — Determine whether data have changed

Description Quick start Syntax Remarks and examples Also see

Description

`clear`, by itself, removes data and value labels from memory and is equivalent to typing

```
. drop _all                (see [D] drop)
. label drop _all          (see [D] label)
```

`clear mata` removes Mata functions and objects from memory and is equivalent to typing

```
. mata: mata clear         (see [M-3] mata clear)
```

`clear results` eliminates stored results from memory and is equivalent to typing

```
. return clear             (see [P] return)
. ereturn clear            (see [P] return)
. sreturn clear            (see [P] return)
. _return drop _all        (see [P] _return)
```

`clear matrix` eliminates from memory all matrices created by Stata's `matrix` command; it does not eliminate Mata matrices from memory. `clear matrix` is equivalent to typing

```
. return clear             (see [P] return)
. ereturn clear            (see [P] return)
. sreturn clear            (see [P] return)
. _return drop _all        (see [P] _return)
. matrix drop _all         (see [P] matrix utility)
. estimates drop _all      (see [R] estimates)
```

`clear programs` eliminates all programs from memory and is equivalent to typing

```
. program drop _all        (see [P] program)
```

`clear ado` eliminates all automatically loaded ado-file programs from memory (but not programs defined interactively or by do-files). It is equivalent to typing

```
. program drop _allado     (see [P] program)
```

`clear rngstream` eliminates from memory stored random-number states for all `mt64s` streams (including the current stream). It resets the `mt64s` generator to the beginning of every stream, based on the current `mt64s` seed. `clear rngstream` does not change the current `mt64s` seed and stream. The `mt64s` seed and stream can be set with `set seed` and `set rngstream`, respectively.

`clear frames` eliminates from memory all `frames` and restores Stata to its initial state of having a single, empty frame named `default`.

`clear collect` removes all collections from memory and is equivalent to typing

```
. collect clear            (see [TABLES] collect clear)
```

`clear all` and `clear *` are synonyms. They remove all data, value labels, matrices, scalars, constraints, clusters, stored results, frames, sersets, and Mata functions and objects from memory. They also close all open files and postfiles, clear the class system, close any open Graph windows and dialog boxes, drop all programs from memory, and reset all timers to zero. However, they do not call `clear rngstream`. They are equivalent to typing

`. drop _all`	(see [D] **drop**)
`. frames reset`	(see [D] **frames reset**)
`. collect clear`	(see [TABLES] **collect clear**)
`. label drop _all`	(see [D] **label**)
`. matrix drop _all`	(see [P] **matrix utility**)
`. scalar drop _all`	(see [P] **scalar**)
`. constraint drop _all`	(see [R] **constraint**)
`. cluster drop _all`	(see [MV] **cluster utility**)
`. file close _all`	(see [P] **file**)
`. postutil clear`	(see [P] **postfile**)
`. _return drop _all`	(see [P] **_return**)
`. discard`	(see [P] **discard**)
`. program drop _all`	(see [P] **program**)
`. timer clear`	(see [P] **timer**)
`. putdocx clear`	(see [RPT] **putdocx begin**)
`. putpdf clear`	(see [RPT] **putpdf begin**)
`. mata: mata clear`	(see [M-3] **mata clear**)
`. python clear`	(see [P] **PyStata integration**)
`. java clear`	(see [P] **Java integration**)

Quick start

Remove data and value labels from memory

```
clear
```

Remove Stata matrices from memory

```
clear matrix
```

Remove Mata matrices, Mata objects, and Mata functions from memory

```
clear mata
```

Remove all programs from memory

```
clear programs
```

Same as above, but only programs automatically loaded by ado-files

```
clear ado
```

Remove results stored in `r()`, `e()`, and `s()` from memory

```
clear results
```

Remove all the above and constraints, clusters, and sersets; reset timers to 0; clear the class system; and close all open files, graph windows, and dialog boxes

```
clear all
```

Same as above

```
clear *
```

Syntax

```
clear

clear [mata|results|matrix|programs|ado|rngstream|frames|collect]

clear [all|*]
```

Remarks and examples

You can clear the entire dataset without affecting macros and programs by typing `clear`. You can also type `clear all`. This command has the same result as `clear` by itself but also clears matrices, scalars, constraints, clusters, stored results, sersets, Mata, the class system, business calendars, and programs; closes all open files and postfiles; closes all open Graph windows and dialog boxes; and resets all timers to zero.

▷ Example 1

We load the `bpwide` dataset to correct a mistake in the data.

```
. use https://www.stata-press.com/data/r19/bpwide
(Fictional blood-pressure data)

. list in 1/5

     +-----------------------------------------------+
     | patient    sex   agegrp   bp_bef~e   bp_after |
     |-----------------------------------------------|
  1. |       1   Male    30-45        143        153 |
  2. |       2   Male    30-45        163        170 |
  3. |       3   Male    30-45        153        168 |
  4. |       4   Male    30-45        153        142 |
  5. |       5   Male    30-45        146        141 |
     +-----------------------------------------------+

. replace bp_after = 145 in 3
(1 real change made)
```

We made another mistake. We meant to change the value of `bp_after` in observation 4. It is easiest to begin again.

```
. clear

. use https://www.stata-press.com/data/r19/bpwide
(Fictional blood-pressure data)
```

◁

Also see

[D] **drop** — Drop variables or observations

[P] **discard** — Drop automatically loaded programs

[U] 11 Language syntax

[U] 13 Functions and expressions

clonevar — Clone existing variable

Description

`clonevar` generates *newvar* as an exact copy of an existing variable, *varname*, with the same storage type, values, and display format as *varname*. *varname*'s variable label, value labels, notes, and characteristics will also be copied.

Quick start

Copy contents, label, and value label of `v1` to `newv1`

    clonevar newv1 = v1

Copy observations from `v2` to `newv2` where `v2` is less than 30

    clonevar newv2 = v2 if v2 < 30

Copy the first 20 observations of `v3` to `newv3`

    clonevar newv3 = v3 in f/20

Same as above

    clonevar newv3 = v3 in 1/20

Menu

Data > Create or change data > Other variable-creation commands > Clone existing variable

Syntax

`clonevar` *newvar* = *varname* [*if*] [*in*]

Remarks and examples

`clonevar` has various possible uses. Programmers may desire that a temporary variable appear to the user exactly like an existing variable. Interactively, you might want a slightly modified copy of an original variable, so the natural starting point is a clone of the original.

▷ Example 1

We have a dataset containing information on modes of travel. These data contain a variable named mode that identifies each observation as a specific mode of travel: air, train, bus, or car.

```
. use https://www.stata-press.com/data/r19/travel
(Modes of travel)

. describe mode

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
mode             byte    %8.0g     travel     Travel mode alternatives

. label list travel
travel:
           1 Air
           2 Train
           3 Bus
           4 Car
```

To create an identical variable identifying only observations that contain air or train, we could use clonevar with an if qualifier.

```
. clonevar airtrain = mode if mode == 1 | mode == 2
(420 missing values generated)

. describe mode airtrain

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
mode             byte    %8.0g     travel     Travel mode alternatives
airtrain         byte    %8.0g     travel     Travel mode alternatives

. list mode airtrain in 1/5

     +------------------+
     |  mode   airtrain |
     |------------------|
  1. |   Air        Air |
  2. | Train      Train |
  3. |   Bus          . |
  4. |   Car          . |
  5. |   Air        Air |
     +------------------+
```

The new airtrain variable has the same storage type, display format, value label, and variable label as mode. If mode had any characteristics or notes attached to it, they would have been applied to the new airtrain variable, too. The only differences in the two variables are their names and values for bus and car.

◁

❑ Technical note

The if qualifier used with the clonevar command in example 1 referred to the values of mode as 1 and 2. Had we wanted to refer to the values by their associated value labels, we could have typed

```
. clonevar airtrain = mode if mode == "air":travel | mode == "train":travel
```

For more details, see **[U] 13.11 Label values**.

❑

Acknowledgments

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Also see

[D] **generate** — Create or change contents of variable

[D] **separate** — Create separate variables

codebook — Describe data contents

Description

`codebook` examines the variable names, labels, and data to produce a codebook describing the dataset.

Quick start

Codebook of all variables in the dataset

```
codebook
```

Codebook of variables `v1`, `v2`, and `v3`

```
codebook v1 v2 v3
```

Codebook of all variables starting with `code`

```
codebook code*
```

Include dataset name, last saved date, and variable notes in the codebook

```
codebook, header notes
```

Report problems with labels, constant-valued variables, embedded spaces and binary 0 in string variables, and noninteger date variables

```
codebook, problems
```

Codebook for dataset with English and Spanish variable and value labels using label languages `en` and `es`

```
codebook, languages(en es)
```

Menu

Data > Describe data > Describe data contents (codebook)

Syntax

codebook [*varlist*] [*if*] [*in*] [, *options*]

options	Description
Options	
all	print complete report without missing values
header	print dataset name and last saved date
notes	print any notes attached to variables
mv	report pattern of missing values
tabulate(#)	set tables/summary statistics threshold; default is tabulate(9)
problems	report potential problems in dataset
detail	display detailed report on the variables; only with problems
compact	display compact report on the variables
dots	display a dot for each variable processed; only with compact
Languages	
languages[(*namelist*)]	use with multilingual datasets; see [D] **label language** for details

collect is allowed; see [U] **11.1.10 Prefix commands**.

Options

Options

all is equivalent to specifying the header and notes options. It provides a complete report, which excludes only performing mv.

header adds to the top of the output a header that lists the dataset name, the date that the dataset was last saved, etc.

notes lists any notes attached to the variables; see [D] **notes**.

mv specifies that codebook search the data to determine the pattern of missing values. This is a CPU-intensive task.

tabulate(#) specifies the number of unique values of the variables to use to determine whether a variable is categorical or continuous. Missing values are not included in this count. The default is 9; when there are more than nine unique values, the variable is classified as continuous. Extended missing values will be included in the tabulation.

problems specifies that a summary report is produced describing potential problems that have been diagnosed:

- Variables that are labeled with an undefined value label
- Incompletely value-labeled variables
- Variables that are constant, including always missing
- Leading, trailing, and embedded spaces in string variables
- Embedded binary 0 (\0) in string variables
- Noninteger-valued date variables

See the discussion of these problems and advice on overcoming them following example 5.

`detail` may be specified only with the `problems` option. It specifies that the detailed report on the variables not be suppressed.

`compact` specifies that a compact report on the variables be displayed. `compact` may not be specified with any options other than `dots`.

`dots` specifies that a dot be displayed for every variable processed. `dots` may be specified only with `compact`.

Languages

`languages`[`(`*namelist*`)`] is for use with multilingual datasets; see [D] **label language**. It indicates that the codebook pertains to the languages in *namelist* or to all defined languages if no such list is specified as an argument to `languages()`. The output of `codebook` lists the data label and variable labels in these languages and which value labels are attached to variables in these languages.

Problems are diagnosed in all of these languages, as well. The problem report does not provide details in which language problems occur. We advise you to rerun `codebook` for problematic variables; specify `detail` to produce the problem report again.

If you have a multilingual dataset but do not specify `languages()`, all output, including the problem report, is shown in the "active" language.

Remarks and examples

`codebook`, without arguments, is most usefully combined with `log` to produce a printed listing for enclosure in a notebook documenting the data; see [U] **15 Saving and printing output—log files**. `codebook` is, however, also useful interactively, because you can specify one or a few variables.

▷ Example 1

`codebook` examines the data in producing its results. For variables that `codebook` thinks are continuous, it presents the mean; the standard deviation; and the 10th, 25th, 50th, 75th, and 90th percentiles. For variables that it thinks are categorical, it presents a tabulation. In part, `codebook` makes this determination by counting the number of unique values of the variable. If the number is nine or fewer, `codebook` reports a tabulation; otherwise, it reports summary statistics.

`codebook` distinguishes the standard missing values (`.`) and the extended missing values (`.a` through `.z`, denoted by `.*`). If extended missing values are found, `codebook` reports the number of distinct missing value codes that occurred in that variable. Missing values are ignored with the `tabulate` option when determining whether a variable is treated as continuous or categorical.

```
. use https://www.stata-press.com/data/r19/educ3
(ccdb46, 52-54)

. codebook fips division, all

                Dataset:  https://www.stata-press.com/data/r19/educ3.dta
             Last saved: 6 Mar 2024 22:20

                  Label: ccdb46, 52-54
   Number of variables: 42
Number of observations: 956
                   Size: 145,312 bytes ignoring labels, etc.

_dta:
  1.  confirmed data with steve on 7/22
--------------------------------------------------------------------------------
fips                                                             state/place code
--------------------------------------------------------------------------------

                   Type: Numeric (long)

                  Range: [10060,560050]               Units: 1
          Unique values: 956                      Missing .: 0/956

                   Mean: 256495
              Std. dev.: 156998

            Percentiles:     10%       25%       50%       75%       90%
                           61462    120426    252848    391360    482530
--------------------------------------------------------------------------------
division                                                         Census Division
--------------------------------------------------------------------------------

                   Type: Numeric (int)
                  Label: division

                  Range: [1,9]                        Units: 1
          Unique values: 9                        Missing .: 4/956
        Unique mv codes: 2                       Missing .*: 2/956

             Tabulation: Freq.   Numeric  Label
                            69         1  N. Eng.
                            97         2  Mid Atl
                           202         3  E.N.C.
                            78         4  W.N.C.
                           115         5  S. Atl.
                            46         6  E.S.C.
                            89         7  W.S.C.
                            59         8  Mountain
                           195         9  Pacific
                             4         .
                             2        .a
```

Because `division` has nine unique nonmissing values, `codebook` reported a tabulation. If `division` had contained one more unique nonmissing value, `codebook` would have switched to reporting summary statistics, unless we had included the `tabulate(#)` option.

◁

▷ Example 2

The mv option is useful. It instructs codebook to search the data to determine patterns of missing values. Different kinds of missing values are not distinguished in the patterns.

```
. use https://www.stata-press.com/data/r19/citytemp
(City temperature data)

. codebook cooldd heatdd tempjan tempjuly, mv

-------------------------------------------------------------------------------
cooldd                                                     Cooling degree days
-------------------------------------------------------------------------------

                  Type: Numeric (int)

                 Range: [0,4389]                    Units: 1
         Unique values: 438                     Missing .: 3/956

                  Mean: 1240.41
             Std. dev.: 937.668

           Percentiles:     10%       25%       50%       75%       90%
                            411       615       940      1566      2761

        Missing values:        heatdd==mv <-> cooldd==mv
                              tempjan==mv --> cooldd==mv
                             tempjuly==mv --> cooldd==mv
-------------------------------------------------------------------------------
heatdd                                                     Heating degree days
-------------------------------------------------------------------------------

                  Type: Numeric (int)

                 Range: [0,10816]                   Units: 1
         Unique values: 471                     Missing .: 3/956

                  Mean: 4425.53
             Std. dev.:  2199.6

           Percentiles:     10%       25%       50%       75%       90%
                           1510      2460      4950      6232      6919

        Missing values:        cooldd==mv <-> heatdd==mv
                              tempjan==mv --> heatdd==mv
                             tempjuly==mv --> heatdd==mv
-------------------------------------------------------------------------------
tempjan                                            Average January temperature
-------------------------------------------------------------------------------

                  Type: Numeric (float)

                 Range: [2.2,72.6]                  Units: .1
         Unique values: 310                     Missing .: 2/956

                  Mean:  35.749
             Std. dev.: 14.1881

           Percentiles:     10%       25%       50%       75%       90%
                           20.2      25.1      31.3      47.8      55.1

        Missing values:      tempjuly==mv <-> tempjan==mv
```

```
--------------------------------------------------------------------------------
tempjuly                                                Average July temperature
--------------------------------------------------------------------------------

                  Type: Numeric (float)

                 Range: [58.1,93.6]                  Units: .1
         Unique values: 196                      Missing .: 2/956

                  Mean: 75.0538
             Std. dev.: 5.49504

           Percentiles:     10%       25%       50%       75%       90%
                           68.8      71.8     74.25      78.7      82.3

        Missing values:       tempjan==mv <-> tempjuly==mv
```

codebook reports that if tempjan is missing, tempjuly is also missing, and vice versa. In the output for the cooldd variable, codebook also reports that the pattern of missing values is the same for cooldd and heatdd. In both cases, the correspondence is indicated with “<->”.

For cooldd, codebook also states that “tempjan==mv -> cooldd==mv”. The one-way arrow means that a missing tempjan value implies a missing cooldd value but that a missing cooldd value does not necessarily imply a missing tempjan value.

◁

Another feature of codebook—this one for numeric variables—is that it can determine the units of the variable. For instance, in the example above, tempjan and tempjuly both have units of 0.1, meaning that temperature is recorded to tenths of a degree. codebook handles precision considerations in making this determination (tempjan and tempjuly are floats; see **[U] 13.12 Precision and problems therein**). If we had a variable in our dataset recorded in 100s (for example, 21,500 or 36,800), codebook would have reported the units as 100. If we had a variable that took on only values divisible by 5 (5, 10, 15, etc.), codebook would have reported the units as 5.

▷ Example 3

We can use the label language command (see **[D] label language**) and the label command (see **[D] label**) to create German value labels for our auto dataset. These labels are reported by codebook:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. label language en, rename
(language default renamed en)

. label language de, new
(language de now current language)

. label data "1978 Automobile Daten"

. label variable foreign "Art Auto"

. label values foreign origin_de

. label define origin_de 0 "Innen" 1 "Ausländisch"
```

```
. codebook foreign

-------------------------------------------------------------------------------
foreign                                                                Art Auto
-------------------------------------------------------------------------------

                  Type: Numeric (byte)
                 Label: origin_de

                 Range: [0,1]                         Units: 1
         Unique values: 2                         Missing .: 0/74

            Tabulation: Freq.   Numeric  Label
                           52         0  Innen
                           22         1  Ausländisch
. codebook foreign, languages(en de)

-------------------------------------------------------------------------------
foreign          in en: Car origin
                 in de: Art Auto
-------------------------------------------------------------------------------

                  Type: Numeric (byte)
           Label in en: origin
           Label in de: origin_de

                 Range: [0,1]                         Units: 1
         Unique values: 2                         Missing .: 0/74

            Tabulation: Freq. Numeric  origin        origin_de
                           52       0  Domestic      Innen
                           22       1  Foreign       Ausländisch
```

With the languages() option, the value labels are shown in the specified active and available languages.

◁

▷ Example 4

codebook, compact summarizes the variables in your dataset, including variable labels. It is an alternative to the summarize command.

```
. use https://www.stata-press.com/data/r19/auto, clear
(1978 automobile data)

. codebook, compact
Variable      Obs Unique      Mean  Min    Max  Label
-------------------------------------------------------------------------------
make           74     74         .    .      .  Make and model
price          74     74  6165.257 3291  15906  Price
mpg            74     21   21.2973   12     41  Mileage (mpg)
rep78          69      5  3.405797    1      5  Repair record 1978
headroom       74      8  2.993243  1.5      5  Headroom (in.)
trunk          74     18  13.75676    5     23  Trunk space (cu. ft.)
weight         74     64  3019.459 1760   4840  Weight (lbs.)
length         74     47  187.9324  142    233  Length (in.)
turn           74     18  39.64865   31     51  Turn circle (ft.)
displacement   74     31  197.2973   79    425  Displacement (cu. in.)
gear_ratio     74     36  3.014865 2.19   3.89  Gear ratio
foreign        74      2  .2972973    0      1  Car origin
-------------------------------------------------------------------------------
```

```
. summarize

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
        make |          0
       price |         74    6165.257    2949.496       3291      15906
         mpg |         74     21.2973    5.785503         12         41
       rep78 |         69    3.405797    .9899323          1          5
    headroom |         74    2.993243    .8459948        1.5          5
-------------+---------------------------------------------------------
       trunk |         74    13.75676    4.277404          5         23
      weight |         74    3019.459    777.1936       1760       4840
      length |         74    187.9324    22.26634        142        233
        turn |         74    39.64865    4.399354         31         51
displacement |         74    197.2973    91.83722         79        425
-------------+---------------------------------------------------------
  gear_ratio |         74    3.014865    .4562871       2.19       3.89
     foreign |         74    .2972973    .4601885          0          1
```

Example 5

When codebook determines that neither a tabulation nor a listing of summary statistics is appropriate, for instance, for a string variable or for a numeric variable taking on many labeled values, it reports a few examples instead.

```
. use https://www.stata-press.com/data/r19/funnyvar
. codebook name

--------------------------------------------------------------------------------
name                                                                 (unlabeled)
--------------------------------------------------------------------------------

                  Type: String (str5), but longest is str3

         Unique values: 10                         Missing "": 0/10

              Examples: "1 0"
                        "3"
                        "5"
                        "7"

               Warning: Variable has embedded blanks.
```

codebook is also on the lookout for common problems that might cause you to make errors when dealing with the data. For string variables, this includes leading, embedded, and trailing blanks and embedded binary 0 (\0). In the output above, codebook informed us that name includes embedded blanks. If name had leading or trailing blanks, it would have mentioned that, too.

When variables are value labeled, codebook performs two checks. First, if a value label *labname* is associated with a variable, codebook checks whether *labname* is actually defined. Second, it checks whether all values are value labeled. Partial labeling of a variable may mean that the label was defined incorrectly (for instance, the variable has values 0 and 1, but the value label maps 1 to “male” and 2 to “female”) or that the variable was defined incorrectly (for example, a variable gender with three values). codebook checks whether date variables are integer valued.

If the problems option is specified, codebook does not provide detailed descriptions of each variable but reports only the potential problems in the data.

```
. codebook, problems
Potential problems in dataset https://www.stata-press.com/data/r19/
> funnyvar.dta
               Potential problem   Variables
──────────────────────────────────────────────────────────────────
  constant (or all missing) vars   human planet
     vars with nonexisting label   educ
       incompletely labeled vars   gender
str# vars that may be compressed   name address city country planet
 string vars with leading blanks   city country
string vars with trailing blanks   planet
string vars with embedded blanks   name address
    string vars with embedded \0   mugshot
     noninteger-valued date vars   birthdate
──────────────────────────────────────────────────────────────────
```

◁

In the example above, `codebook, problems` reported various potential problems with the dataset. These problems include

- Constant variables, including variables that are always missing

    Variables that are constant, taking the same value in all observations, or that are always missing, are often superfluous. Such variables, however, may also indicate problems. For instance, variables that are always missing may occur when importing data with an incorrect input specification. Such variables may also occur if you generate a new variable for a subset of the data, selected with an expression that is false for all observations.

    Advice: Carefully check the origin of constant variables. If you are saving a constant variable, be sure to `compress` the variable to use minimal storage.

- Variables with nonexisting value labels

    Stata treats value labels as separate objects that can be attached to one or more variables. A problem may arise if variables are linked to value labels that are not yet defined or if an incorrect value label name was used.

    Advice: Attach the correct value label, or `label define` the value label. See [D] **label**.

- Incompletely labeled variables

    A variable is called "incompletely value labeled" if the variable is value labeled but no mapping is provided for some values of the variable. An example is a variable with values 0, 1, and 2 and value labels for 1, 2, and 3. This situation usually indicates an error, either in the data or in the value label.

    Advice: Change either the data or the value label.

- String variables that may be compressed

    The storage space used by a string variable is determined by its data type; see [D] **Data types**. For instance, the storage type `str20` indicates that 20 bytes are used per observation. If the declared storage type exceeds your requirements, memory and disk space is wasted.

    Advice: Use `compress` to store the data as compactly as possible.

- String variables with leading or trailing blanks

  In most applications, leading and trailing spaces do not affect the meaning of variables but are probably side effects from importing the data or from data manipulation. Spurious leading and trailing spaces force Stata to use more memory than required. In addition, manipulating strings with leading and trailing spaces is harder.

  Advice: Remove leading and trailing blanks from a string variable `s` by typing

  ```
  replace s = strtrim(s)
  ```

  See [FN] **String functions**.

- String variables with embedded blanks

  String variables with embedded blanks are often appropriate; however, sometimes they indicate problems importing the data.

  Advice: Verify that blanks are meaningful in the variables.

- String variables with embedded binary 0 (`\0`)

  String variables with embedded binary 0 (`\0`) are allowed; however, caution should be used when working with them as some commands and functions may only work with the plain text portion of a binary string, ignoring anything after the first binary 0.

  Advice: Be aware of binary strings in your data and whether you are manipulating them in a way that is only appropriate with plain text values.

- Noninteger-valued date variables

  Stata's date and time formats were designed for use with integer values but will work with noninteger values.

  Advice: Carefully inspect the nature of the noninteger values. If noninteger values in a variable are the consequence of roundoff error, you may want to round the variable to the nearest integer.

  ```
  replace time = round(time)
  ```

Of course, more problems not reported by `codebook` are possible. These might include

- Numerical data stored as strings

  After importing data into Stata, you may discover that some string variables can actually be interpreted as numbers. Stata can do much more with numerical data than with string data. Moreover, string representation usually makes less efficient use of computer resources. `destring` will convert string variables to numeric.

  A string variable may contain a "field" with numeric information. An example is an address variable that contains the street name followed by the house number. The Stata string functions can extract the relevant substring.

- Categorical variables stored as strings

  Most statistical commands do not allow string variables. Moreover, string variables that take only a limited number of distinct values are an inefficient storage method. Use value-labeled numeric values instead. These are easily created with `encode`.

- Duplicate observations

  See [D] **duplicates**.

- Observations that are always missing

  Drop observations that are missing for all variables in *varlist* using the `rownonmiss()` `egen` function:

  `egen nobs = rownonmiss(`*varlist*`)`

  `drop if nobs==0`

  Specify `_all` for *varlist* if only observations that are always missing should be dropped.

Stored results

`codebook` stores the following lists of variables with potential problems in `r()`:

Macros

`r(cons)`	constant (or missing)
`r(labelnotfound)`	undefined value labeled
`r(notlabeled)`	value labeled but with unlabeled categories
`r(str_type)`	compressible
`r(str_leading)`	leading blanks
`r(str_trailing)`	trailing blanks
`r(str_embedded)`	embedded blanks
`r(str_embedded0)`	embedded binary 0 (`\0`)
`r(realdate)`	noninteger dates

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Also see

[D] **describe** — Describe data in memory or in a file

[D] **ds** — Compactly list variables with specified properties

[D] **inspect** — Display simple summary of data's attributes

[D] **labelbook** — Label utilities

[D] **notes** — Place notes in data

[D] **split** — Split string variables into parts

[U] 15 Saving and printing output—log files

Description Quick start Menu Syntax
Options Remarks and examples Acknowledgment Also see

Description

`collapse` converts the dataset in memory into a dataset of means, sums, medians, etc. *clist* must refer to numeric variables exclusively.

Note: See [D] **contract** if you want to collapse to a dataset of frequencies.

Quick start

Replace dataset in memory with means of `v1` and `v2`

```
collapse v1 v2
```

Same as above, but calculate statistics separately by each level of `catvar`

```
collapse v1 v2, by(catvar)
```

Dataset of mean, standard deviation, and standard error of the mean of `v1`

```
collapse (mean) mean1=v1 (sd) sd1=v1 (semean) sem1=v1
```

Mean and standard error of the mean for binomial `v2`

```
collapse (mean) mean2=v2 (sebinomial) sem2=v2
```

Frequency, median, and interquartile range of `v1`

```
collapse (count) freq=v1 (p50) p50=v1 (iqr) iqr=v1
```

Weighted and unweighted sum of `v2` using frequency weight `wvar`

```
collapse (sum) weighted=v2 (rawsum) unweighted=v2 [fweight=wvar]
```

Menu

Data > Create or change data > Other variable-transformation commands > Make dataset of means, medians, etc.

Syntax

`collapse` *clist* [*if*] [*in*] [*weight*] [, *options*]

where *clist* is either

[(*stat*)] *varlist* [[(*stat*)] ...]
[(*stat*)] *target_var*=*varname* [*target_var*=*varname* ...] [[(*stat*)] ...]

or any combination of the *varlist* and *target_var* forms, and *stat* is one of

`mean`	means; the default
`median`	medians
`p1`	1st percentile
`p2`	2nd percentile
...	3rd–49th percentiles
`p50`	50th percentile (same as `median`)
...	51st–97th percentiles
`p98`	98th percentile
`p99`	99th percentile
`sd`	standard deviations
`semean`	standard error of the mean (`sd/sqrt(n)`)
`sebinomial`	standard error of the mean, binomial (`sqrt(p(1-p)/n)`)
`sepoisson`	standard error of the mean, Poisson (`sqrt(mean/n)`)
`sum`	sums
`rawsum`	sums, ignoring optionally specified weight except observations with a weight of zero are excluded
`count`	number of nonmissing observations
`percent`	percentage of nonmissing observations in the by group (100 × (# nonmissing in by group)/(total # nonmissing))
`max`	maximums
`min`	minimums
`iqr`	interquartile range
`first`	first value
`last`	last value
`firstnm`	first nonmissing value
`lastnm`	last nonmissing value

options	Description
Options	
`by(`*varlist*`)`	groups over which *stat* is to be calculated
`cw`	casewise deletion instead of all possible observations
`fast`	do not restore the original dataset should the user press *Break*; programmer's command

varlist and *varname* in *clist* may contain time-series operators; see **[U] 11.4.4 Time-series varlists**.

`aweight`s, `fweight`s, `iweight`s, and `pweight`s are allowed; see **[U] 11.1.6 weight**, and see *Weights* below. `pweight`s may not be used with `sd`, `semean`, `sebinomial`, or `sepoisson`. `iweight`s may not be used with `semean`, `sebinomial`, or `sepoisson`. `aweight`s may not be used with `sebinomial` or `sepoisson`.

`fast` does not appear in the dialog box.

Examples:

```
. collapse age educ income, by(state)
. collapse (mean) age educ (median) income, by(state)
. collapse (mean) age educ income (median) medinc=income, by(state)
. collapse (p25) gpa [fw=number], by(year)
```

Options

Options

by(*varlist*) specifies the groups over which the means, etc., are to be calculated. If this option is not specified, the resulting dataset will contain 1 observation. If it is specified, *varlist* may refer to either string or numeric variables.

cw specifies casewise deletion. If cw is not specified, all possible observations are used for each calculated statistic.

The following option is available with collapse but is not shown in the dialog box:

fast specifies that collapse not restore the original dataset should the user press *Break*. fast is intended for use by programmers.

Remarks and examples

collapse takes the dataset in memory and creates a new dataset containing summary statistics of the original data. collapse adds meaningful variable labels to the variables in this new dataset. Because the syntax diagram for collapse makes using it appear more complicated than it is, collapse is best explained with examples.

Remarks are presented under the following headings:

Introductory examples

▷ Example 1

Consider the following artificial data on the grade-point average (gpa) of college students:

```
. use https://www.stata-press.com/data/r19/college

. describe

Contains data from https://www.stata-press.com/data/r19/college.dta
 Observations:            12
    Variables:             4                  3 Jan 2024 12:05
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
gpa             float   %9.0g                 gpa for this year
hour            int     %9.0g                 Total academic hours
year            int     %9.0g                 1 = freshman, 2 = sophomore, 3 =
                                                junior, 4 = senior
number          int     %9.0g                 number of students
--------------------------------------------------------------------------------
Sorted by: year
```

```
. list, sep(4)
```

	gpa	hour	year	number
1.	3.2	30	1	3
2.	3.5	34	1	2
3.	2.8	28	1	9
4.	2.1	30	1	4
5.	3.8	29	2	3
6.	2.5	30	2	4
7.	2.9	35	2	5
8.	3.7	30	3	4
9.	2.2	35	3	2
10.	3.3	33	3	3
11.	3.4	32	4	5
12.	2.9	31	4	2

To obtain a dataset containing the 25th percentile of gpa's for each year, we type

```
. collapse (p25) gpa [fw=number], by(year)
```

We used frequency weights.

Next we want to create a dataset containing the mean of gpa and hour for each year. We do not have to type `(mean)` to specify that we want the mean because the mean is reported by default.

```
. use https://www.stata-press.com/data/r19/college, clear
. collapse gpa hour [fw=number], by(year)
. list
```

	year	gpa	hour
1.	1	2.788889	29.44444
2.	2	2.991667	31.83333
3.	3	3.233333	32.11111
4.	4	3.257143	31.71428

Now we want to create a dataset containing the mean and median of gpa and `hour`, and we want the median of gpa and `hour` to be stored as variables `medgpa` and `medhour`, respectively.

```
. use https://www.stata-press.com/data/r19/college, clear
. collapse (mean) gpa hour (median) medgpa=gpa medhour=hour [fw=num], by(year)
. list
```

	year	gpa	hour	medgpa	medhour
1.	1	2.788889	29.44444	2.8	29
2.	2	2.991667	31.83333	2.9	30
3.	3	3.233333	32.11111	3.3	33
4.	4	3.257143	31.71428	3.4	32

Here we want to create a dataset containing a count of gpa and `hour` and the minimums of gpa and `hour`. The minimums of gpa and `hour` will be stored as variables `mingpa` and `minhour`, respectively.

```
. use https://www.stata-press.com/data/r19/college, clear
. collapse (count) gpa hour (min) mingpa=gpa minhour=hour [fw=num], by(year)
. list
```

	year	gpa	hour	mingpa	minhour
1.	1	18	18	2.1	28
2.	2	12	12	2.5	29
3.	3	9	9	2.2	30
4.	4	7	7	2.9	31

Now we replace the values of gpa in 3 of the observations with missing values.

```
. use https://www.stata-press.com/data/r19/college, clear
. replace gpa = . in 2/4
(3 real changes made, 3 to missing)
. list, sep(4)
```

	gpa	hour	year	number
1.	3.2	30	1	3
2.	.	34	1	2
3.	.	28	1	9
4.	.	30	1	4
5.	3.8	29	2	3
6.	2.5	30	2	4
7.	2.9	35	2	5
8.	3.7	30	3	4
9.	2.2	35	3	2
10.	3.3	33	3	3
11.	3.4	32	4	5
12.	2.9	31	4	2

If we now want to list the data containing the mean of gpa and `hour` for each year, `collapse` uses all observations on `hour` for `year` = 1, even though gpa is missing for observations 1–3.

```
. collapse gpa hour [fw=num], by(year)
. list
```

	year	gpa	hour
1.	1	3.2	29.44444
2.	2	2.991667	31.83333
3.	3	3.233333	32.11111
4.	4	3.257143	31.71428

If we repeat this process but specify the cw option, collapse ignores all observations that have missing values.

```
. use https://www.stata-press.com/data/r19/college, clear
. replace gpa = . in 2/4
(3 real changes made, 3 to missing)
. collapse (mean) gpa hour [fw=num], by(year) cw
. list
```

	year	gpa	hour
1.	1	3.2	30
2.	2	2.991667	31.83333
3.	3	3.233333	32.11111
4.	4	3.257143	31.71428

◁

▷ Example 2

We have individual-level data from a census in which each observation is a person. Among other variables, the dataset contains the numeric variables age, educ, and income and the string variable state. We want to create a 50-observation dataset containing the means of age, education, and income for each state.

```
. collapse age educ income, by(state)
```

The resulting dataset contains means because collapse assumes that we want means if we do not specify otherwise. To make this explicit, we could have typed

```
. collapse (mean) age educ income, by(state)
```

Had we wanted the mean for age and educ and the median for income, we could have typed

```
. collapse (mean) age educ (median) income, by(state)
```

or if we had wanted the mean for age and educ and both the mean and the median for income, we could have typed

```
. collapse (mean) age educ income (median) medinc=income, by(state)
```

This last dataset will contain three variables containing means—age, educ, and income—and one variable containing the median of income—medinc. Because we typed (median) medinc=income, Stata knew to find the median for income and to store those in a variable named medinc. This renaming convention is necessary in this example because a variable named income containing the mean is also being created.

◁

Variablewise or casewise deletion

▷ Example 3

Let's assume that in our census data, we have 25,000 persons for whom age is recorded but only 15,000 for whom income is recorded; that is, `income` is missing for 10,000 observations. If we want summary statistics for `age` and `income`, `collapse` will, by default, use all 25,000 observations when calculating the summary statistics for `age`. If we prefer that `collapse` use only the 15,000 observations for which `income` is not missing, we can specify the `cw` (casewise) option:

```
. collapse (mean) age income (median) medinc=income, by(state) cw
```

◁

Weights

`collapse` allows all four weight types; the default is `aweights`. Weight normalization affects only the `sum`, `count`, `sd`, `semean`, and `sebinomial` statistics.

Let j index observations and i index by-groups. Here are the definitions for `count` and `sum` with weights:

`count`:

unweighted:	N_i, the number of observations in group i
`aweight`:	N_i, the number of observations in group i
`fweight`, `iweight`, `pweight`:	$\sum w_j$, the sum of the weights over observations in group i

`sum`:

unweighted:	$\sum x_j$, the sum of x_j over observations in group i
`aweight`:	$\sum v_j x_j$ over observations in group i; $v_j =$ weights normalized to sum to N_i
`fweight`, `iweight`, `pweight`:	$\sum w_j x_j$ over observations in group i

When the `by()` option is not specified, the entire dataset is treated as one group.

The `sd` statistic with weights returns the square root of the bias-corrected variance, which is based on the factor $\sqrt{N_i/(N_i - 1)}$, where N_i is the number of observations. Statistics `sd`, `semean`, `sebinomial`, and `sepoisson` are not allowed with `pweight`ed data. Otherwise, the statistic is changed by the weights through the computation of the weighted count, as outlined above.

For instance, consider a case in which there are 25 observations in the dataset and a weighting variable that sums to 57. In the unweighted case, the weight is not specified, and the count is 25. In the analytically weighted case, the count is still 25; the scale of the weight is irrelevant. In the frequency-weighted case, however, the count is 57, the sum of the weights.

The `rawsum` statistic with `aweights` ignores the weight, with one exception: observations with zero weight will not be included in the sum.

▷ Example 4

Using our same census data, suppose that instead of starting with individual-level data and aggregating to the state level, we started with state-level data and wanted to aggregate to the region level. Also assume that our dataset contains pop, the population of each state.

To obtain unweighted means and medians of age and income, by region, along with the total population, we could type

```
. collapse (mean) age income (median) medage=age medinc=income (sum) pop,
> by(region)
```

To obtain weighted means and medians of age and income, by region, along with the total population and using frequency weights, we could type

```
. collapse (mean) age income (median) medage=age medinc=income (count) pop
> [fweight=pop], by(region)
```

Note: Specifying `(sum) pop` would not have worked because that would have yielded the pop-weighted sum of pop. Specifying `(count) age` would have worked as well as `(count) pop` because `count` merely counts the number of nonmissing observations. The counts here, however, are frequency-weighted and equal the sum of pop.

To obtain the same mean and medians as above, but using analytic weights, we could type

```
. collapse (mean) age income (median) medage=age medinc=income (rawsum) pop
> [aweight=pop], by(region)
```

Note: Specifying `(count) pop` would not have worked because, with analytic weights, `count` would count numbers of physical observations. Specifying `(sum) pop` would not have worked because `sum` would calculate weighted sums (with a normalized weight). The `rawsum` function, however, ignores the weights and sums only the specified variable, with one exception: observations with zero weight will not be included in the sum. `rawsum` would have worked as the solution to all three cases.

◁

A final example

▷ Example 5

We have census data containing information on each state's median age, marriage rate, and divorce rate. We want to form a new dataset containing various summary statistics, by region, of the variables:

```
. use https://www.stata-press.com/data/r19/census5, clear
(1980 Census data by state)

. describe

Contains data from https://www.stata-press.com/data/r19/census5.dta
 Observations:            50                  1980 Census data by state
    Variables:             7                  6 Apr 2024 15:43
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
state           str14   %14s                  State
state2          str2    %-2s                  Two-letter state abbreviation
region          int     %8.0g      cenreg     Census region
pop             long    %10.0g                Population
median_age      float   %9.2f                 Median age
marriage_rate   float   %9.0g
divorce_rate    float   %9.0g
--------------------------------------------------------------------------------
Sorted by: region

. collapse (median) median_age marriage divorce (mean) avgmrate=marriage
> avgdrate=divorce [aw=pop], by(region)

. list

     +-----------------------------------------------------------------------+
     |   region   median~e   marria~e   divorc~e   avgmrate   avgdrate |
     |-----------------------------------------------------------------------|
  1. |       NE      31.90   .0080657   .0035295   .0081472   .0035359 |
  2. | N Cntrl      29.90   .0093821   .0048636   .0096701    .004961 |
  3. |    South      29.60   .0112609   .0065792   .0117082   .0059439 |
  4. |     West      29.90   .0089093   .0056423   .0125199   .0063464 |
     +-----------------------------------------------------------------------+

. describe

Contains data
 Observations:             4                  1980 Census data by state
    Variables:             6
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
region          int     %8.0g      cenreg     Census region
median_age      float   %9.2f                 (p 50) median_age
marriage_rate   float   %9.0g                 (p 50) marriage_rate
divorce_rate    float   %9.0g                 (p 50) divorce_rate
avgmrate        float   %9.0g                 (mean) marriage_rate
avgdrate        float   %9.0g                 (mean) divorce_rate
--------------------------------------------------------------------------------
Sorted by: region
     Note: Dataset has changed since last saved.
```

◁

Acknowledgment

We thank David Roodman of the Open Philanthropy Project for writing collapse2, which inspired several features in collapse.

Also see

[D] **contract** — Make dataset of frequencies and percentages

[D] **egen** — Extensions to generate

[D] **statsby** — Collect statistics for a command across a by list

[R] **summarize** — Summary statistics

compare — Compare two variables

Description Quick start Menu Syntax Remarks and examples
Also see

Description

`compare` reports the differences and similarities between *varname*$_1$ and *varname*$_2$.

Quick start

Describe differences in missing and defined values of `v1` and `v2`

```
compare v1 v2
```

Same as above, but only for observations where `catvar` is equal to 3

```
compare v1 v2 if catvar==3
```

Same as above, but for each level of `catvar`

```
by catvar: compare v1 v2
```

Menu

Data > Data utilities > Compare two variables

Syntax

`compare` *varname*$_1$ *varname*$_2$ [*if*] [*in*]

by is allowed; see [D] **by**.

Remarks and examples

▷ Example 1

One of the more useful accountings made by `compare` is the pattern of missing values:

```
. use https://www.stata-press.com/data/r19/fullauto
(Automobile models)

. compare rep77 rep78

                                        ---------- Difference ----------
                            Count       Minimum      Average     Maximum
------------------------------------------------------------------------
rep77<rep78                    16            -3      -1.3125          -1
rep77=rep78                    43
rep77>rep78                     7             1            1           1
                       ----------
Jointly defined                66            -3     -.2121212          1
rep77 missing only              3
Jointly missing                 5
                       ----------
Total                          74
```

We see that both rep77 and rep78 are missing in 5 observations and that rep77 is also missing in 3 more observations.

◁

❑ Technical note

compare may be used with numeric variables, string variables, or both. When used with string variables, the summary of the differences (minimum, average, maximum) is not reported. When used with string and numeric variables, the breakdown by <, =, and > is also suppressed.

❑

Also see

[D] **cf** — Compare two datasets

[D] **codebook** — Describe data contents

[D] **inspect** — Display simple summary of data's attributes

compress — Compress data in memory

Description   Quick start   Menu   Syntax   Option   Remarks and examples
Also see

Description

`compress` attempts to reduce the amount of memory used by your data.

Quick start

Reduce the amount of memory used by the current dataset

```
compress
```

Same as above, but only reduce memory used by `v1` and `v2`

```
compress v1 v2
```

Speed up `compress` for large datasets with `strL`-type variables, but possibly reduce the amount of memory saved

```
compress, nocoalesce
```

Menu

Data > Data utilities > Optimize variable storage

Syntax

`compress` [*varlist*] [`, nocoalesce`]

Option

`nocoalesce` specifies that `compress` not try to find duplicate values within `strL` variables in an attempt to save memory. If `nocoalesce` is not specified, `compress` must sort the data by each `strL` variable, which can be time consuming in large datasets.

Remarks and examples

`compress` reduces the size of your dataset by considering two things. First, it considers demoting

`doubles`	to	`longs`, `ints`, or `bytes`
`floats`	to	`ints` or `bytes`
`longs`	to	`ints` or `bytes`
`ints`	to	`bytes`
`str#s`	to	shorter `str#s`
`strLs`	to	`str#s`

See [D] **Data types** for an explanation of these storage types.

Second, it considers coalescing strLs within each strL variable. That is to say, if a strL variable takes on the same value in multiple observations, compress can link those values to a single memory location to save memory. To check for this, compress must sort the data on each strL variable. You can use the nocoalesce option to tell compress not to take the time to perform this check. If compress does check whether it can coalesce strL values, it will do whichever saves more memory—coalescing strL values or demoting a strL to a str#—or it will do nothing if it cannot save memory by changing a strL.

compress leaves your data logically unchanged but (probably) appreciably smaller. compress never makes a mistake, results in loss of precision, or hacks off strings.

▷ Example 1

If you do not specify *varlist*, compress considers demoting all the variables in your dataset, so typing compress by itself is usually enough:

```
. use https://www.stata-press.com/data/r19/compxmp2
(1978 automobile data)

. compress
  variable mpg was float now byte
  variable price was long now int
  variable yenprice was double now long
  variable weight was double now int
  variable make was str26 now str17
  (1,776 bytes saved)
```

If there are no compression possibilities, compress does nothing. For instance, typing compress again results in

```
. compress
  (0 bytes saved)
```

◁

Video example

How to optimize the storage of variables

Also see

[D] **Data types** — Quick reference for data types

[D] **recast** — Change storage type of variable

contract — Make dataset of frequencies and percentages

Description | Quick start | Menu | Syntax | Options
Remarks and examples | Acknowledgments | Reference | Also see

Description

`contract` replaces the dataset in memory with a new dataset consisting of all combinations of *varlist* that exist in the data and a new variable that contains the frequency of each combination.

Quick start

Frequency of each combination of `v1` and `v2` saved in `_freq`

```
contract v1 v2
```

Same as above, but name new frequency variable `newf`

```
contract v1 v2, freq(newf)
```

Add percentage of total in `newp`

```
contract v1 v2, freq(newf) percent(newp)
```

Add cumulative frequency `newcf` and cumulative percentage `newcp`

```
contract v1 v2, freq(newf) percent(newp) cfreq(newcf) ///
   cpercent(newcp)
```

Frequency of combinations excluding missing values

```
contract v1 v2, nomiss
```

Add combinations with zero observations

```
contract v1 v2, nomiss zero
```

Menu

Data > Create or change data > Other variable-transformation commands > Make dataset of frequencies

Syntax

contract *varlist* [*if*] [*in*] [*weight*] [, *options*]

options	Description
Options	
freq(*newvar*)	name of frequency variable; default is _freq
cfreq(*newvar*)	create cumulative frequency variable
percent(*newvar*)	create percentage variable
cpercent(*newvar*)	create cumulative percentage variable
float	generate percentage variables as type float
format(*format*)	display format for new percentage variables; default is format(%8.2f)
zero	include combinations with frequency zero
nomiss	drop observations with missing values

fweights are allowed; see [U] **11.1.6 weight**.

Options

Options

freq(*newvar*) specifies a name for the frequency variable. If not specified, _freq is used.

cfreq(*newvar*) specifies a name for the cumulative frequency variable. If not specified, no cumulative frequency variable is created.

percent(*newvar*) specifies a name for the percentage variable. If not specified, no percentage variable is created.

cpercent(*newvar*) specifies a name for the cumulative percentage variable. If not specified, no cumulative percentage variable is created.

float specifies that the percentage variables specified by percent() and cpercent() will be generated as variables of type float. If float is not specified, these variables will be generated as variables of type double. All generated variables are compressed to the smallest storage type possible without loss of precision; see [D] **compress**.

format(*format*) specifies a display format for the generated percentage variables specified by percent() and cpercent(). If format() is not specified, these variables will have the display format %8.2f.

zero specifies that combinations with frequency zero be included.

nomiss specifies that observations with missing values on any variable in *varlist* be dropped. If nomiss is not specified, all observations possible are used.

Remarks and examples

contract takes the dataset in memory and creates a new dataset containing all combinations of *varlist* that exist in the data and a new variable that contains the frequency of each combination.

Sometimes you may want to collapse a dataset into frequency form. Several observations that have identical values on one or more variables will be replaced by one such observation, together with the frequency of the corresponding set of values. For example, in certain generalized linear models, the frequency of some combination of values is the response variable, so you would need to produce that response variable. The set of covariate values associated with each frequency is sometimes called a covariate class or covariate pattern. Such collapsing is reversible for the variables concerned, because the original dataset can be reconstituted by using expand (see [D] **expand**) with the variable containing the frequencies of each covariate class.

▷ Example 1

Suppose that we wish to collapse auto2.dta to a set of frequencies of the variables rep78, which takes values labeled "Poor", "Fair", "Average", "Good", and "Excellent", and foreign, which takes values labeled "Domestic" and "Foreign".

```
. use https://www.stata-press.com/data/r19/auto2
(1978 automobile data)

. contract rep78 foreign

. list

     +--------------------------------+
     |     rep78    foreign     _freq |
     |--------------------------------|
  1. |      Poor   Domestic         2 |
  2. |      Fair   Domestic         8 |
  3. |   Average   Domestic        27 |
  4. |   Average    Foreign         3 |
  5. |      Good   Domestic         9 |
     |--------------------------------|
  6. |      Good    Foreign         9 |
  7. | Excellent   Domestic         2 |
  8. | Excellent    Foreign         9 |
  9. |         .   Domestic         4 |
 10. |         .    Foreign         1 |
     +--------------------------------+
```

By default, contract uses the variable name _freq for the new variable that contains the frequencies. If _freq is in use, you will be reminded to specify a new variable name via the freq() option.

Specifying the `zero` option requests that combinations with frequency zero also be listed.

```
. use https://www.stata-press.com/data/r19/auto2, clear
(1978 automobile data)

. contract rep78 foreign, zero

. list

     +-------------------------------+
     |     rep78    foreign    _freq |
     |-------------------------------|
  1. |      Poor   Domestic        2 |
  2. |      Poor    Foreign        0 |
  3. |      Fair   Domestic        8 |
  4. |      Fair    Foreign        0 |
  5. |   Average   Domestic       27 |
     |-------------------------------|
  6. |   Average    Foreign        3 |
  7. |      Good   Domestic        9 |
  8. |      Good    Foreign        9 |
  9. | Excellent   Domestic        2 |
 10. | Excellent    Foreign        9 |
     |-------------------------------|
 11. |         .   Domestic        4 |
 12. |         .    Foreign        1 |
     +-------------------------------+
```

◁

Acknowledgments

`contract` was written by Nicholas J. Cox (1998) of the Department of Geography at Durham University, UK, who is coeditor of the *Stata Journal* and author of *Speaking Stata Graphics*. The `cfreq()`, `percent()`, `cpercent()`, `float`, and `format()` options were written by Roger Newson of the Imperial College London.

Reference

Cox, N. J. 1998. dm59: Collapsing datasets to frequencies. *Stata Technical Bulletin* 44: 2–3. Reprinted in *Stata Technical Bulletin Reprints*, vol. 8, pp. 20–21. College Station, TX: Stata Press.

Also see

[D] **expand** — Duplicate observations

[D] **collapse** — Make dataset of summary statistics

[D] **duplicates** — Report, tag, or drop duplicate observations

copy — Copy file from disk or URL

Description Quick start Syntax Options Remarks and examples Also see

Description

`copy` copies an existing file to a file with a new name.

Quick start

Copy `mydata.dta` from `C:\myfolder` to `C:\otherfolder`

```
copy c:\myfolder\mydata.dta c:\otherfolder\
```

Same as above, but change dataset name to `newdata.dta`

```
copy c:\myfolder\mydata.dta c:\otherfolder\newdata.dta
```

Same as above, but replace `newdata.dta` if it exists

```
copy c:\myfolder\mydata.dta c:\otherfolder\newdata.dta, replace
```

Copy web-based Stata example dataset `fullauto.dta` to the current working directory

```
copy https://www.stata-press.com/data/r19/fullauto.dta myauto.dta
```

Syntax

`copy` *filename*$_1$ *filename*$_2$ [, *options*]

filename$_1$ may be a filename or a URL. *filename*$_2$ may be the name of a file or a directory. If *filename*$_2$ is a directory name, *filename*$_1$ will be copied to that directory. *filename*$_2$ may *not* be a URL.

Note: Double quotes may be used to enclose the filenames, and the quotes must be used if the filename contains embedded blanks.

options	Description
`public`	make *filename*$_2$ readable by all
`text`	interpret *filename*$_1$ as text file and translate to native text format
`replace`	may overwrite *filename*$_2$

`replace` does not appear in the dialog box.

Options

`public` specifies that *filename*$_2$ be readable by everyone; otherwise, the file will be created according to the default permissions of your operating system.

`text` specifies that *filename*$_1$ be interpreted as a text file and be translated to the native form of text files on your computer. Computers differ on how end-of-line is recorded: Unix systems record one line-feed character, Windows computers record a carriage-return/line-feed combination, and Mac computers record just a carriage return. `text` specifies that *filename*$_1$ be examined to determine how it has end-of-line recorded and that the line-end characters be switched to whatever is appropriate for your computer when the copy is made.

There is no reason to specify `text` when copying a file already on your computer to a different location because the file would already be in your computer's format.

Do not specify `text` unless you know that the file is a text file; if the file is binary and you specify `text`, the copy will be useless. Most word processors produce binary files, not text files. The term *text*, as it is used here, specifies a particular way of recording textual information.

When other parts of Stata read text files, they do not care how lines are terminated, so there is no reason to translate end-of-line characters on that score. You specify `text` because you may want to look at the file with other software.

The following option is available with `copy` but is not shown in the dialog box:

`replace` specifies that *filename*$_2$ be replaced if it already exists.

Remarks and examples

Examples:

Windows:

```
. copy orig.dta newcopy.dta
. copy mydir\orig.dta .
. copy orig.dta ../../
. copy "my document" "copy of document"
. copy ..\mydir\doc.txt document\doc.tex
. copy https://www.stata.com/examples/simple.dta simple.dta
. copy https://www.stata.com/examples/simple.txt simple.txt, text
```

Mac and Unix:

```
. copy orig.dta newcopy.dta
. copy mydir/orig.dta .
. copy orig.dta ../../
. copy "my document" "copy of document"
. copy ../mydir/doc.txt document/doc.tex
. copy https://www.stata.com/examples/simple.dta simple.dta
. copy https://www.stata.com/examples/simple.txt simple.txt, text
```

Also see

[D] **cd** — Change directory

[D] **dir** — Display filenames

[D] **erase** — Erase a disk file

[D] **mkdir** — Create directory

[D] **rmdir** — Remove directory

[D] **shell** — Temporarily invoke operating system

[D] **type** — Display contents of a file

[U] 11.6 Filenaming conventions

corr2data — Create dataset with specified correlation structure

Description

`corr2data` adds new variables with specified covariance (correlation) structure to the existing dataset or creates a new dataset with a specified covariance (correlation) structure. Singular covariance (correlation) structures are permitted. The purpose of this is to allow you to perform analyses from summary statistics (correlations/covariances and maybe the means) when these summary statistics are all you know and summary statistics are sufficient to obtain results. For example, these summary statistics are sufficient for performing analysis of t tests, variance, principal components, regression, and factor analysis. The recommended process is

`. clear`	(clear memory)
`. corr2data ..., n(#) cov(...) ...`	(create artificial data)
`. regress ...`	(use artificial data appropriately)

However, for factor analyses and principal components, the commands `factormat` and `pcamat` allow you to skip the step of using `corr2data`; see [MV] **factor** and [MV] **pca**.

The data created by `corr2data` are artificial; they are not the original data, and it is not a sample from an underlying population with the summary statistics specified. See [D] **drawnorm** if you want to generate a random sample. In a sample, the summary statistics will differ from the population values and will differ from one sample to the next.

The dataset `corr2data` creates is suitable for one purpose only: performing analyses when all that is known are summary statistics and those summary statistics are sufficient for the analysis at hand. The artificial data tricks the analysis command into producing the desired result. The analysis command, being by assumption only a function of the summary statistics, extracts from the artificial data the summary statistics, which are the same summary statistics you specified, and then makes its calculation based on those statistics.

If you doubt whether the analysis depends only on the specified summary statistics, you can generate different artificial datasets by using different seeds of the random-number generator (see the `seed()` option below) and compare the results, which should be the same within rounding error.

Quick start

Create dataset with 1,000 observations, `v1` with mean of 3.4 and std. dev. of 1, `v2` with mean of 3 and std. dev. of 0.5, and no correlation between `v1` and `v2`

```
corr2data v1 v2, n(1000) means(3.4 3) sds(1 .5)
```

Same as above, but with correlation between `v1` and `v2` specified in matrix `mymat`

```
corr2data v1 v2, n(1000) means(3.4 3) sds(1 .5) corr(mymat)
```

Menu

Data > Create or change data > Other variable-creation commands > Create dataset with specified correlation

Syntax

`corr2data` *newvarlist* [, *options*]

options	Description
Main	
`clear`	replace the current dataset
`double`	generate variable type as `double`; default is `float`
`n(#)`	generate # observations; default is current number
`sds(`*vector*`)`	standard deviations of generated variables
`corr(`*matrix* | *vector*`)`	correlation matrix
`cov(`*matrix* | *vector*`)`	covariance matrix
`cstorage(full)`	store correlation/covariance structure as a symmetric $k \times k$ matrix
`cstorage(lower)`	store correlation/covariance structure as a lower triangular matrix
`cstorage(upper)`	store correlation/covariance structure as an upper triangular matrix
`forcepsd`	force the covariance/correlation matrix to be positive semidefinite
`means(`*vector*`)`	means of generated variables; default is `means(0)`
Options	
`seed(#)`	seed for random-number generator

Options

Main

`clear` specifies that it is okay to replace the dataset in memory, even though the current dataset has not been saved on disk.

`double` specifies that the new variables be stored as Stata `double`s, meaning 8-byte reals. If `double` is not specified, variables are stored as `float`s, meaning 4-byte reals. See [D] **Data types**.

`n(#)` specifies the number of observations to be generated; the default is the current number of observations. If `n(#)` is not specified or is the same as the current number of observations, `corr2data` adds the new variables to the existing dataset; otherwise, `corr2data` replaces the dataset in memory.

`sds(`*vector*`)` specifies the standard deviations of the generated variables. `sds()` may not be specified with `cov()`.

`corr(`*matrix* | *vector*`)` specifies the correlation matrix. If neither `corr()` nor `cov()` is specified, the default is orthogonal data.

`cov(`*matrix* | *vector*`)` specifies the covariance matrix. If neither `corr()` nor `cov()` is specified, the default is orthogonal data.

`cstorage(full|lower|upper)` specifies the storage mode for the correlation or covariance structure in `corr()` or `cov()`. The following storage modes are supported:

`full` specifies that the correlation or covariance structure is stored (recorded) as a symmetric $k \times k$ matrix.

`lower` specifies that the correlation or covariance structure is recorded as a lower triangular matrix. With k variables, the matrix should have $k(k+1)/2$ elements in the following order:

$$\mathrm{C}_{11}\ \mathrm{C}_{21}\ \mathrm{C}_{22}\ \mathrm{C}_{31}\ \mathrm{C}_{32}\ \mathrm{C}_{33}\ \ldots\ \mathrm{C}_{k1}\ \mathrm{C}_{k2}\ \ldots\ \mathrm{C}_{kk}$$

`upper` specifies that the correlation or covariance structure is recorded as an upper triangular matrix. With k variables, the matrix should have $k(k+1)/2$ elements in the following order:

$$\mathrm{C}_{11}\ \mathrm{C}_{12}\ \mathrm{C}_{13}\ \ldots\ \mathrm{C}_{1k}\ \mathrm{C}_{22}\ \mathrm{C}_{23}\ \ldots \mathrm{C}_{2k}\ \ldots\ \mathrm{C}_{(k-1k-1)}\ \mathrm{C}_{(k-1k)}\ \mathrm{C}_{kk}$$

Specifying `cstorage(full)` is optional if the matrix is square. `cstorage(lower)` or `cstorage(upper)` is required for the vectorized storage methods. See *Storage modes for correlation and covariance matrices* in [D] **drawnorm** for examples.

`forcepsd` modifies the matrix C to be positive semidefinite (psd) and to thus be a proper covariance matrix. If C is not positive semidefinite, it will have negative eigenvalues. By setting the negative eigenvalues to 0 and reconstructing, we obtain the least-squares positive-semidefinite approximation to C. This approximation is a singular covariance matrix.

`means(`*vector*`)` specifies the means of the generated variables. The default is `means(0)`.

Options

`seed(`#`)` specifies the seed of the random-number generator used to generate data. # defaults to 0. The random numbers generated inside `corr2data` do not affect the seed of the standard random-number generator.

Remarks and examples

`corr2data` is designed to enable analyses of correlation (covariance) matrices by commands that expect variables rather than a correlation (covariance) matrix. `corr2data` creates variables with exactly the correlation (covariance) that you want to analyze. Apart from means and covariances, all aspects of the data are meaningless. Only analyses that depend on the correlations (covariances) and means produce meaningful results. Thus you may perform a paired t test ([R] **ttest**) or an ordinary regression analysis ([R] **regress**), etc.

If you are not sure that a statistical result depends only on the specified summary statistics and not on other aspects of the data, you can generate different datasets, each having the same summary statistics but other different aspects, by specifying the `seed()` option. If the statistical results differ beyond what is attributable to roundoff error, then using `corr2data` is inappropriate.

▷ Example 1

We first run a regression using the auto dataset.

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. regress weight length trunk

      Source |       SS           df       MS      Number of obs   =        74
-------------+----------------------------------   F(2, 71)        =    303.95
       Model |  39482774.4         2  19741387.2   Prob > F        =    0.0000
    Residual |  4611403.95        71  64949.3513   R-squared       =    0.8954
-------------+----------------------------------   Adj R-squared   =    0.8925
       Total |  44094178.4        73  604029.841   Root MSE        =    254.85

------------------------------------------------------------------------------
      weight | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      length |   33.83435   1.949751    17.35   0.000     29.94666    37.72204
       trunk |   -5.83515   10.14957    -0.57   0.567    -26.07282    14.40252
       _cons |   -3258.84   283.3547   -11.50   0.000    -3823.833   -2693.846
------------------------------------------------------------------------------
```

Suppose that, for some reason, we no longer have the auto dataset. Instead, we know the means and covariance matrices of weight, length, and trunk, and we want to do the same regression again. The matrix of means is

```
. matrix list M

M[1,3]
          weight     length      trunk
_cons  3019.4595  187.93243  13.756757
```

and the covariance matrix is

```
. matrix list V

symmetric V[3,3]
            weight     length      trunk
weight   604029.84
length   16370.922  495.78989
 trunk   2234.6612  69.202518  18.296187
```

To do the regression analysis in Stata, we need to create a dataset that has the specified correlation structure.

```
. corr2data x y z, n(74) cov(V) means(M)

. regress x y z

      Source |       SS           df       MS      Number of obs   =        74
-------------+----------------------------------   F(2, 71)        =    303.95
       Model |  39482773.3         2  19741386.6   Prob > F        =    0.0000
    Residual |  4611402.75        71  64949.3345   R-squared       =    0.8954
-------------+----------------------------------   Adj R-squared   =    0.8925
       Total |    44094176        73  604029.809   Root MSE        =    254.85

------------------------------------------------------------------------------
           x | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
           y |   33.83435   1.949751    17.35   0.000     29.94666    37.72204
           z |  -5.835155   10.14957    -0.57   0.567    -26.07282    14.40251
       _cons |   -3258.84   283.3546   -11.50   0.000    -3823.833   -2693.847
------------------------------------------------------------------------------
```

The results from the regression based on the generated data are the same as those based on the real data. ◁

Methods and formulas

Two steps are involved in generating the desired dataset. The first step is to generate a zero-mean, zero-correlated dataset. The second step is to apply the desired correlation structure and the means to the zero-mean, zero-correlated dataset. In both steps, we take into account that, given any matrix $\mathbf{A}$ and any vector of variables $\mathbf{X}$, $\mathrm{Var}(\mathbf{A}'\mathbf{X}) = \mathbf{A}'\mathrm{Var}(\mathbf{X})\mathbf{A}$.

Reference

Cappellari, L., and S. P. Jenkins. 2006. Calculation of multivariate normal probabilities by simulation, with applications to maximum simulated likelihood estimation. *Stata Journal* 6: 156–189.

Also see

[D] **Data types** — Quick reference for data types

[D] **drawnorm** — Draw sample from multivariate normal distribution

Description

`count` counts the number of observations that satisfy the specified conditions. If no conditions are specified, `count` displays the number of observations in the data.

Quick start

Count the number of observations

    count

Same as above, but where `catvar` equals 3

    count if catvar==3

Count observations for each value of `catvar`

    by catvar: count

Menu

Data > Data utilities > Count observations satisfying condition

Syntax

`count` [*if*] [*in*]

`by` and `collect` are allowed; see **[U] 11.1.10 Prefix commands**.

Remarks and examples

`count` may strike you as an almost useless command, but it can be one of Stata's handiest.

▷ Example 1

How many times have you obtained a statistical result and then asked yourself how it was possible? You think a moment and then mutter aloud, "Wait a minute. Is income ever *negative* in these data?" or "Is sex ever equal to *3*?" `count` can quickly answer those questions:

```
. use https://www.stata-press.com/data/r19/countxmpl
(1980 Census data by state)

. count
  641

. count if income<0
  0

. count if sex==3
  1

. by division: count if sex==3

--------------------------------------------------------------------------------
-> division = New England
  0
--------------------------------------------------------------------------------
-> division = Mountain
  0
--------------------------------------------------------------------------------
-> division = Pacific
  1
```

We have 641 observations. `income` is never negative. `sex`, however, takes on the value 3 once. When we decompose the count by `division`, we see that it takes on that odd value in the Pacific division.

◁

Stored results

`count` stores the following in `r()`:

Scalars
  `r(N)` number of observations

References

Cox, N. J. 2007a. Speaking Stata: Counting groups, especially panels. *Stata Journal* 7: 571–581.

———. 2007b. Speaking Stata: Making it count. *Stata Journal* 7: 117–130.

———. 2007c. Stata tip 51: Events in intervals. *Stata Journal* 7: 440–443.

Also see

[R] **tabulate oneway** — One-way table of frequencies

cross — Form every pairwise combination of two datasets

Description Quick start Menu Syntax
Remarks and examples References Also see

Description

cross forms every pairwise combination of the data in memory with the data in *filename*. If *filename* is specified without a suffix, .dta is assumed.

Quick start

Form every pairwise combination of observations from mydata1.dta in memory with observations from mydata2.dta

```
cross using mydata2
```

Menu

Data > Combine datasets > Form every pairwise combination of two datasets

Syntax

cross using *filename*

cross does not allow alias variables; see [D] **frunalias** for advice on how to get around this restriction.

Remarks and examples

This command is rarely used; also see [D] **joinby**, [D] **merge**, and [D] **append**.

Crossing refers to merging two datasets in every way possible. That is, the first observation of the data in memory is merged with every observation of *filename*, followed by the second, and so on. Thus the result will have $N_1 N_2$ observations, where N_1 and N_2 are the number of observations in memory and in *filename*, respectively.

Typically, the datasets will have no common variables. If they do, such variables will take on only the values of the data in memory.

▷ Example 1

We wish to form a dataset containing all combinations of three age categories and two sexes to serve as a stub. The three age categories are 20, 30, and 40. The two sexes are male and female:

```
. input str6 sex
            sex
  1. male
  2. female
  3. end

. save sex
file sex.dta saved

. drop _all

. input agecat
        agecat
  1. 20
  2. 30
  3. 40
  4. end

. cross using sex

. list

     +-----------------+
     | agecat      sex |
     |-----------------|
  1. |     20     male |
  2. |     30     male |
  3. |     40     male |
  4. |     20   female |
  5. |     30   female |
     |-----------------|
  6. |     40   female |
     +-----------------+
```

◁

References

Baum, C. F. 2016. *An Introduction to Stata Programming*. 2nd ed. College Station, TX: Stata Press.

Franklin, C. H. 2006. Stata tip 29: For all times and all places. *Stata Journal* 6: 147–148.

Also see

[D] **append** — Append datasets

[D] **fillin** — Rectangularize dataset

[D] **frunalias** — Change storage type of alias variables

[D] **joinby** — Form all pairwise combinations within groups

[D] **merge** — Merge datasets

[D] **save** — Save Stata dataset

Description Remarks and examples Also see

Description

This entry provides a quick reference for data types allowed by Stata. See [U] **12 Data** for details.

Remarks and examples

Storage type	Minimum	Maximum	Closest to 0 without being 0	Bytes
`byte`	−127	100	±1	1
`int`	−32,767	32,740	±1	2
`long`	−2,147,483,647	2,147,483,620	±1	4
`float`	$-1.70141173319 \times 10^{38}$	$1.70141173319 \times 10^{38}$	$\pm 10^{-38}$	4
`double`	$-8.9884656743 \times 10^{307}$	$8.9884656743 \times 10^{307}$	$\pm 10^{-323}$	8

Precision for `float` is 3.795×10^{-8}.

Precision for `double` is 1.414×10^{-16}.

String storage type	Maximum length	Bytes
`str1`	1	1
`str2`	2	2
...	.	.
...	.	.
...	.	.
`str2045`	2045	2045
`strL`	2000000000	2000000000

Each element of data is said to be either type numeric or type string. The word "real" is sometimes used in place of numeric. Associated with each data type is a storage type.

Numbers are stored as `byte`, `int`, `long`, `float`, or `double`, with the default being `float`. `byte`, `int`, and `long` are said to be of integer type in that they can hold only integers.

Strings are stored as `str#`, for instance, `str1`, `str2`, `str3`, ..., `str2045`, or as `strL`. The number after the `str` indicates the maximum length of the string. A `str5` could hold the word "male", but not the word "female" because "female" has six characters. A `strL` can hold strings of arbitrary lengths, up to 2000000000 characters, and can even hold binary data containing embedded `\0` characters.

Stata keeps data in memory, and you should record your data as parsimoniously as possible. If you have a string variable that has maximum length 6, it would waste memory to store it as a `str20`. Similarly, if you have an integer variable, it would be a waste to store it as a `double`.

Precision of numeric storage types

floats have about 7 digits of accuracy; the magnitude of the number does not matter. Thus, 1234567 can be stored perfectly as a float, as can 1234567e+20. The number 123456789, however, would be rounded to 123456792. In general, this rounding does not matter.

If you are storing identification numbers, the rounding could matter. If the identification numbers are integers and take 9 digits or less, store them as longs; otherwise, store them as doubles. doubles have 16 digits of accuracy.

Stata stores numbers in binary, and this has a second effect on numbers less than 1. 1/10 has no perfect binary representation just as 1/11 has no perfect decimal representation. In float, .1 is stored as .10000000149011612. Note that there are 7 digits of accuracy, just as with numbers larger than 1. Stata, however, performs all calculations in double precision. If you were to store 0.1 in a float called x and then ask, say, `list if x==.1`, there would be nothing in the list. The .1 that you just typed was converted to double, with 16 digits of accuracy (.100000000000000014...), and that number is never equal to 0.1 stored with float accuracy.

One solution is to type `list if x==float(.1)`. The float() function rounds its argument to float accuracy; see [FN] **Programming functions**. The other alternative would be store your data as double, but this is probably a waste of memory. Few people have data that is accurate to 1 part in 10 to the 7th. Among the exceptions are banks, who keep records accurate to the penny on amounts of billions of dollars. If you are dealing with such financial data, store your dollar amounts as doubles.

Also see

[D] **compress** — Compress data in memory

[D] **destring** — Convert string variables to numeric variables and vice versa

[D] **encode** — Encode string into numeric and vice versa

[D] **format** — Set variables' output format

[D] **recast** — Change storage type of variable

[U] 12.2.2 Numeric storage types

[U] 12.4 Strings

[U] 12.5 Formats: Controlling how data are displayed

[U] 13.12 Precision and problems therein

datasignature — Determine whether data have changed

Description

These commands calculate, display, save, and verify checksums of the data, which taken together form what is called a *signature*. An example signature is 162:11(12321):2725060400:4007406597. That signature is a function of the values of the variables and their names, and thus the signature can be used later to determine whether a dataset has changed.

`datasignature` without arguments calculates and displays the signature of the data in memory.

`datasignature set` does the same, and it stores the signature as a characteristic in the dataset. You should `save` the dataset afterward so that the signature becomes a permanent part of the dataset.

`datasignature confirm` verifies that, were the signature recalculated this instant, it would match the one previously set. `datasignature confirm` displays an error message and returns a nonzero return code if the signatures do not match.

`datasignature report` displays a full report comparing the previously set signature to the current one.

In the above, the signature is stored in the dataset and accessed from it. The signature can also be stored in a separate, small file.

`datasignature set, saving(`*filename*`)` calculates and displays the signature and, in addition to storing it as a characteristic in the dataset, also saves the signature in *filename*.

`datasignature confirm using` *filename* verifies that the current signature matches the one stored in *filename*.

`datasignature report using` *filename* displays a full report comparing the current signature with the one stored in *filename*.

In all the above, if *filename* is specified without an extension, `.dtasig` is assumed.

`datasignature clear` clears the signature, if any, stored in the characteristics of the dataset in memory.

Quick start

Calculate and display the signature of the dataset in memory

```
datasignature
```

Same as above, and store the signature as a characteristic of the data

```
datasignature set
```

Same as above, but also save the signature in `datasig.txt`

```
datasignature set, saving(datasig.txt)
```

Confirm that the data are currently exactly the same as they were when signed

```
datasignature confirm
```

Confirm that the data in memory have the same signature saved in `datasig.txt`

```
datasignature confirm using datasig.txt
```

Menu

Data > Other utilities > Manage data signature

Syntax

```
datasignature

datasignature set [, reset]

datasignature confirm [, strict]

datasignature report

datasignature set, saving(filename[, replace]) [reset]

datasignature confirm using filename [, strict]

datasignature report using filename

datasignature clear
```

`collect` is allowed; see **[U] 11.1.10 Prefix commands**.

Options

`reset` is used with `datasignature set`. It specifies that even though you have previously set a signature, you want to erase the old signature and replace it with the current one.

`strict` is for use with `datasignature confirm`. It specifies that, in addition to requiring that the signatures match, you also wish to require that the variables be in the same order and that no new variables have been added to the dataset. (If any variables were dropped, the signatures would not match.)

`saving(`*filename*[`, replace`]`)` is used with `datasignature set`. It specifies that, in addition to storing the signature in the dataset, you want a copy of the signature saved in a separate file. If *filename* is specified without a suffix, `.dtasig` is assumed. The `replace` suboption allows *filename* to be replaced if it already exists.

Remarks and examples

Remarks are presented under the following headings:

Using datasignature interactively

`datasignature` is useful in the following cases:

1. You and a coworker, separated by distance, have both received what is claimed to be the same dataset. You wish to verify that it is.
2. You work interactively and realize that you could mistakenly modify your data. You wish to guard against that.
3. You want to give your dataset to an assistant to improve the labels and the like. You wish to verify that the data returned to you are the same data.
4. You work with an important dataset served on a network drive. You wish to verify that others have not changed it.

Example 1: Verification at a distance

You load the data and type

```
. datasignature
  74:12(71728):3831085005:1395876116
```

Your coworker does the same with his or her copy. You compare the two signatures.

Example 2: Protecting yourself from yourself

You load the data and type

```
. datasignature set
  74:12(71728):3831085005:1395876116    (data signature set)
. save, replace
```

From then on, you periodically type

```
. datasignature confirm
  (data unchanged since 19feb2025 14:24)
```

One day, however, you check and see the message:

```
. datasignature confirm
  (data unchanged since 19feb2025 14:24, except 2 variables have been added)
```

You can find out more by typing

```
. datasignature report
  (data signature set on Monday 19feb2025 14:24)
  Data signature summary
   1. Previous data signature     74:12(71728):3831085005:1395876116
   2. Same data signature today   (same as 1)
   3. Full data signature today   74:14(113906):1142538197:2410350265
  Comparison of current data with previously set data signature
      variables                      number  notes
      ------------------------------------------------------------
      original # of variables           12  (values unchanged)
      added variables                    2  (1)
      dropped variables                  0
      ------------------------------------------------------------
      resulting # of variables          14
      (1) Added variables are agesquared logincome.
```

You could now either drop the added variables or decide to incorporate them:

```
. datasignature set
  data signature already set -- specify option reset
r(110)
. datasignature set, reset
  74:14(113906):1142538197:2410350265       (data signature reset)
```

Concerning the detailed report, three data signatures are reported: 1) the stored signature, 2) the signature that would be calculated today on the basis of the same variables in their original order, and 3) the signature that would be calculated today on the basis of all the variables and in their current order.

`datasignature confirm` knew that new variables had been added because signature 1 was equal to signature 2. If some variables had been dropped, however, `datasignature confirm` would not be able to determine whether the remaining variables had changed.

Example 3: Working with assistants

You give your dataset to an assistant to have variable labels and the like added. You wish to verify that the returned data are the same data.

Saving the signature with the dataset is inadequate here. Your assistant, having your dataset, could change both your data and the signature and might even do that in a desire to be helpful. The solution is to save the signature in a separate file that you do not give to your assistant:

```
. datasignature set, saving(mycopy)
  74:12(71728):3831085005:1395876116       (data signature set)
  (file mycopy.dtasig saved)
```

You keep file `mycopy.dtasig`. When your assistant returns the dataset to you, you use it and compare the current signature to what you have stored in `mycopy.dtasig`:

```
. datasignature confirm using mycopy
  (data unchanged since 19feb2025 15:05)
```

By the way, the signature is a function of the following:

- The number of observations and number of variables in the data
- The values of the variables

- The names of the variables
- The order in which the variables occur in the dataset
- The storage types of the individual variables

The signature is not a function of variable labels, value labels, notes, and the like.

Example 4: Working with shared data

You work on a dataset served on a network drive, which means that others could change the data. You wish to know whether this occurs.

The solution here is the same as working with an assistant: you save the signature in a separate, private file on your computer,

```
. datasignature set, saving(private)
  74:12(71728):3831085005:1395876116       (data signature set)
  (file private.dtasig saved)
```

and then you periodically check the signature by typing

```
. datasignature confirm using private
  (data unchanged since 15mar2025 11:22)
```

Using datasignature in do-files

`datasignature confirm` aborts with error if the signatures do not match:

```
. datasignature confirm
  data have changed since 19feb2025 15:05
r(9);
```

This means that, if you use `datasignature confirm` in a do-file, execution of the do-file will be stopped if the data have changed.

You may want to specify the `strict` option. `strict` adds two more requirements: that the variables be in the same order and that no new variables have been added. Without `strict`, these are not considered errors:

```
. datasignature confirm
  (data unchanged since 19feb2025 15:22)
. datasignature confirm, strict
  (data unchanged since 19feb2025 15:05, but order of variables has changed)
r(9);
```

and

```
. datasignature confirm
  (data unchanged since 19feb2025 15:22, except 1 variable has been added)
. datasignature confirm, strict
  (data unchanged since 19feb2025 15:22, except 1 variable has been added)
r(9);
```

If you keep logs of your analyses, issuing `datasignature` or `datasignature confirm` immediately after loading each dataset is a good idea. This way, you have a permanent record that you can use for comparison.

Interpreting data signatures

An example signature is 74:12(71728):3831085005:1395876116. The components are

1. 74, the number of observations;
2. 12, the number of variables;
3. 71728, a checksum function of the variable names and the order in which they occur; and
4. 3831085005 and 1395876116, checksum functions of the values of the variables, calculated two different ways.

Two signatures are equal only if all their components are equal.

Two different datasets will probably not have the same signature, and it is even more unlikely that datasets containing similar values will have equal signatures. There are two data checksums, but do not read too much into that. If either data checksum changes, even just a little, the data have changed. Whether the change in the checksum is large or small—or in one, the other, or both—signifies nothing.

The logic of data signatures

The components of a data signature are known as checksums. The checksums are many-to-one mappings of the data onto the integers. Let's consider the checksums of auto.dta carefully.

The data portion of auto.dta contains 38,184 bytes. There are 256^{38184} such datasets or, equivalently, 2^{305472}. The first checksum has 2^{48} possible values, and it can be proven that those values are equally distributed over the 2^{305472} datasets. Thus there are $2^{305472}/2^{48} - 1 = 2^{305424} - 1$ datasets that have the same first checksum value as auto.dta. The same can be said for the second checksum. It would be difficult to prove, but we believe that the two checksums are conditionally independent, being based on different bit shifts and bit shuffles of the same data. Of the $2^{305424} - 1$ datasets that have the same first checksum as auto.dta, the second checksum should be equally distributed over them. Thus there are about $2^{305376} - 1$ datasets with the same first and second checksums as auto.dta.

Now let's consider those $2^{305376} - 1$ other datasets. Most of them look nothing like auto.dta. The checksum formulas guarantee that a change of one variable in 1 observation will lead to a change in the calculated result if the value changed is stored in 4 or fewer bytes, and they nearly guarantee it in other cases. When it is not guaranteed, the change cannot be subtle—"Chevrolet" will have to change to binary junk, or a double-precision 1 to −6.476678983751e+301, and so on. The change will be easily detected if you summarize your data and just glance at the minimums and maximums. If the data look at all like auto.dta, which is unlikely, they will look like a corrupted version.

More interesting are offsetting changes across observations. For instance, can you change one variable in 1 observation and make an offsetting change in another observation so that, taken together, they will go undetected? You can fool one of the checksums, but fooling both of them simultaneously will prove difficult. The basic rule is that the more changes you make, the easier it is to create a dataset with the same checksums as auto.dta, but by the time you have done that, the data will look nothing like auto.dta.

Stored results

`datasignature` without arguments and `datasignature set` store the following in `r()`:

Macros

`r(datasignature)`	the signature

`datasignature confirm` stores the following in `r()`:

Scalars

`r(k_added)`	number of variables added

Macros

`r(datasignature)`	the signature

`datasignature confirm` aborts execution if the signatures do not match and so then returns nothing except a return code of 9.

`datasignature report` stores the following in `r()`:

Scalars

`r(datetime)`	`%tc` date–time when set
`r(changed)`	`.` if `r(k_dropped)` $\neq 0$, otherwise `0` if data have not changed, `1` if data have changed
`r(reordered)`	`1` if variables reordered, `0` if not reordered, `.` if `r(k_added)` $\neq 0$ | `r(k_dropped)` $\neq 0$
`r(k_original)`	number of original variables
`r(k_added)`	number of added variables
`r(k_dropped)`	number of dropped variables

Macros

`r(origdatasignature)`	original signature
`r(curdatasignature)`	current signature on same variables, if it can be calculated
`r(fulldatasignature)`	current full-data signature
`r(varsadded)`	variable names added
`r(varsdropped)`	variable names dropped

`datasignature clear` stores nothing in `r()` but does clear it.

`datasignature set` stores the signature in the following characteristics:

Characteristic

`_dta[datasignature_si]`	signature
`_dta[datasignature_dt]`	`%tc` date–time when set in `%21x` format
`_dta[datasignature_vl1]`	part 1, original variables
`_dta[datasignature_vl2]`	part 2, original variables, if necessary
etc.	

To access the original variables stored in `_dta[datasignature_vl1]`, etc., from an ado-file, code

```
mata: ado_fromlchar("vars", "_dta", "datasignature_vl")
```

Thereafter, the original variable list would be found in `` `vars' ``.

Methods and formulas

`datasignature` is implemented using `_datasignature`; see [P] **_datasignature**.

Reference

Gould, W. W. 2006. Stata tip 35: Detecting whether data have changed. *Stata Journal* 6: 428–429.

Also see

[P] **_datasignature** — Determine whether data have changed

[P] **signestimationsample** — Determine whether the estimation sample has changed

Datetime — Date and time values and variables

Description Quick start Syntax Remarks and examples References Also see

Description

This entry provides a complete overview of Stata's date and time values. We discuss functions used to obtain Stata dates, including string-to-numeric conversions and conversions among different types of dates and times.

Stata's date and time values need to be formatted so they look like the dates and times we are familiar with. We show basic formatting options here, but more details can be found in [D] **Datetime display formats**.

[D] **Datetime conversion** has more details on converting dates and times stored as strings to numerically encoded Stata dates and times.

[D] **Datetime values from other software** discusses getting Stata dates from dates created by other software.

[D] **Datetime durations** describes functions designed to get durations (for example, ages) from two Stata dates or to express a duration in different units.

[D] **Datetime relative dates** describes functions that return dates based on other dates, for example, the date of a birthday in another year.

[D] **Datetime business calendars** describes business calendars—using dates with nonbusiness days (for example, weekends and holidays) removed. You can use existing calendars or create your own; see [D] **Datetime business calendars creation**.

For an alphabetical listing of all the datetime functions, see [FN] **Date and time functions**.

Quick start

Convert the string variable `strdate`, with dates such as `"January 1, 2020"`, to a numerically encoded Stata date

```
generate numdate = date(strdate, "MDY")
```

Format `numdate` to make it readable when displayed

```
format numdate %td
```

Convert the string variable `strtime`, with dates and times such as `"January 1,2020 10:30 am"`, to a numerically encoded Stata datetime variable

```
generate double numtime = clock(strtime, "MDYhm")
```

Format `numtime` to make it readable when displayed

```
format numtime %tc
```

Convert the string variable `strmonthly`, with monthly dates such as `"2012-04"`, to a Stata date, and format it to make it readable when displayed

```
generate nummonth = monthly(strmonthly, "YM")
format nummonth %tm
```

List observations for which `numdate` is prior to February 15, 2013

```
list if numdate < td(15/2/2013)
```

Create a monthly date variable from numeric variables `year` and `month`

```
generate monthly = ym(year,month)
```

Create a daily date variable from the datetimes stored in `numtime`

```
generate dateoftime = dofc(numtime)
```

Create a monthly date variable from the daily dates stored in `numdate`

```
generate monthlyofdate = mofd(numdate)
```

Create a new variable with the month of the daily dates stored in `numdate`

```
generate monthnum = month(numdate)
```

Syntax

Syntax is presented under the following headings:

Types of dates and how they are displayed

Dates and times can take many forms; below, we list the types of dates that are supported in Stata. Note that throughout our documentation, we use the term "datetime" to refer to variables that record time or date and time.

Date type	Examples
datetime	20jan2010 09:15:22.120
date	20jan2010, 20/01/2010, ...
weekly date	2010w3
monthly date	2010m1
quarterly date	2010q1
half-yearly date	2010h1
yearly date	2010

The styles of the dates in the table above are merely examples; dates can be displayed in a number of ways. Perhaps you prefer 2010.01.20; Jan. 20, 2010; 2010-1; etc.

How Stata dates are stored

Stata dates are numeric values that record durations (positive or negative) from 01jan1960. Below, we list the numeric values corresponding to the dates displayed in the table in the previous section.

Stata date type	Examples	Units
datetime/c	1,579,598,122,120	milliseconds since 01jan1960 00:00:00.000, assuming 86,400 s/day
datetime/C	1,579,598,146,120	milliseconds since 01jan1960 00:00:00.000, adjusted for leap seconds*
date	18,282	days since 01jan1960 (01jan1960 = 0)
weekly date	2,601	weeks since 1960w1
monthly date	600	months since 1960m1
quarterly date	200	quarters since 1960q1
half-yearly date	100	half-years since 1960h1
yearly date	2010	years since 0000

* Datetime/C is equivalent to coordinated universal time (UTC). In UTC, leap seconds are periodically inserted because the length of the mean solar day is slowly increasing. See *Why there are two datetime encodings* in [D] **Datetime conversion**.

Stata dates are stored as regular Stata numeric variables.

You can convert dates stored as strings to Stata dates by using the string-to-numeric conversion functions; see *Converting dates stored as strings to Stata dates*.

You can make Stata dates readable by placing the appropriate %*fmt* on the numeric variable; see *Formatting Stata dates for display*.

You can convert from one Stata date type to another by using conversion functions; see *Converting among units*.

Storing dates as numeric values is convenient because you can subtract them to obtain time between dates, for example,

$$
\begin{aligned}
\text{datetime2} - \text{datetime1} &= \text{milliseconds between datetime1 and datetime2} \\
&\quad \text{(divide by 1,000 to obtain seconds)} \\
\text{date2} - \text{date1} &= \text{days between date1 and date2} \\
\text{week2} - \text{week1} &= \text{weeks between week1 and week2} \\
\text{month2} - \text{month1} &= \text{months between month1 and month2} \\
\text{half2} - \text{half1} &= \text{half-years between half1 and half2} \\
\text{year2} - \text{year1} &= \text{years between year1 and year2}
\end{aligned}
$$

For time differences in other units, for example, the number of years between date1 and date2, see [D] **Datetime durations**.

Converting dates stored as strings to Stata dates

To convert dates and times stored as strings to Stata dates and times, use one of the functions listed below.

Stata date type	Function	Required variable precision
datetime/c	`clock(`*str*`,` *mask*`)`	`double`
datetime/C	`Clock(`*str*`,` *mask*`)`	`double`
date	`date(`*str*`,` *mask*`)`	`float` or `long`
weekly date	`weekly(`*str*`,` *mask*`)`*	`float` or `int`
monthly date	`monthly(`*str*`,` *mask*`)`*	`float` or `int`
quarterly date	`quarterly(`*str*`,` *mask*`)`*	`float` or `int`
half-yearly date	`halfyearly(`*str*`,` *mask*`)`*	`float` or `int`
yearly date	`yearly(`*str*`,` *mask*`)`	`float` or `int`

* *str* is a string variable or a literal string enclosed in quotes.

Within each function, you need to specify the string you want to convert and the order in which the date and time components appear in that string.

The string to be converted with `clock()`, `Clock()`, and `date()` may contain dates and times that are run together or include punctuation marks between the components. However, the functions marked with an asterisk require that the string date contain a space or punctuation between the year and the other component if the string consists only of numbers. For more information on how punctuation is handled and other details related to these conversion functions, see [D] **Datetime conversion**.

The order of the components is specified within quotes, such as `"YMD"`, and is referred to as a mask. The mask may contain the following elements:

Mask element	Component
`D`	day
`W`	week
`M`	month
`Q`	quarter
`H`	half-year
`Y`	year
`19Y`	two-digit year in the 1900s
`20Y`	two-digit year in the 2000s
`h`	hour
`m`	minute
`s`	second
`#`	placeholder for something to be ignored

Examples:

1. You have datetimes stored in the string variable `mystr`, an example being `2010.07.12 14:32`. To convert this to a Stata datetime/c variable, you type

   ```
   . generate double eventtime = clock(mystr, "YMDhm")
   ```

   The string contains the year, month, and day followed by the hour and minute, so you specify the mask `"YMDhm"`.

2. You have datetimes stored in `mystr`, an example being `2010.07.12 14:32:12`. You type

   ```
   . generate double eventtime = clock(mystr, "YMDhms")
   ```

   Mask element `s` specifies seconds. In example 1, there were no seconds; in this example, there are.

3. You have datetimes stored in `mystr`, an example being `2010 Jul 12 14:32`. You type

   ```
   . generate double eventtime = clock(mystr, "YMDhm")
   ```

   This is the same command that you typed in example 1. In the mask, you specify the order of the components; Stata figures out the style for itself. In example 1, months were numeric. In this example, they are spelled out (and happen to be abbreviated).

4. You have datetimes stored in `mystr`, an example being `July 12, 2010 2:32 PM`. You type

   ```
   . generate double eventtime = clock(mystr, "MDYhm")
   ```

   Stata automatically looks for AM and PM, in uppercase and lowercase, with and without periods.

5. You have datetimes stored in `mystr`, an example being `7-12-10 14.32`. The 2-digit year is to be interpreted as being prefixed with 20. You type

   ```
   . generate double eventtime = clock(mystr, "MD20Yhm")
   ```

6. You have datetimes stored in `mystr`, an example being `14:32 on 7/12/2010`. You type

   ```
   . generate double eventtime = clock(mystr, "hm#MDY")
   ```

   The `#` sign between `m` and `M` means “ignore one thing between minute and month”, which in this case is the word “on”. Had you omitted the `#` from the mask, the new variable `eventtime` would have contained missing values.

7. You have a date stored in `mystr`, an example being `22/7/2010`. In this case, you want to create a Stata date instead of a datetime. You type

   ```
   . generate eventdate = date(mystr, "DMY")
   ```

   Typing

   ```
   . generate double eventtime = clock(mystr, "DMY")
   ```

   would have worked, too. Variable `eventtime` would contain a different coding from that contained by `eventdate`; namely, it would contain milliseconds from 1jan1960 rather than days (1,595,376,000,000 rather than 18,465). Datetime value 1,595,376,000,000 corresponds to 22jul2010 00:00:00.000.

Formatting Stata dates for display

While Stata dates are stored as regular Stata numeric variables, they are formatted so they look like the dates and times we are familiar with. Each type of date has a corresponding display format, and we list them below:

Stata date type	Display format
datetime/c	%tc
datetime/C	%tC
date	%td
weekly date	%tw
monthly date	%tm
quarterly date	%tq
half-yearly date	%th
yearly date	%ty

The display formats above are the simplest forms of each of the Stata dates. You can control how each type of Stata date is displayed; see [D] **Datetime display formats**.

Examples:

1. You have datetimes stored in string variable `mystr`, an example being `2010.07.12 14:32`. To convert this to a Stata datetime/c variable and make the new variable readable when displayed, you type

```
. generate double eventtime = clock(mystr, "YMDhm")
. format eventtime %tc
```

2. You have a date stored in `mystr`, an example being `22/7/2010`. To convert this to a Stata date variable and make the new variable readable when displayed, you type

```
. generate eventdate = date(mystr, "DMY")
. format eventdate %td
```

Creating dates from components

If you have components of your date stored separately, you can use the following functions to create a single date variable. Note that each component used in this function must be numeric; you can specify numeric variables or simply digits.

Stata date type	Function to build from components
datetime/c	mdyhms(M, D, Y, h, m, s)* dhms(e_d, h, m, s)*† hms(h, m, s)*
datetime/C	Cmdyhms(M, D, Y, h, m, s)* Cdhms(e_d, h, m, s)*† Chms(h, m, s)*
date	mdy(M, D, Y) dmy(D, M, Y)
weekly date	yw(Y, W)
monthly date	ym(Y, M)
quarterly date	yq(Y, Q)
half-yearly date	yh(Y, H)
yearly date	y(Y)

* Stata datetime variables must be stored as `double`s.
† e_d is a Stata date with a month, day, and year component.

Examples:

1. Your dataset has three variables, `mo`, `da`, and `yr`, with each variable containing a date component in numeric form. To create a date variable from these components, you type

```
. generate eventdate = mdy(mo, da, yr)
. format eventdate %td
```

If you prefer the ordering day, month, and year, you can use `dmy()` instead of `mdy()`:

```
. generate eventdate = dmy(da, mo, yr)
. format eventdate %td
```

2. Your dataset has two numeric variables, `mo` and `yr`. To create a date variable corresponding to the first day of the month, you type

```
. generate eventdate = mdy(mo, 1, yr)
. format eventdate %td
```

3. Your dataset has two numeric variables, `da` and `yr`, and one string variable, `month`, containing the spelled-out month. In this case, do not use the building-from-component functions. Instead, construct a new string variable with these components, and then convert the string to a Stata date using the conversion functions:

```
. generate str work  = month + " " + string(da) + " " + string(yr)
. generate eventdate = date(work, "MDY")
. format eventdate %td
```

Converting among units

The table below lists the functions for converting one type of date and time to another. Because there are not official functions for every possible conversion, we have also included the functions you can nest instead to obtain those conversions. Similarly, for any other conversion not listed here, you can use two functions, going through date or datetime as appropriate. For example, to obtain a monthly date from a datetime/c variable, you would use `mofd(dofc(`*varname*`))`.

From:	To: datetime/c	datetime/C	date
datetime/c		`Cofc()`	`dofc()`
datetime/C	`cofC()`		`dofC()`
date	`cofd()`	`Cofd()`	

From:	To: date	weekly	monthly	quarterly
date		`wofd()`	`mofd()`	`qofd()`
weekly	`dofw()`		`mofd(dofw())`	`qofd(dofw())`
monthly	`dofm()`	`wofd(dofm())`		`qofd(dofm())`
quarterly	`dofq()`	`wofd(dofq())`	`mofd(dofq())`	

From:	To: date	half-yearly	yearly
date		`hofd()`	`yofd()`
half-yearly	`dofh()`		
yearly	`dofy()`		

Note that if you are converting to a date type for which you do not have all the components, those missing elements will be set to their defaults. For example, converting a yearly date to a weekly date would give you the first week of each year. Converting a quarterly date to a monthly date would give you the first month of each quarter, along with the year, of course. Below, we list the defaults for the date and time components:

Date component	Default
`year`	1960
`half-year`	1
`quarter`	1
`month`	1
`week`	1
`day`	01
`hour`	00
`minute`	00
`second`	00

Examples:

1. You have the Stata datetime/c variable `eventtime` and wish to create the new variable `eventdate` containing just the date from the datetime variable. You type

```
. generate eventdate = dofc(eventtime)
. format eventdate %td
```

2. You have the daily date `eventdate` and wish to create the new datetime/c variable `eventtime` from it. For this unusual case, you can even type

```
. generate double eventtime = cofd(eventdate)
. format eventtime %tc
```

   The time components of the new variable will be set to the default 00:00:00.000.

3. You have the Stata quarterly variable `eventqtr` and wish to create the new Stata date variable `eventdate` from it. You type

```
. generate eventdate = dofq(eventqtr)
. format eventdate %tq
```

   The new variable, `eventdate`, will contain 01jan dates for quarter 1, 01apr dates for quarter 2, 01jul dates for quarter 3, and 01oct dates for quarter 4.

4. You have the datetime/c variable `admittime` and wish to create the quarterly variable `admitqtr` from it. You type

```
. generate admitqtr = qofd(dofc(admittime))
. format admitqtr %tq
```

   Because there is no `qofc()` function, you use `qofd(dofc())`.

Extracting time-of-day components from datetimes

In the table below, we list the functions used to extract time-of-day components from datetimes. If you are working with standard datetimes, use the functions in the datetime/c column. If you are working with leap second–adjusted times, use the functions in the datetime/C column.

	Function		
Desired component	datetime/c	datetime/C	Example
hour of day	`hh(`e_{tc}`)`	`hhC(`e_{tC}`)`	14
minutes of day	`mm(`e_{tc}`)`	`mmC(`e_{tC}`)`	42
seconds of day	`ss(`e_{tc}`)`	`ssC(`e_{tC}`)`	57.123
year, month, day, hour, minute, second, or millisecond	`clockpart(`e_{tc}`,`s_u`)`	`Clockpart(`e_{tC}`,`s_u`)`	2020

e_{tc} is a Stata datetime/c value.
e_{tC} is a Stata datetime/C value (UTC time with leap seconds).
s_u is a string specifying the time unit. s_u can be string `"year"` or `"y"` for year; `"month"` or `"mon"` for month; `"day"` or `"d"` for day; `"hour"` or `"h"` for hour; `"minute"` or `"min"` for minute; `"second"`, `"sec"`, or `"s"` for second; and `"millisecond"` or `"ms"` for millisecond (case insensitive).
Notes:

$0 \le \texttt{hh}(e_{tc}) \le 23,\quad 0 \le \texttt{hhC}(e_{tC}) \le 23$
$0 \le \texttt{mm}(e_{tc}) \le 59,\quad 0 \le \texttt{mmC}(e_{tC}) \le 59$
$0 \le \texttt{ss}(e_{tc}) < 60,\quad 0 \le \texttt{ssC}(e_{tC}) < 61$ (sic)

Example:

1. You have the Stata datetime/c variable `admittime`. You wish to create the new variable `admithour` equal to the hour and fraction of hour within the day of admission. You type

```
. generate admithour = hh(admittime) + mm(admittime)/60
> + ss(admittime)/3600
```

2. You have the Stata datetime/C variable `admitTime`. You wish to create the new variable `admityear` to record the year of admission. You type

```
. generate admityear = Clockpart(admitTime, "year")
```

See [D] **Datetime durations** for other functions that can be used to calculate durations.

Extracting date components from daily dates

You might be working with dates that have more information than you need. For example, daily dates refer to dates that have a month, day, and year component. If you want to refer only to the month, or year, of a daily date, you can use the extraction functions below.

Desired component	Function*	Example†
calendar year	`year(`e_d`)`	2013
	`datepart(`e_d`, "year")`	2013
calendar month	`month(`e_d`)`	7
	`datepart(`e_d`, "month")`	7
calendar day	`day(`e_d`)`	5
	`datepart(`e_d`, "day")`	5
day of week (0=Sunday)	`dow(`e_d`)`	2
Julian day of year (1=first day)	`doy(`e_d`)`	186
week within year (1=first week)	`week(`e_d`)`	27
quarter within year (1=first quarter)	`quarter(`e_d`)`	3
half within year (1=first half)	`halfyear(`e_d`)`	2

* e_d is a Stata date with a month, day, and year component.
† All examples are with e_d = `mdy(7,5,2013)`.

All functions require a numeric Stata daily date as an argument. A string variable cannot be specified as the date. To extract components from other Stata date types, use the appropriate conversion function to convert to a daily date. For example, `quarter(dofq(`*qvar*`))` would return the quarter of the quarterly date values stored in *qvar*.

Examples:

1. You wish to obtain the day of week Sunday, Monday, ... corresponding to the daily date variable `eventdate`. You type

```
. generate day_of_week = dow(eventdate)
```

   The new variable, `day_of_week`, contains 0 for Sunday, 1 for Monday, ..., 6 for Saturday.

2. You wish to obtain the day of week Sunday, Monday, ... corresponding to the datetime/c variable `eventtime`. You type

```
. generate day_of_week = dow(dofc(eventtime))
```

3. You have the daily date variable `evdate` and wish to create the new date variable `evdate_r` from it. `evdate_r` will contain the same date as `evdate` but rounded back to the first of the month. You type

```
. generate evdate_r = mdy(month(evdate), 1, year(evdate))
```

   In the above solution, we used the date-component extraction functions `month()` and `year()` and used the build-from-components function `mdy()`.

Typing dates into expressions

You can type date values by just typing the number, such as 16,237 or 1,402,920,000,000, as in

```
. generate before = cond(hiredon < 16237, 1, 0) if !missing(hiredon)
. drop if admittedon < 1402920000000
```

Easier to type is

```
. generate before = cond(hiredon < td(15jun2004), 1, 0) if !missing(hiredon)
. drop if admittedon < tc(15jun2004 12:00:00)
```

You can type Stata date values by typing the date inside `td()`, as in `td(15jun2004)`.

You can type Stata datetime/c values by typing the datetime inside `tc()`, as in `tc(15jun2004 12:00:00)`.

`td()` and `tc()` are called pseudofunctions because they translate what you type into their numerical equivalents. Pseudofunctions require only that you specify the datetime components in the expected order, so rather than 15jun2004 above, we could have specified 15 June 2004, 15-6-2004, or 15/6/2004.

The pseudofunctions and their expected component order are

Desired date type	Pseudofunction
datetime/c	`tc(` [*day-month-year*] *hh*`:`*mm*[`:`*ss* [`.`*sss*]] `)`
datetime/C	`tC(` [*day-month-year*] *hh*`:`*mm*[`:`*ss* [`.`*sss*]] `)`
date	`td(`*day-month-year*`)`
weekly date	`tw(`*year-week*`)`
monthly date	`tm(`*year-month*`)`
quarterly date	`tq(`*year-quarter*`)`
half-yearly date	`th(`*year-half*`)`
yearly date	none necessary; years are numeric and can be typed directly

Note that the *day-month-year* in `tc()` and `tC()` are optional. If you omit them, 01jan1960 is assumed. Doing so produces time as an offset, which can be useful in, for example,

```
. generate six_hrs_later = eventtime + tc(6:00)
```

Note that string-to-date functions can be used in expressions with literal strings. For example, `date("15jun2004","DMY")` gives the same result as `td(15jun2004)`.

Remarks and examples

Remarks are presented under the following headings:

Introduction

To use dates in Stata, you must first convert what you have to a Stata date. Stata dates are numbers, so they can easily be translated from, say, daily dates to monthly dates. Even so, they can be formatted so that they look like the dates you are familiar with. If you have dates stored as strings, you must first convert them to Stata dates.

Converting a string date to a Stata date is as simple as telling Stata the string date and the order of the components. For example, we have a fictional dataset on patients who visited a local hospital. We have their birthdates, the dates of their visits, the reasons for their visits, and the dates they were discharged. All dates and times are stored as strings.

```
. use https://www.stata-press.com/data/r19/visits
(Fictional hospital visit data)

. describe

Contains data from https://www.stata-press.com/data/r19/visits.dta
 Observations:            5                  Fictional hospital visit data
    Variables:            7                  27 Aug 2024 22:56
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
patid           byte    %9.0g                 Patient ID
dateofbirth     str9    %9s                   Date of birth
reason          str15   %15s                  Reason for visit
admit_d         str8    %9s                   Admission date
admit_t         str17   %17s                  Admission date and time
discharge_d     str9    %9s                   Discharge date
discharge_t     str14   %14s                  Discharge date and time
--------------------------------------------------------------------------------

Sorted by:
```

```
. list admit_d dateofbirth
```

	admit_d	dateofb~h
1.	20110625	May152001
2.	20110313	Apr011999
3.	20110409	Nov151975
4.	20120211	Aug261960
5.	20120801	Dec161987

If we wanted to sort our data by birthdates or use these dates to compute a patient's age, we would need these variables to be numeric, not strings. So let's create numeric Stata dates from the birthdates and dates of admission:

```
. generate admit = date(admit_d, "YMD")
. generate dob = date(dateofbirth, "MDY")
. list admit_d admit dateofbirth dob
```

	admit_d	admit	dateofb~h	dob
1.	20110625	18803	May152001	15110
2.	20110313	18699	Apr011999	14335
3.	20110409	18726	Nov151975	5797
4.	20120211	19034	Aug261960	238
5.	20120801	19206	Dec161987	10211

For dates of admission, we told Stata that the string date was stored in `admit_d` and that the date was stored in the following order: year, month, day (YMD). Similarly, for birthdates we specify the string date and the order of the components: month, day, and year (MDY). It does not matter whether the month is written as a number, spelled out completely, or abbreviated to three letters.

You might be surprised by the values listed. The numbers represent the days elapsed since January 1, 1960, Stata's base date. Most software store dates and times in this manner, but they differ in the date they choose as a base. For us to understand the dates that these values represent, we apply a display format. All datetime display formats begin with a `%t` and contain a second letter representing the type of date: `%td` for daily dates, `%tw` for weekly dates, and so on. In our case, we have daily dates, so we use the `%td` format.

```
. format admit dob %td
. list admit dob
```

	admit	dob
1.	25jun2011	15may2001
2.	13mar2011	01apr1999
3.	09apr2011	15nov1975
4.	11feb2012	26aug1960
5.	01aug2012	16dec1987

If we instead had weekly dates, monthly dates, or quarterly dates, we would use the appropriate string-to-numeric conversion function to create the numeric variable and the appropriate display format. For more ways to format the dates above, see [D] **Datetime display formats**.

This is a simple example to get us started. The key points are that we want our dates to be stored numerically and formatted so that they look like the dates we are familiar with.

Below, we will discuss how to work with other types of dates. We will explore dates that have a time component, dates with components stored in multiple variables, and dates that have more components than we wish to work with. So whether you need to build, extract, or convert among different types of dates, you will learn how to do so with the examples that follow.

Example 1: Converting string datetimes to Stata datetimes

In this dataset, we also have string variables that record the date and time of admission and discharge:

```
. codebook admit_t discharge_t

--------------------------------------------------------------------------------
admit_t                                                   Admission date and time
--------------------------------------------------------------------------------

                  Type: String (str17)

         Unique values: 5                          Missing "": 0/5

            Tabulation: Freq.  Value
                            1  "20110313 8:30:45"
                            1  "20110409 10:17:08"
                            1  "20110625 5:15:06"
                            1  "20120211 10:30:12"
                            1  "20120801 6:45:59"

               Warning: Variable has embedded blanks.
--------------------------------------------------------------------------------
discharge_t                                               Discharge date and time
--------------------------------------------------------------------------------

                  Type: String (str14)

         Unique values: 5                          Missing "": 0/5

            Tabulation: Freq.  Value
                            1  "20110326 2:15"
                            1  "20110409 19:35"
                            1  "20110629 10:27"
                            1  "20120216 2:15"
                            1  "20120802 11:59"

               Warning: Variable has embedded blanks.
```

Let's convert these to Stata dates. Regardless if we are working with simple dates or dates and times, the process is the same. We are going to specify the string we want to convert and the order of the components. The only difference between this example and the previous example is the function; because these variables record the date and time, we will now use the `clock()` function, and the variables we generate will be referred to as datetime variables.

```
. generate double admit_time = clock(admit_t, "YMDhms")
. generate double disch_time = clock(discharge_t, "YMDhm")
. format admit_time disch_time %tc
. list admit_time disch_time

     +-----------------------------------------+
     |         admit_time           disch_time |
     |-----------------------------------------|
  1. | 25jun2011 05:15:06   29jun2011 10:27:00 |
  2. | 13mar2011 08:30:45   26mar2011 02:15:00 |
  3. | 09apr2011 10:17:08   09apr2011 19:35:00 |
  4. | 11feb2012 10:30:12   16feb2012 02:15:00 |
  5. | 01aug2012 06:45:59   02aug2012 11:59:00 |
     +-----------------------------------------+
```

Note that the string variable `admit_t` contained the hour, minutes, and seconds, whereas the string variable `discharge_t` contained only the hour and minutes. This is why we did not specify an `s` in the list of components for `discharge_t`, and it is also why the seconds are set to zero for `disch_time`.

These variables now record the milliseconds since 01jan1960 00:00:00.000, assuming 86,400 seconds per day. You might have guessed that these values will be quite large, which is why we need to use the most precise storage type in Stata, `double`.

We have a lot of information in these variables, but we can choose to view just the portion in which we are interested by modifying the display format. For example, below we specify that we want to display only the hour and minute for the time of discharge, and we list the newly formatted time alongside the original string variable.

```
. format disch_time %tcHH:MM
. list discharge_t disch_time

     +--------------------------+
     |    discharge_t   disch_~e |
     |--------------------------|
  1. | 20110629 10:27      10:27 |
  2. |  20110326 2:15      02:15 |
  3. | 20110409 19:35      19:35 |
  4. |  20120216 2:15      02:15 |
  5. | 20120802 11:59      11:59 |
     +--------------------------+
```

We created the datetime variables above assuming there are 86,400 seconds in a day. This is one way to record time; another way would be to use UTC. UTC times are adjusted for leap seconds and can be obtained by modifying our commands just slightly, as follows:

```
. generate double admit_Time = Clock(admit_t, "YMDhms")
. format admit_Time %tC
```

Notice that the `Clock()` function and the `%tC` display format both contain a capital C. When you are working with standard datetimes, you will use functions with a lowercase `c`, and for UTC times, you will use functions with an uppercase `C`.

Example 2: Extracting date components

Suppose we want to work with just the month or year of admission. We can extract these components from our Stata date variable:

```
. generate admonth = month(admit)
. generate adyear = year(admit)
. list admit admonth adyear
```

	admit	admonth	adyear
1.	25jun2011	6	2011
2.	13mar2011	3	2011
3.	09apr2011	4	2011
4.	11feb2012	2	2012
5.	01aug2012	8	2012

Now, for each year, we can look at the patients that were admitted in the first three months and the reason for their visit:

```
. bysort adyear: list patid reason if admonth < 4

-> adyear = 2011
```

	patid	reason
2.	2	chest pain

```
-> adyear = 2012
```

	patid	reason
1.	4	abdominal pain

Example 3: Building dates from components

If we are concerned only with the month and year of admission, we can also create a monthly date with the two newly created variables above:

```
. generate monthly = ym(adyear,admonth)
. format monthly %tm
. list admit monthly
```

	admit	monthly
1.	25jun2011	2011m6
2.	13mar2011	2011m3
3.	09apr2011	2011m4
4.	11feb2012	2012m2
5.	01aug2012	2012m8

Because we now have monthly dates, we apply the `%tm` display format.

The ym() function shown above is useful when you have components of a date stored separately. In fact, we could have created this monthly date variable by nesting functions:

```
. generate monthly2 = ym(year(admit), month(admit))
. format monthly2 %tm
```

Instead of generating those intermediary variables to extract the month and year of the daily date, we simply used the extraction functions year() and month() within the ym() function. Either of the two methods shown above will give you the same result, but if your goal is to convert a daily date variable to a monthly date, you can use the mofd() conversion function, as demonstrated in the next example.

Example 4: Converting among date types

Often, we need to modify the data from its raw form for our purposes. For example, suppose our dataset included only the datetime variable admit_time but we were interested only in the date. We could type

```
. generate dateoftime = dofc(admit_time)
. format dateoftime %td
. list admit_time dateoftime

     +----------------------------------+
     |         admit_time    dateoft~e  |
     |----------------------------------|
  1. | 25jun2011 05:15:06    25jun2011  |
  2. | 13mar2011 08:30:45    13mar2011  |
  3. | 09apr2011 10:17:08    09apr2011  |
  4. | 11feb2012 10:30:12    11feb2012  |
  5. | 01aug2012 06:45:59    01aug2012  |
     +----------------------------------+
```

Or we might want to create a monthly date from the date of admission:

```
. generate monthofdate = mofd(admit)
. format monthofdate %tm
. list admit monthofdate

     +-----------------------+
     |     admit   montho~e  |
     |-----------------------|
  1. | 25jun2011     2011m6  |
  2. | 13mar2011     2011m3  |
  3. | 09apr2011     2011m4  |
  4. | 11feb2012     2012m2  |
  5. | 01aug2012     2012m8  |
     +-----------------------+
```

Several functions are available for converting from one type of date and time to another. But, if one is not available for what you need, you can nest functions to obtain the conversion you want. For example, suppose we would like to convert a monthly date to a quarterly date. There is no direct function for this conversion, so instead we type

```
. generate quarterly = qofd(dofm(monthofdate))
. format quarterly %tq
. list monthofdate quarterly
```

	montho~e	quarte~y
1.	2011m6	2011q2
2.	2011m3	2011q1
3.	2011m4	2011q2
4.	2012m2	2012q1
5.	2012m8	2012q3

We use the `dofm()` function to convert the monthly date to a daily date. This daily date will contain the month and year from the monthly date, and the day will be set to 1. This is the general rule with datetime functions; if you are converting from one type of date to another that has more elements, those elements are set to their defaults. The `qofd()` function then converts the resulting daily date to a quarterly date.

Example 5: Using dates in expressions

Besides generating date and time variables, you might use dates in expressions. For example, suppose we wanted to look only at observations after a certain date. Let's list visit information for any patients who were admitted after February 20, 2012:

```
. list admit patid reason if admit > td(20feb2012)
```

	admit	patid	reason
5.	01aug2012	5	rapid breathing

This `td()` function will convert February 20, 2012, to its numeric form. Our expression is then evaluated by comparing this numeric value with the numeric values stored in `admit`.

If you would like to see that underlying numeric value, you can type

```
. display td(20feb2012)
```

References

Cox, N. J. 2010. Stata tip 68: Week assumptions. *Stata Journal* 10: 682–685.

———. 2012. Stata tip 111: More on working with weeks. *Stata Journal* 12: 565–569.

Cox, N. J., and C. B. Schechter. 2018. Speaking Stata: Seven steps for vexatious string variables. *Stata Journal* 18: 981–994.

Also see

[D] **Datetime business calendars** — Business calendars

[D] **Datetime conversion** — Converting strings to Stata dates

[D] **Datetime display formats** — Display formats for dates and times

[D] **Datetime durations** — Obtaining and working with durations

[D] **Datetime relative dates** — Obtaining dates and date information from other dates

[D] **Datetime values from other software** — Date and time conversion from other software

Description   Syntax   Remarks and examples   Also see

Description

Stata provides user-definable business calendars.

Syntax

Apply business calendar format

`format` *varlist* `%tb`*calname*

Apply detailed date format with business calendar format

`format` *varlist* `%tb`*calname* [`:`*datetime-specifiers*]

Convert between business dates and regular dates

{ `generate` | `replace` } *bdate* = `bofd("`*calname*`",` *regulardate*`)`

{ `generate` | `replace` } *regulardate* = `dofb(`*bdate*`, "`*calname*`")`

File *calname*`.stbcal` contains the business calendar definition.

Details of the syntax follow:

1. Definition.
   Business calendars are regular calendars with some dates crossed out:

November 2011

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	X
X	7	8	9	10	11	X
X	14	15	16	17	18	X
X	21	22	23	X	X	X
X	28	29	30			

A date that appears on the business calendar is called a business date. 11nov2011 is a business date. 12nov2011 is not a business date with respect to this calendar.

Crossed-out dates are literally omitted. That is,

$$18\text{nov}2011 + 1 = 21\text{nov}2011$$

$$28\text{nov}2011 - 1 = 23\text{nov}2011$$

Stata's lead and lag operators work the same way.

2. Business calendars are named.
   Assume that the above business calendar is named `simple`.

3. Business calendars are defined in files named *calname*`.stbcal`, such as `simple.stbcal`. Calendars may be supplied by StataCorp and already installed, obtained from other users directly or via the SSC, or written yourself. Calendars can also be created automatically from the current dataset with the `bcal create` command; see [D] **bcal**. Stbcal-files are treated in the same way as ado-files.

   You can obtain a list of all business calendars installed on your computer by typing `bcal dir`; see [D] **bcal**.

4. Datetime format.
   The date format associated with the business calendar named `simple` is `%tbsimple`, which is to say `%` + `t` + `b` + *calname*.

`%`	it is a format
`t`	it is a datetime
`b`	it is based on a business calendar
calname	the calendar's name

5. Format variables the usual way.
   You format variables to have business calendar formats just as you format any variable, using the `format` command.

   ```
   . format mydate %tbsimple
   ```

   specifies that existing variable `mydate` contains values according to the business calendar named `simple`. See [D] **format**.

   You may format variables `%tb`*calname* regardless of whether the corresponding stbcal-file exists. If it does not exist, the underlying numeric values will be displayed in a %g format.

6. Detailed date formats.
   You may include detailed datetime format specifiers by placing a colon and the detail specifiers after the calendar's name.

   ```
   . format mydate %tbsimple:CCYY.NN.DD
   ```

   would display 21nov2011 as 2011.11.21. See [D] **Datetime display formats** for detailed datetime format specifiers.

7. Reading business dates.
   To read files containing business dates, ignore the business date aspect and read the files as if they contained regular dates. Convert and format those dates as `%td`; see *Converting dates stored as strings to Stata dates* in [D] **Datetime**. Then convert the regular dates to `%tb` business dates:

   ```
   . generate mydate = bofd("simple", regulardate)
   . format mydate %tbsimple
   . assert mydate!=. if regulardate!=.
   ```

   The first statement performs the conversion.

   The second statement attaches the `%tbsimple` date format to the new variable `mydate` so that it will display correctly.

The third statement verifies that all dates recorded in `regulardate` fit onto the business calendar. For instance, 12nov2011 does not appear on the `simple` calendar but, of course, it does appear on the regular calendar. If the data contained 12nov2011, that would be an error. Function `bofd()` returns missing when the date does not appear on the specified calendar.

8. More on conversion.
   There are only two functions specific to business dates, `bofd()` and `dofb()`. Their definitions are

   bdate = `bofd("`*calname*`", `*regulardate*`)`

   regulardate = `dofb(`*bdate*`, "`*calname*`")`

   `bofd()` returns missing if *regulardate* is missing or does not appear on the specified business calendar. `dofb()` returns missing if *bdate* contains missing.

9. Obtaining day of week, etc.
   You obtain day of week, etc., by converting business dates to regular dates and then using the standard functions. To obtain the day of week of *bdate* on business calendar *calname*, type

```
. generate dow = dow(dofb(bdate, "calname"))
```

   See *Extracting date components from daily dates* in [D] **Datetime** for the other extraction functions.

10. Stbcal-files.
    The stbcal-file for `simple`, the calendar shown below,

November 2011

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	X
X	7	8	9	10	11	X
X	14	15	16	17	18	X
X	21	22	23	X	X	X
X	28	29	30			

is

begin simple.stbcal

```
*! version 1.0.0
*  simple.stbcal

version 19.5      // (or version 19 if you do not have StataNow)
purpose "Example for manual"
dateformat dmy

range 01nov2011 30nov2011
centerdate 01nov2011

omit dayofweek (Sa Su)
omit date 24nov2011
omit date 25nov2011
```

end simple.stbcal

This calendar was so simple that we crossed out the Thanksgiving holidays by specifying the dates to be omitted. In a real calendar, we would change the last two lines,

```
omit date 24nov2011
omit date 25nov2011
```

to read

```
omit dowinmonth +4 Th of Nov and +1
```

which says to omit the fourth (+4) Thursday of November in every year, and omit the day after that (+1), too. See [D] **Datetime business calendars creation**.

Remarks and examples

See [D] **Datetime** for an introduction to Stata's date and time features.

Below we work through an example from start to finish.

Remarks are presented under the following headings:

Step 1: Read the data, date as string

File `bcal_simple.raw` on our website provides data, including a date variable, that is to be interpreted according to the business calendar `simple` shown under *Syntax* above.

```
. type https://www.stata-press.com/data/r19/bcal_simple.raw
11/4/11 51
11/7/11 9
11/18/11 12
11/21/11 4
11/23/11 17
11/28/11 22
```

We begin by reading the data and then listing the result. Note that we read the date as a string variable:

```
. infile str10 sdate float x using https://www.stata-press.com/data/r19/bcal_simple
(6 observations read)

. list

     +----------------+
     |    sdate     x |
     |----------------|
  1. |  11/4/11    51 |
  2. |  11/7/11     9 |
  3. | 11/18/11    12 |
  4. | 11/21/11     4 |
  5. | 11/23/11    17 |
     |----------------|
  6. | 11/28/11    22 |
     +----------------+
```

Step 2: Convert date variable to %td date

Now we create a numeric date variable from the string date and format it as a date (`%td`):

```
. generate rdate = date(sdate, "MD20Y")

. format rdate %td
```

See *Converting dates stored as strings to Stata dates* in [D] **Datetime**. We verify that the conversion went well and drop the string variable of the date:

```
. list
```

	sdate	x	rdate
1.	11/4/11	51	04nov2011
2.	11/7/11	9	07nov2011
3.	11/18/11	12	18nov2011
4.	11/21/11	4	21nov2011
5.	11/23/11	17	23nov2011
6.	11/28/11	22	28nov2011

```
. drop sdate
```

Step 3: Convert %td date to %tb date

We convert the `%td` date to a `%tbsimple` date following the instructions of item 7 of *Syntax* above.

```
. generate mydate = bofd("simple", rdate)
. format mydate %tbsimple
. assert mydate!=. if rdate!=.
```

Had there been any dates that could not be converted from regular dates to `simple` business dates, `assert` would have responded, "assertion is false". Nonetheless, we will list the data to show you that the conversion went well. We would usually drop the `%td` encoding of the date, but we want it to demonstrate a feature below.

```
. list
```

	x	rdate	mydate
1.	51	04nov2011	04nov2011
2.	9	07nov2011	07nov2011
3.	12	18nov2011	18nov2011
4.	4	21nov2011	21nov2011
5.	17	23nov2011	23nov2011
6.	22	28nov2011	28nov2011

Key feature: Each business calendar has its own encoding

In the listing above, `rdate` and `mydate` appear to be equal. They are not:

```
. format rdate mydate %9.0g          // remove date formats
. list
```

	x	rdate	mydate
1.	51	18935	3
2.	9	18938	4
3.	12	18949	13
4.	4	18952	14
5.	17	18954	16
6.	22	18959	17

%tb dates each have their own encoding, and those encodings differ from the encoding used by %td dates. It does not matter. Neither encoding is better than the other. Neither do you need to concern yourself with the encoding. If you were curious, you could learn more about the encoding used by %tbsimple by typing bcal describe simple; see [D] **bcal**.

We will drop variable rdate and put the %tbsimple format back on variable mydate:

```
. drop rdate
. format mydate %tbsimple
```

Key feature: Omitted dates really are omitted

In *Syntax*, we mentioned that for the simple business calendar

$$18\text{nov}2011 + 1 = 21\text{nov}2011$$

$$28\text{nov}2011 - 1 = 23\text{nov}2011$$

That is true:

```
. generate tomorrow = mydate + 1
. generate yesterday = mydate - 1
. format tomorrow yesterday %tbsimple
. list

     +------------------------------------------+
     |  x      mydate    tomorrow   yesterday  |
     |------------------------------------------|
  1. | 51   04nov2011   07nov2011   03nov2011  |
  2. |  9   07nov2011   08nov2011   04nov2011  |
  3. | 12   18nov2011   21nov2011   17nov2011  |
  4. |  4   21nov2011   22nov2011   18nov2011  |
  5. | 17   23nov2011   28nov2011   22nov2011  |
     |------------------------------------------|
  6. | 22   28nov2011   29nov2011   23nov2011  |
     +------------------------------------------+

. drop tomorrow yesterday
```

Stata's lag and lead operators L.*varname* and F.*varname* work similarly.

Key feature: Extracting components from %tb dates

You extract components such as day of week, month, day, and year from business dates using the same extraction functions you use with Stata's regular %td dates, namely, dow(), month(), day(), and year(), and you use function dofb() to convert business dates to regular dates. Below we add day of week to our data, list the data, and then drop the new variable:

```
. generate dow = dow(dofb(mydate, "simple"))
. list

     +----------------------+
     |  x      mydate   dow |
     |----------------------|
  1. | 51   04nov2011     5 |
  2. |  9   07nov2011     1 |
  3. | 12   18nov2011     5 |
  4. |  4   21nov2011     1 |
  5. | 17   23nov2011     3 |
     |----------------------|
  6. | 22   28nov2011     1 |
     +----------------------+

. drop dow
```

See *Extracting date components from daily dates* in [D] **Datetime**.

Key feature: Merging on dates

It may happen that you have one dataset containing business dates and a second dataset containing regular dates, say, on economic conditions, and you want to merge them. To do that, you create a regular date variable in your first dataset and merge on that:

```
. generate rdate = dofb(mydate, "simple")
. merge 1:1 rdate using econditions, keep(match)
. drop rdate
```

Also see

[D] **bcal** — Business calendar file manipulation

[D] **Datetime business calendars creation** — Business calendars creation

[D] **Datetime** — Date and time values and variables

Description   Syntax   Remarks and examples   Also see

Description

Stata provides user-definable business calendars. Business calendars are provided by StataCorp and by other users, and you can write your own. You can also create a business calendar automatically from the current dataset with the `bcal create` command; see [D] **bcal**. This entry concerns writing your own business calendars.

See [D] **Datetime business calendars** for an introduction to business calendars.

Syntax

Business calendar *calname* and corresponding display format `%tb`*calname* are defined by the text file *calname*`.stbcal`, which contains the following:

`*` *comments*

`version` *version_of_stata*

`purpose "`*text*`"`

`dateformat` { `ymd` | `ydm` | `myd` | `mdy` | `dym` | `dmy` }

`range` *date date*

`centerdate` *date*

[`from` { *date* | `.` } `to` { *date* | `.` }`:`] `omit` ... [*if*]

...

...

where

`omit` ... may be

`omit date` *pdate* [`and` *pmlist*]

`omit dayofweek` *dowlist*

`omit dowinmonth` *pm# dow* [`of` *monthlist*] [`and` *pmlist*]

[*if*] may be

`if` *restriction* [`&` *restriction* ...]

restriction is one of

`dow(`*dowlist*`)`
`month(`*monthlist*`)`
`year(`*yearlist*`)`

date is a date written with the *year*, *month*, and *day* in the order specified by `dateformat`. For instance, if `dateformat` is `dmy`, a *date* can be `12apr2013`, `12-4-2013`, or `12.4.2013`.

pdate is a *date* or it is a *date* with character * substituted where the year would usually appear. If dateformat is dmy, a *pdate* can be 12apr2013, 12-4-2013, or 12.4.2013; or it can be 12apr*, 12-4-*, or 12.4.*. 12apr* means the 12th of April across all years.

dow is a day of the week, in English. It may be abbreviated to as few as 2 characters, and capitalization is irrelevant. Examples: Sunday, Mo, tu, Wed, th, Friday, saturday.

dowlist is a *dow*, or it is a space-separated list of one or more *dow*s enclosed in parentheses. Examples: Sa, (Sa), (Sa Su).

month is a month of the year, in English, or it is a month number. It may be abbreviated to the minimum possible, and capitalization is irrelevant. Examples: January, 2, Mar, ap, may, 6, Jul, aug, 9, Octob, nov, 12.

monthlist is a *month*, or it is a space-separated list of one or more *month*s enclosed in parentheses. Examples: Nov, (Nov), 11, (11), (Nov Dec), (11 12).

year is a 4-digit calendar year. Examples: 1872, 1992, 2013, 2050.

yearlist is a *year*, or it is a space-separated list of one or more *year*s enclosed in parentheses. Examples: 2013, (2013), (2013 2014).

pm# is a nonzero integer preceded by a plus or minus sign. Examples: -2, -1, +1. *pm#* appears in omit dowinmonth *pm# dow* of *monthlist*, where *pm#* specifies which *dow* in the month. omit dowinmonth +1 Th means the first Thursday of the month. omit dowinmonth -1 Th means the last Thursday of the month.

pmlist is a *pm#*, or it is a space-separated list of one or more *pm#*s enclosed in parentheses. Examples: +1, (+1), (+1 +2), (-1 +1 +2). *pmlist* appears in the optional and *pmlist* allowed at the end of omit *date* and omit dowinmonth, and it specifies additional dates to be omitted. and +1 means and the day after. and -1 means and the day before.

Remarks and examples

Remarks are presented under the following headings:

Introduction

A business calendar is a regular calendar with some dates crossed out, such as

November 2011

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	X
X	7	8	9	10	11	X
X	14	15	16	17	18	X
X	21	22	23	X	X	X
X	28	29	30			

The purpose of the stbcal-file is to

1. Specify the range of dates covered by the calendar.
2. Specify the particular date that will be encoded as date 0.
3. Specify the dates from the regular calendar that are to be crossed out.

The stbcal-file for the above calendar could be as simple as

begin example_1.stbcal
```
version 19.5      // (or version 19 if you do not have StataNow)
range 01nov2011 30nov2011
centerdate 01nov2011
omit date  5nov2011
omit date  6nov2011
omit date 12nov2011
omit date 13nov2011
omit date 19nov2011
omit date 20nov2011
omit date 24nov2011
omit date 25nov2011
omit date 26nov2011
omit date 27nov2011
```
end example_1.stbcal

In fact, this calendar can be written more compactly because we can specify to omit all Saturdays and Sundays:

begin example_2.stbcal
```
version 19.5      // (or version 19 if you do not have StataNow)
range 01nov2011 30nov2011
centerdate 01nov2011
omit dayofweek (Sa Su)
omit date 24nov2011
omit date 25nov2011
```
end example_2.stbcal

In this particular calendar, we are omitting 24nov2011 and 25nov2011 because of the American Thanksgiving holiday. Thanksgiving is celebrated on the fourth Thursday of November, and many businesses close on the following Friday as well. It is possible to specify rules like that in stbcal-files:

begin example_3.stbcal
```
version 19.5      // (or version 19 if you do not have StataNow)
range 01nov2011 30nov2011
centerdate 01nov2011
omit dayofweek (Sa Su)
omit dowinmonth +4 Th of Nov and +1
```
end example_3.stbcal

Understand that this calendar is an artificial example, and it is made all the more artificial because it covers so brief a period. Real stbcal-files cover at least decades, and some cover centuries.

Concepts

You are required to specify four things in an stbcal-file:

1. the version of Stata being used,
2. the range of the calendar,
3. the center date of the calendar, and
4. the dates to be omitted.

Version.

You specify the version of Stata to ensure forward compatibility with future versions of Stata. If your calendar starts with the line `version 19.5` or, if you do not have StataNow, `version 19.0`, future versions of Stata will know how to interpret the file even if the definition of the stbcal-file language has greatly changed.

Range.

A calendar is defined over a specific range of dates, and you must explicitly state what that range is. When you or others use your calendar, dates outside the range will be considered invalid, which usually means that they will be treated as missing values.

Center date.

Stata stores dates as integers. In a calendar, 57 might stand for a particular date. If it did, then $57 - 1 = 56$ stands for the day before, and $57 + 1 = 58$ stands for the day after. The previous statement works just as well if we substitute $-12{,}739$ for 57, and thus the particular values do not matter except that we must agree upon what values we wish to standardize because we will be storing these values in our datasets.

The standard is called the center date, and here center does not mean the date that corresponds to the middle of your calendar. It means the date that corresponds to the center of integers, which is to say, 0. You must choose a date within the range as the standard. The particular date you choose does not matter, but most authors choose easily remembered ones. Stata's built-in `%td` calendar uses 01jan1960, but that date will probably not be available to you because the center date must be a date on the business calendars, and most businesses were closed on 01jan1960.

It will sometimes happen that you will want to expand the range of your calendar in the future. Today, you make a calendar that covers, say 1990 to 2020, which is good enough for your purposes. Later, you need to expand the range, say back to 1970 or forward to 2030, or both. When you update your calendar, do not change the center date. This way, your new calendar will be backward compatible with your previous one.

Omitted dates.

Obviously you will need to specify the dates to be omitted. You can specify the exact dates to be omitted when need be, but whenever possible, specify the rules instead of the outcome of the rules. Rules change, so learn about the `from/to` prefix that can be used in front of `omit` commands. You can code things like

```
from 01jan1960 to 31dec1968: omit ...
from 01jan1979 to .: omit ...
```

When specifying `from/to`, `.` for the first date is synonymous with the opening date of the range. `.` for the second date is synonymous with the closing date.

The preliminary commands

Stbcal-files should begin with these commands:

`version` *version_of_stata*
`purpose "`*text*`"`
`dateformat` { `ymd` | `ydm` | `myd` | `mdy` | `dym` | `dmy` }
`range` *date date*
`centerdate` *date*

`version` *version_of_stata*

You could specify `version 19.5` or, if you do not have StataNow, `version 19.0`. Better still, type command `version` in Stata to discover the version of Stata you are currently using. Specify that version, and be sure to look at the documentation so that you use the modern syntax correctly.

`purpose "`*text*`"`

This command is optional. The purpose of `purpose` is not to make comments in your file. If you want comments, include those with a `*` in front. The `purpose` sets the text that `bcal describe` *calname* will display.

`dateformat` { `ymd` | `ydm` | `myd` | `mdy` | `dym` | `dmy` }

This command is optional. `dateformat ymd` is assumed if not specified. This command has nothing to do with how dates will look when variables are formatted with `%tb`*calname*. This command specifies how you are typing dates in this stbcal-file on the subsequent commands. Specify the format that you find convenient.

`range` *date date*

The date range was discussed in *Concepts*. You must specify it.

`centerdate` *date*

The centering date was discussed in *Concepts*. You must specify it.

The omit commands: from/to and if

An stbcal-file usually contains multiple `omit` commands. The `omit` commands have the syntax

[`from` { *date* | `.` } `to` { *date* | `.` }`:`] `omit` ... [*if*]

That is, an `omit` command may optionally be preceded by `from/to` and may optionally contain an `if` at the end.

When you do not specify `from`/`to`, results are the same as if you specified

```
from . to .:  omit ...
```

That is, the `omit` command applies to all dates from the beginning to the end of the range. In *Introduction*, we showed the command

```
omit dowinmonth +4 Th of Nov and +1
```

Our sample calendar covered only the month of November, but imagine that it covered a longer period and that the business was open on Fridays following Thanksgiving up until 1998. The Thanksgiving holidays could be coded

```
from . to 31dec1997: omit dowinmonth +4 Th of Nov
from 01jan1998 to .: omit dowinmonth +4 Th of Nov and +1
```

The same holidays could also be coded

```
omit dowinmonth +4 Th of Nov
from 01jan1998 to .: omit dowinmonth +4 Th of Nov and +1
```

We like the first style better, but understand that the same dates can be omitted from the calendars multiple times and for multiple reasons, and the result is still the same as if the dates were omitted only once.

The optional `if` also determines when the `omit` statement is operational. Let's think about the Christmas holidays. Let's say a business is closed on the 24th and 25th of December. That could be coded

```
omit date 24dec*
omit date 25dec*
```

although perhaps that would be more understandable if we coded

```
from . to .: omit date 24dec*
from . to .: omit date 25dec*
```

Remember, `from . to .` is implied when not specified. In any case, we are omitting `24dec` and `25dec` across all years.

Now consider a more complicated rule. The business is closed on the 24th and 25th of December if the 25th is on Tuesday, Wednesday, Thursday, or Friday. If the 25th is on Saturday or Sunday, the holidays are the preceding Friday and the following Monday. If the 25th is on Monday, the holidays are Monday and Tuesday. The rule could be coded

```
omit date 25dec* and -1      if dow(Tu We Th Fr)
omit date 25dec* and (-2 -1) if dow(Sa)
omit date 25dec* and (-3 -2) if dow(Su)
omit date 25dec* and +1      if dow(Mo)
```

The `if` clause specifies that the `omit` command is only to be executed when `25dec*` is one of the specified days of the week. If `25dec*` is not one of those days, the `omit` statement is ignored for that year. Our focus here is on the `if` clause. We will explain about the `and` clause in the next section.

Sometimes, you have a choice between using `from`/`to` or `if`. In such cases, use whichever is convenient. For instance, imagine that the Christmas holiday rule for Monday changed in 2011 and 2012. You could code

```
from . to 31dec2010: omit date 25dec* and +1 if dow(Mo)
from 01jan2011 to .: omit date ... if dow(Mo)
```

or

```
omit date 25dec* and +1 if dow(Mo) & year(2007 2008 2009 2010)
omit date ... if dow(Mo) & year(2011 2012)
```

Generally, we find `from`/`to` more convenient to code than `if year()`.

The omit commands: and

The other common piece of syntax that shows up on `omit` commands is `and` *pmlist*. We used it above in coding the Christmas holidays,

```
omit date 25dec* and -1      if dow(Tu We Th Fr)
omit date 25dec* and (-2 -1) if dow(Sa)
omit date 25dec* and (-3 -2) if dow(Su)
omit date 25dec* and +1      if dow(Mo)
```

`and` *pmlist* specifies a list of days also to be omitted if the date being referred to is omitted. The extra days are specified as how many days they are from the date being referred to. Please excuse the inelegant "date being referred to", but sometimes the date being referred to is implied rather than stated explicitly. For this problem, however, the date being referred to is `25dec` across a number of years. The line

```
omit date 25dec* and -1      if dow(Tu We Th Fr)
```

says to omit `25dec` and the day before if `25dec` is on a Tuesday, Wednesday, etc. The line

```
omit date 25dec* and (-2 -1) if dow(Sa)
```

says to omit `25dec` and two days before and one day before if `25dec` is Saturday. The line

```
omit date 25dec* and (-3 -2) if dow(Su)
```

says to omit `25dec` and three days before and two days before if `25dec` is Sunday. The line

```
omit date 25dec* and +1      if dow(Mo)
```

says to omit `25dec` and the day after if `25dec` is Monday.

Another `omit` command for solving a different problem reads

```
omit dowinmonth -1 We of (Nov Dec) and +1 if year(2009)
```

Please focus on the `and +1`. We are going to omit the date being referred to and the date after if the year is 2009. The date being referred to here is `-1 We of (Nov Dec)`, which is to say, the last Wednesday of November and December.

The omit commands: omit date

The full syntax of `omit date` is

[`from` { *date* | `.` } `to` { *date* | `.` }`:`] `omit date` *pdate* [`and` *pmlist*] [*if*]

You may omit specific dates,

```
omit date 25dec2010
```

or you may omit the same date across years:

```
omit date 25dec*
```

The omit commands: omit dayofweek

The full syntax of `omit dayofweek` is

[`from` { *date* | `.` } `to` { *date* | `.` }`:`] `omit dayofweek` *dowlist* [*if*]

The specified days of week (Monday, Tuesday, ...) are omitted.

The omit commands: omit dowinmonth

The full syntax of `omit dowinmonth` is

[`from` { *date* | `.` } `to` { *date* | `.` }`:`] `omit` *pm# dow* [`of` *monthlist*] [`and` *pmlist*] [*if*]

`dowinmonth` stands for day of week in month and refers to days such as the first Monday, second Monday, ..., next-to-last Monday, and last Monday of a month. This is written as `+1 Mo`, `+2 Mo`, ..., `-2 Mo`, and `-1 Mo`.

Creating stbcal-files with bcal create

Business calendars can be obtained from your Stata installation or from other Stata users. You can also write your own business calendar files or use the `bcal create` command to automatically create a business calendar from the current dataset. With `bcal create`, business holidays are automatically inferred from gaps in the dataset, or they can be explicitly defined by specifying the `if` and `in` qualifiers, as well as the `excludemissing()` option. You can also edit business calendars created with `bcal create` or obtained from other sources. It is advisable to use `bcal load` or `bcal describe` to verify that a business calendar is well constructed and remains so after editing.

See [D] **bcal** for more information on `bcal create`.

Where to place stbcal-files

Stata automatically searches for stbcal-files in the same way it searches for ado-files. Stata looks for ado-files and stbcal-files in the official Stata directories, your site's directory (`SITE`), your current working directory (`.`), your personal directory (`PERSONAL`), and your directory for materials written by other users (`PLUS`). On this writer's computer, these directories happen to be

```
. sysdir
   STATA:  C:\Program Files\Stata19\
    BASE:  C:\Program Files\Stata12\ado\base\
    SITE:  C:\Program Files\Stata19\ado\site\
    PLUS:  C:\ado\plus\
PERSONAL:  C:\ado\personal\
OLDPLACE:  C:\ado\
```

Place calendars that you write into `.`, `PERSONAL`, or `SITE`. Calendars you obtain from others using `net` or `ssc` will be placed by those commands into `PLUS`. See [P] **sysdir**, [R] **net**, and [R] **ssc**.

How to debug stbcal-files

Stbcal-files are loaded automatically as they are needed, and because this can happen anytime, even at inopportune moments, no output is produced. If there are errors in the file, no mention is made of the problem, and thereafter Stata simply acts as if it had never found the file, which is to say, variables with `%tb`*calname* formats are displayed in `%g` format.

You can tell Stata to load a calendar file right now and to show you the output, including error messages. Type

```
. bcal load calname
```

It does not matter where *calname*`.stbcal` is stored, Stata will find it. It does not matter whether Stata has already loaded *calname*`.stbcal`, either secretly or because you previously instructed the file be loaded. It will be reloaded, you will see what you wrote, and you will see any error messages.

Ideas for calendars that may not occur to you

Business calendars obviously are not restricted to businesses, and neither do they have to be restricted to days.

Say you have weekly data and want to create a calendar that contains only Mondays. You could code

begin mondays.stbcal

```
version 19.5      // (or version 19 if you do not have StataNow)

purpose "Mondays only"
range 04jan1960 06jan2020
centerdate 04jan1960

omitdow (Tu We Th Fr Sa Su)
```

end mondays.stbcal

Say you have semimonthly data and want to include the 1st and 15th of every month. You could code

begin smnth.stbcal

```
version 19.5      // (or version 19 if you do not have StataNow)

purpose "Semimonthly"
range 01jan1960 15dec2020
centerdate 01jan1960

omit date 2jan*
omit date 3jan*
.
.
omit date 14jan*
omit date 16jan*
.
.
omit date 31jan*
omit date  2feb*
.
.
```

end smnth.stbcal

Forgive the ellipses, but this file will be long. Even so, you have to create it only once.

As a final example, say that you just want Stata's `%td` dates, but you wish they were centered on 01jan1970 rather than on 01jan1960. You could code

begin rectr.stbcal

```
version 19.5      // (or version 19 if you do not have StataNow)

Purpose "%td centered on 01jan1970"
range 01jan1800 31dec2999
centerdate 01jan1970
```

end rectr.stbcal

Also see

[D] **bcal** — Business calendar file manipulation

[D] **Datetime business calendars** — Business calendars

[D] **Datetime** — Date and time values and variables

Description Quick start Syntax Remarks and examples
Reference Also see

Description

These functions convert dates and times recorded as strings to Stata dates. Stata dates are numbers that can be formatted so that they look like the dates you are familiar with. See [D] **Datetime** for an introduction to Stata's date and time features.

Quick start

Convert `strdate1`, with dates such as `"Tue January 25, 2013"`, to a numerically encoded Stata date variable, ignoring the day of the week from the string

```
generate numvar1 = date(strdate1, "#MDY")
```

Convert `strdate2`, with dates in the 2000s such as `"01-25-13"`, to a Stata date variable

```
generate numvar2 = date(strdate2, "MD20Y")
```

Convert `strdate3`, with dates such as `"15Jan05"`, to a Stata date variable; expand the two-digit years to the largest year that does not exceed 2006

```
generate numvar3 = date(strdate3, "DMY", 2006)
```

Convert `strtime`, with times such as `"11:15 am"`, to a numerically encoded Stata datetime/c variable

```
generate double numvar4 = clock(strtime,"hm")
```

Syntax

The string-to-numeric date and time conversion functions are

Desired Stata date type	String-to-numeric conversion function
datetime/c	`clock(`*str*`,` *mask* [`,` *topyear*] `)`
datetime/C	`Clock(`*str*`,` *mask* [`,` *topyear*] `)`
date	`date(`*str*`,` *mask* [`,` *topyear*] `)`
weekly date	`weekly(`*str*`,` *mask* [`,` *topyear*] `)`
monthly date	`monthly(`*str*`,` *mask* [`,` *topyear*] `)`
quarterly date	`quarterly(`*str*`,` *mask* [`,` *topyear*] `)`
half-yearly date	`halfyearly(`*str*`,` *mask* [`,` *topyear*] `)`
yearly date	`yearly(`*str*`,` *mask* [`,` *topyear*] `)`

str is the string value to be converted.

mask specifies the order of the date and time components and is a string composed of a sequence of codes (see the next table).

topyear is described in *Working with two-digit years*, below.

Code	Meaning
`M`	month
`D`	day within month
`Y`	4-digit year
`19Y`	2-digit year to be interpreted as 19*xx*
`20Y`	2-digit year to be interpreted as 20*xx*
`W`	week (`weekly()` only)
`Q`	quarter (`quarterly()` only)
`H`	half-year (`halfyearly()` only)
`h`	hour of day
`m`	minutes within hour
`s`	seconds within minute
`#`	ignore one element

Blanks are also allowed in *mask*, which can make the *mask* easier to read, but they otherwise have no significance.

Examples of *masks* include the following:

`"MDY"` *str* contains month, day, and year, in that order.

`"MD19Y"` means the same as `"MDY"`, except that *str* may contain two-digit years, and when it does, they are to be treated as if they are 4-digit years beginning with 19.

`"MDYhms"` *str* contains month, day, year, hour, minute, and second, in that order.

`"MDY hms"` means the same as `"MDYhms"`; the blank has no meaning.

`"MDY#hms"` means that one element between the year and the hour is to be ignored. For example, *str* contains values like `"1-1-2010 at 15:23:17"` or values like `"1-1-2010 at 3:23:17 PM"`.

Remarks and examples

Remarks are presented under the following headings:

Introduction

The conversion functions are used to convert string dates, such as 08/12/06, 12-8-2006, 12 Aug 06, 12aug2006 14:23, and 12 aug06 2:23 pm, to Stata dates. The conversion functions are typically used after importing or reading data. You read the date information into string variables and then these functions convert the string into something Stata can use, namely, a numeric Stata date variable.

You use `generate` to create the Stata date variables. The conversion functions are used in the expressions, such as

```
. generate double time_admitted = clock(time_admitted_str, "DMYhms")
. format time_admitted %tc
. generate date_hired = date(date_hired_str, "MDY")
. format date_hired %td
```

Every conversion function—such as `clock()` and `date()` above—requires these two arguments:

1. *str* specifying the string to be converted; and
2. *mask* specifying the order in which the date and time components appear in *str*.

Notes:

1. You choose the conversion function `clock()`, `Clock()`, `date()`, etc., according to the type of Stata date you want returned.
2. You specify the mask according to the contents of *str*.

Usually, you will want to convert *str* containing 2006.08.13 14:23 to a Stata datetime/c or datetime/C value and convert *str* containing 2006.08.13 to a Stata date. If you wish, however, it can be the other way around. In that case, the detailed string would convert to a Stata date corresponding to just the date part, 13aug2006, and the less detailed string would convert to a Stata datetime corresponding to 13aug2006 00:00:00.000.

Specifying the mask

An argument *mask* is a string specifying the order of the date and time components in *str*. Examples of string dates and the mask required to convert them include the following:

str	Corresponding mask	
01dec2006 14:22	`"DMYhm"`	
01-12-2006 14.22	`"DMYhm"`	
1dec2006 14:22	`"DMYhm"`	
1-12-2006 14:22	`"DMYhm"`	
01dec06 14:22	`"DM20Yhm"`	
01-12-06 14.22	`"DM20Yhm"`	
December 1, 2006 14:22	`"MDYhm"`	
2006 Dec 01 14:22	`"YMDhm"`	
2006-12-01 14:22	`"YMDhm"`	
2006-12-01 14:22:43	`"YMDhms"`	
2006-12-01 14:22:43.2	`"YMDhms"`	
2006-12-01 14:22:43.21	`"YMDhms"`	
2006-12-01 14:22:43.213	`"YMDhms"`	
2006-12-01 2:22:43.213 pm	`"YMDhms"`	(see note 1)
2006-12-01 2:22:43.213 pm.	`"YMDhms"`	
2006-12-01 2:22:43.213 p.m.	`"YMDhms"`	
2006-12-01 2:22:43.213 P.M.	`"YMDhms"`	
20061201 1422	`"YMDhm"`	
14:22	`"hm"`	(see note 2)
2006-12-01	`"YMD"`	
Fri Dec 01 14:22:43 CST 2006	`"#MDhms#Y"`	

Notes:

1. Nothing special needs to be included in *mask* to process a.m. and p.m. markers. When you include code `h`, the conversion functions automatically watch for meridian markers.
2. You specify the mask according to what is contained in *str*. If that is a subset of what the selected Stata date type could record, the remaining elements are set to their defaults. `clock("14:22", "hm")` produces 01jan1960 14:22:00 and `clock("2006-12-01", "YMD")` produces 01dec2006 00:00:00. `date("jan 2006", "MY")` produces 01jan2006.

mask may include spaces so that it is more readable; the spaces have no meaning. Thus, you can type

```
. generate double admit = clock(admitstr, "#MDhms#Y")
```

or type

```
. generate double admit = clock(admitstr, "# MD hms # Y")
```

and which one you use makes no difference.

How the conversion functions interpret the mask

The conversion functions apply the following rules when interpreting *str*:

1. For each string date to be converted, remove all punctuation except for the period separating seconds from tenths, hundredths, and thousandths of seconds. Replace removed punctuation with a space.
2. Insert a space in the string everywhere that a letter is next to a number, or vice versa.
3. Interpret the resulting elements according to *mask*.

For instance, consider the string

    01dec2006 14:22

Under rule 1, the string becomes

    01dec2006 14 22

Under rule 2, the string becomes

    01 dec 2006 14 22

Finally, the conversion functions apply rule 3. If the mask is `"DMYhm"`, then the functions interpret "01" as the day, "dec" as the month, and so on.

Or consider the string

    Wed Dec 01 14:22:43 CST 2006

Under rule 1, the string becomes

    Wed Dec 01 14 22 43 CST 2006

Applying rule 2 does not change the string. Now rule 3 is applied. If the mask is `"#MDhms#Y"`, the conversion function skips "Wed", interprets "Dec" as the month, and so on.

The `#` code serves a second purpose. If it appears at the end of the mask, it specifies that the rest of *string* is to be ignored. Consider converting the string

    Wed Dec 01 14 22 43 CST 2006 patient 42

The mask code that previously worked when patient 42 was not part of the string, `"#MDhms#Y"`, will result in a missing value in this case. The functions are careful in the conversion, and if the whole string is not used, they return missing. If you end the mask in `#`, however, the functions ignore the rest of the string. Changing the mask from `"#MDhms#Y"` to `"#MDhms#Y#"` will produce the desired result.

Working with two-digit years

Consider converting the string 01-12-06 14:22, which is to be interpreted as 01dec2006 14:22:00, to a Stata datetime value. The conversion functions provide two ways of doing this.

The first is to specify the assumed prefix in the mask. The string 01-12-06 14:22 can be read by specifying the mask `"DM20Yhm"`. If we instead wanted to interpret the year as 1906, we would specify the mask `"DM19Yhm"`. We could even interpret the year as 1806 by specifying `"DM18Yhm"`.

What if our data include 01-12-06 14:22 and include 15-06-98 11:01? We want to interpret the first year as being in 2006 and the second year as being in 1998. That is the purpose of the optional argument *topyear*:

    clock(*string*, *mask* [, *topyear*])

When you specify *topyear*, you are stating that when years in *string* are two digits, the full year is to be obtained by finding the largest year that does not exceed *topyear*. Thus, you could code

```
. generate double timestamp = clock(timestr, "DMYhm", 2020)
```

The two-digit year 06 would be interpreted as 2006 because 2006 does not exceed 2020. The two-digit year 98 would be interpreted as 1998 because 2098 does exceed 2020.

Working with incomplete dates and times

The conversion functions do not require that every component of the date and time be specified.

Converting 2006-12-01 with mask `"YMD"` results in 01dec2006 00:00:00.

Converting 14:22 with mask `"hm"` results in 01jan1960 14:22:00.

Converting 11-2006 with mask `"MY"` results in 01nov2006 00:00:00.

The default for a component, if not specified in the mask, is

Code	Default (if not specified)
`M`	01
`D`	01
`Y`	1960
`h`	00
`m`	00
`s`	00

Thus, if you have data recording 14:22, meaning a duration of 14 hours and 22 minutes or the time 14:22 each day, you can convert it with `clock(`*str*`, "hm")`.

Converting run-together dates, such as 20060125

The `clock()`, `Clock()`, and `date()` conversion functions will convert dates and times that are run together, such as 20060125, 060125, and 20060125110215 (which is 25jan2006 11:02:15). You do not have to do anything special to convert them:

```
. display %d date("20060125", "YMD")
25jan2006

. display %td date("060125", "20YMD")
25jan2006

. display %tc clock("20060125110215", "YMDhms")
25jan2006 11:02:15
```

However, the `weekly()`, `monthly()`, `quarterly()`, and `halfyearly()` functions will convert only dates that are run together if there is a combination of letters and numbers. For example,

```
. display %tm monthly("2020m1", "YM")
2020m1

. display %tq quarterly("2020q2", "YQ")
2020q1
```

If your string consists of numbers only, such as 202001, you will need to insert a space or punctuation between the year and the other component before using one of these functions.

In a data context, you could type

```
. generate startdate = date(startdatestr, "YMD")
. generate double starttime = clock(starttimestr, "YMDhms")
```

Remember to read the original date into a string. If you mistakenly read the date as numeric, the best advice is to read the date again. Numbers such as 20060125 and 20060125110215 will be rounded unless they are stored as `doubles`.

If you mistakenly read the variables as numeric and have verified that rounding did not occur, you can convert the variable from numeric to string by using the `string()` function, which comes in one- and two-argument forms. You will need the two-argument form:

```
. generate str startdatestr = string(startdatedouble, "%10.0g")
. generate str starttimestr = string(starttimedouble, "%16.0g")
```

If you omitted the format, `string()` would produce 2.01e+07 for 20060125 and 2.01e+13 for 20060125110215. The format we used had a width that was two characters larger than the length of the integer number, although using a too-wide format does no harm.

Valid times

An invalid time is 27:62:90. If you try to convert 27:62:90 to a datetime value, you will obtain a missing value.

Another invalid time is 24:00:00. A correct time would be 00:00:00 of the next day.

In *hh*:*mm*:*ss*, the requirements are $0 \leq hh < 24$, $0 \leq mm < 60$, and $0 \leq ss < 60$, although sometimes 60 is allowed. The encoding 31dec2005 23:59:60 is an invalid datetime/c but a valid datetime/C. The encoding 31dec2005 23:59:60 includes an inserted leap second.

Invalid in both datetime encodings is 30dec2005 23:59:60. Not including a leap second as in 30dec2005 23:59:60 would also be an invalid encoding. A correct datetime would be 31dec2005 00:00:00.

The clock() and Clock() functions

Stata provides two separate datetime encodings that we call datetime/c and datetime/C and that others would call "times assuming 86,400 seconds per day" and "times adjusted for leap seconds" or, equivalently, Coordinated Universal Time (UTC).

The syntax of the two functions is the same:

`clock(`*str*`,` *mask* [`,` *topyear*]`)`

`Clock(`*str*`,` *mask* [`,` *topyear*]`)`

Function `Clock()` is nearly identical to function `clock()`, except that `Clock()` returns a datetime/C value rather than a datetime/c value. For instance,

$$\begin{aligned}\text{Noon of 23nov2010} &= \text{1,606,132,800,000 in datetime/c}\\ &= \text{1,606,132,824,000 in datetime/C}\end{aligned}$$

They differ because 24 seconds have been inserted into datetime/C between 01jan1960 and 23nov2010. Correspondingly, `Clock()` understands times in which there are leap seconds, such as 30jun1997 23:59:60. `clock()` would consider 30jun1997 23:59:60 an invalid time and so return a missing value.

Why there are two datetime encodings

Stata provides two different datetime encodings, datetime/c and datetime/C.

The datetime/c encoding assumes that there are $24 \times 60 \times 60 \times 1000$ ms per day, just as an atomic clock does. Atomic clocks count oscillations between the nucleus and the electrons of an atom and thus provide a measurement of the real passage of time.

Time of day measurements have historically been based on astronomical observation, which is a fancy way of saying that the measurements are based on looking at the sun. The sun should be at its highest point at noon, right? So however you might have kept track of time—by falling grains of sand or a wound-up spring—you would have periodically reset your clock and then gone about your business. In olden times, it was understood that the 60 seconds per minute, 60 minutes per hour, and 24 hours per day were theoretical goals that no mechanical device could reproduce accurately. These days, we have more formal definitions for measurements of time. One second is 9,192,631,770 periods of the radiation corresponding to the transition between two levels of the ground state of cesium 133. Obviously, we have better equipment than the ancients, so problem solved, right? Wrong. There are two problems: the formal definition of a second is just a little too short to use for accurately calculating the length of a day, and the Earth's rotation is slowing down.

Thus, since 1972, leap seconds have been added to atomic clocks once or twice a year to keep time measurements in synchronization with Earth's rotation. Unlike leap years, however, there is no formula for predicting when leap seconds will occur. Earth may be on average slowing down, but there is a large random component to that. Therefore, leap seconds are determined by committee and announced six months before they are inserted. Leap seconds are added, if necessary, on the end of the day on June 30 and December 31 of the year. The exact times are designated as 23:59:60.

Unadjusted atomic clocks may accurately mark the passage of real time, but you need to understand that leap seconds are every bit as real as every other second of the year. Once a leap second is inserted, it ticks just like any other second and real things can happen during that tick.

You may have heard of terms such as Greenwich Mean Time (GMT) and UTC.

GMT, based on astronomical observation, has been replaced by UTC.

UTC is measured by atomic clocks and is occasionally corrected for leap seconds. UTC is derived from two other times, Universal Time 1 (UT1) and International Atomic Time (TAI). UT1 is the mean solar time with which UTC is kept in sync by the occasional addition of a leap second. TAI is the atomic time on which UTC is based. TAI is a statistical combination of various atomic chronometers, and even it has not ticked uniformly over its history; see http://www.ucolick.org/~sla/leapsecs/timescales.html and especially http://www.ucolick.org/~sla/leapsecs/dutc.html#TAI.

UNK is our term for the time standard most people use. UNK stands for unknown or unknowing. UNK is based on a recent time observation, probably UTC, and it just assumes that there are 86,400 seconds per day after that.

The UNK standard is adequate for many purposes, and when using it you will want to use datetime/c rather than the leap second–adjusted datetime/C encoding. If you are using computer-timestamped data, however, you need to find out whether the timestamping system accounted for leap-second adjustment. Problems can arise even if you do not care about losing or gaining a second here and there.

For instance, you may import from other systems timestamp values recorded in the number of milliseconds that have passed since some agreed-upon date. You may do this, but if you choose the wrong encoding scheme (choose datetime/c when you should choose datetime/C, or vice versa), more recent times will be off by 24 seconds.

To avoid such problems, you may decide to import and export data as strings, such as Fri Aug 18 14:05:36 CDT 2010. This method has advantages, but for datetime/C (UTC) encoding, times such as 23:59:60 are possible. Some systems will refuse to decode such times.

Stata refuses to decode 23:59:60 in the datetime/c encoding (function `clock()`) and accepts it with datetime/C (function `Clock()`). When datetime/C function `Clock()` sees a time with a 60th second, `Clock()` verifies that the time is one of the official leap seconds. Thus, when converting from printable forms, try assuming datetime/c, and check the result for missing values. If there are none, then you can assume your use of datetime/c was valid. However, if there are missing values and they are due to leap seconds and not some other error, you must use datetime/C `Clock()` to convert the string value. After that, if you still want to work in datetime/c units, use function `cofC()` to convert datetime/C values to datetime/c.

If precision matters, the best way to process datetime/C data is simply to treat them that way. The inconvenience is that you cannot assume that there are 86,400 seconds per day. To obtain the duration between dates, you must subtract the two time values involved. The other difficulty has to do with dealing with dates in the future. Under the datetime/C (UTC) encoding, there is no set value for any date more than six months in the future. Below is a summary of advice.

Advice on using datetime/c and datetime/C

Stata provides two datetime encodings:

1. datetime/C, also known as UTC, which accounts for leap seconds; and
2. datetime/c, which ignores leap seconds (it assumes 86,400 seconds/day).

Systems vary in how they treat time variables. SAS ignores leap seconds. Oracle includes them. Stata handles either situation. Here is our advice:

- If you obtain data from a system that accounts for leap seconds, import using Stata's datetime/C encoding.
    a. If you later need to export data to a system that does not account for leap seconds, use Stata's `cofC()` function to convert time values before exporting.
    b. If you intend to `tsset` the time variable and the analysis will be at the second level or finer, just `tsset` the datetime/C variable, specifying the appropriate `delta()` if necessary—for example, `delta(1000)` for seconds.
    c. If you intend to `tsset` the time variable and the analysis will be coarser than the second level (minute, hour, etc.), create a datetime/c variable from the datetime/C variable (`generate double` *tctime* = `cofC(`*tCtime*`)`) and `tsset` that, specifying the appropriate `delta()` if necessary. You must do that because in a datetime/C variable, there are not necessarily 60 seconds in a minute; some minutes have 61 seconds.
- If you obtain data from a system that ignores leap seconds, use Stata's datetime/c encoding.
    a. If you later need to export data to a system that does account for leap seconds, use Stata's `Cofc()` function to convert time values before exporting.
    b. If you intend to `tsset` the time variable, just `tsset` it, specifying the appropriate `delta()`.

Some users prefer always to use Stata's datetime/c because `%tc` values are a little easier to work with. You can always use datetime/c if

- you do not mind having up to 1 second of error; and
- you do not import or export numerical values (clock ticks) from other systems that are using leap seconds, because doing so could introduce nearly 30 seconds of error.

Remember these two things if you use datetime/C variables:

1. The number of seconds between two dates is a function of when the dates occurred. Five days from one date is not simply a matter of adding $5 \times 24 \times 60 \times 60 \times 1000$ ms. You might need to add another 1,000 ms. Three hundred sixty-five days from now might require adding 1,000 or 2,000 ms. The longer the span, the more you might have to add. The best way to add durations to datetime/C variables is to extract the components, add to them, and then reconstruct from the numerical components.
2. You cannot accurately predict datetimes more than six months into the future. We do not know what the datetime/C value of 25dec2026 00:00:00 will be, because every year along the way, the International Earth Rotation Reference Systems Service (IERS) will twice announce whether a leap second will be inserted.

You can help alleviate these inconveniences. Face west and throw rocks. The benefit will be transitory only if the rocks land back on Earth, so you need to throw them really hard. We know what you are thinking, but this does not need to be a coordinated effort.

Determining when leap seconds occurred

Stata system file `leapseconds.maint` lists the dates on which leap seconds occurred. The file is updated periodically (see [R] **update**; the file is updated when you `update all`), and Stata's datetime/C functions access the file to know when leap seconds occurred.

You can access it, too. To view the file, type

```
. viewsource leapseconds.maint
```

The date() function

The syntax of the `date()` function is

`date(`*string*`,` *mask* [`,` *topyear*]`)`

The `date()` function is identical to `clock()`, except that `date()` returns a Stata date value rather than a Stata datetime value. The `date()` function is the same as `dofc(clock())`.

`daily()` is a synonym for `date()`.

The other conversion functions

The other conversion functions are

Stata date type	Conversion function
weekly date	`weekly(`*str*`,` *mask* [`,` *topyear*]`)`
monthly date	`monthly(`*str*`,` *mask* [`,` *topyear*]`)`
quarterly date	`quarterly(`*str*`,` *mask* [`,` *topyear*]`)`
half-yearly date	`halfyearly(`*str*`,` *mask* [`,` *topyear*]`)`

str is the value to be converted.

mask specifies the order of the components.

topyear is described in *Working with two-digit years*, above.

These functions are rarely used because data seldom arrive in these formats.

Each of the functions converts a pair of numbers: `weekly()` converts a year and a week number (1–52); `monthly()` converts a year and a month number (1–12); `quarterly()` converts a year and a quarter number (1–4); and `halfyearly()` translates a year and a half number (1–2).

The masks allowed are far more limited than the masks for `clock()`, `Clock()`, and `date()`:

Code	Meaning
`Y`	4-digit year
`19Y`	2-digit year to be interpreted as 19*xx*
`20Y`	2-digit year to be interpreted as 20*xx*
`W`	week number (`weekly()` only)
`M`	month number (`monthly()` only)
`Q`	quarter number (`quarterly()` only)
`H`	half-year number (`halfyearly()` only)

The pair of numbers to be converted must be separated by a space or punctuation. No extra characters are allowed.

Reference

Rajbhandari, A. 2015. A tour of datetime in Stata. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2015/12/17/a-tour-of-datetime-in-stata-i/.

Also see

[D] **Datetime** — Date and time values and variables

[D] **Datetime business calendars** — Business calendars

[D] **Datetime display formats** — Display formats for dates and times

[D] **Datetime durations** — Obtaining and working with durations

[D] **Datetime relative dates** — Obtaining dates and date information from other dates

[D] **Datetime values from other software** — Date and time conversion from other software

Description Quick start Syntax Remarks and examples Also see

Description

Stata stores dates and times numerically in one of eight units. The value of a Stata date might be 18,282 or even 1,579,619,730,000. Place the appropriate format on it, and the 18,282 is displayed as 20jan2010 (`%td`). The 1,579,619,730,000 is displayed as 20jan2010 15:15:30 (`%tc`).

If you specify additional format characters, you can change how the result is displayed. Rather than 20jan2010, you could change it to 2010.01.20; January 20, 2010; or 1/20/10. Rather than 20jan2010 15:15:30, you could change it to 2010.01.20 15:15; January 20, 2010 3:15 pm; or Wed Jan 20 15:15:30 2010.

See [D] **Datetime** for an introduction to Stata's dates and times.

Quick start

Format daily dates stored in `datevar` to display as `15mar2005`

```
format datevar %td
```

Format daily dates stored in `datevar` to display as `3/15/05`

```
format datevar %tdnn/DD/YY
```

Format daily dates stored in `datevar` to display as `Tue Mar. 15`

```
format datevar %tdDay_Mon._DD
```

Format dates and times stored in `timevar` to display as `15mar2005 14:30:00`

```
format timevar %tc
```

Format dates and times stored in `timevar` to display as `14:30`

```
format timevar %tcHH:MM
```

Format dates and times stored in `timevar` to display as `2:30 PM`

```
format timevar %tchh:mm_AM
```

Syntax

The formats for displaying Stata dates and times are

Stata date type	Display format
datetime/c	`%tc` [*details*]
datetime/C	`%tC` [*details*]
date	`%td` [*details*]
weekly date	`%tw` [*details*]
monthly date	`%tm` [*details*]
quarterly date	`%tq` [*details*]
half-yearly date	`%th` [*details*]
yearly date	`%ty` [*details*]

The optional *details* allows you to control how results appear and is composed of a sequence of the following codes:

Code	Meaning	Output
`CC`	century-1	01–99
`cc`	century-1	1–99
`YY`	2-digit year	00–99
`yy`	2-digit year	0–99
`JJJ`	day within year	001–366
`jjj`	day within year	1–366
`Mon`	month	Jan, Feb, ..., Dec
`Month`	month	January, February, ..., December
`mon`	month	jan, feb, ..., dec
`month`	month	january, february, ..., december
`NN`	month	01–12
`nn`	month	1–12
`DD`	day within month	01–31
`dd`	day within month	1–31
`DAYNAME`	day of week	Sunday, Monday, ... (aligned)
`Dayname`	day of week	Sunday, Monday, ... (unaligned)
`Day`	day of week	Sun, Mon, ...
`Da`	day of week	Su, Mo, ...
`day`	day of week	sun, mon, ...
`da`	day of week	su, mo, ...

h	half	1–2
q	quarter	1–4
WW	week	01–52
ww	week	1–52
HH	hour	00–23
Hh	hour	00–12
hH	hour	0–23
hh	hour	0–12
MM	minute	00–59
mm	minute	0–59
SS	second	00–60 (sic, due to leap seconds)
ss	second	0–60 (sic, due to leap seconds)
.s	tenths	.0–.9
.ss	hundredths	.00–.99
.sss	thousandths	.000–.999
am	show am or pm	am or pm
a.m.	show a.m. or p.m.	a.m. or p.m.
AM	show AM or PM	AM or PM
A.M.	show A.M. or P.M.	A.M. or P.M.
.	display period	.
,	display comma	,
:	display colon	:
-	display hyphen	-
_	display space	
/	display slash	/
\	display backslash	\
!*c*	display character	*c*
+	separator (see note)	

Note: `+` displays nothing; it may be used to separate one code from the next to make the format more readable. `+` is never necessary. For instance, `%tchh:MM+am` and `%tchh:MMam` have the same meaning, as does `%tc+hh+:+MM+am`.

When *details* is not specified, it is equivalent to specifying

Format	Implied (fully specified) format
`%tC`	`%tCDDmonCCYY_HH:MM:SS`
`%tc`	`%tcDDmonCCYY_HH:MM:SS`
`%td`	`%tdDDmonCCYY`
`%tw`	`%twCCYY!www`
`%tm`	`%tmCCYY!mnn`
`%tq`	`%tqCCYY!qq`
`%th`	`%thCCYY!hh`
`%ty`	`%tyCCYY`

That is, typing

```
. format mytimevar %tc
```

has the same effect as typing

```
. format mytimevar %tcDDmonCCYY_HH:MM:SS
```

Format `%tcDDmonCCYY_HH:MM:SS` is interpreted as

`%`	`t`	`c`	`DDmonCCYY_HH:MM:SS`
all formats start with %	it is a datetime format	variable coded in milliseconds	formatting codes specify how to display value

Remarks and examples

Remarks are presented under the following headings:

Specifying display formats

Rather than using the default format 20jan2010, you could display the daily date in one of these formats:

2010.01.20
January 20, 2010
1/20/10

Likewise, rather than displaying the datetime/c variable in the default format 20jan2010 15:15:30, you could display it in one of these formats:

2010.01.20 15:15
January 20, 2010 3:15 pm
Wed Jan 20 15:15:30 2010

Here is how to do it:

1. 2010.01.20
   `format` *mytdvar* `%tdCCYY.NN.DD`
2. January 20, 2010
   `format` *mytdvar* `%tdMonth_dd,_CCYY`
3. 1/20/10
   `format` *mytdvar* `%tdnn/dd/YY`
4. 2010.01.20 15:15
   `format` *mytcvar* `%tcCCYY.NN.DD_HH:MM`
5. January 20, 2010 3:15 pm
   `format` *mytcvar* `%tcMonth_dd,_CCYY_hh:MM_am`
   Code `am` at the end indicates that am or pm should be displayed, as appropriate.
6. Wed Jan 20 15:15:30 2010
   `format` *mytcvar* `%tcDay_Mon_DD_HH:MM:SS_CCYY`

In examples 1 to 3, the formats each begin with `%td`, and in examples 4 to 6, the formats begin with `%tc`. It is important that you specify the opening correctly—namely, as `%` + `t` + *third_character*. The third character indicates the particular encoding type, which is to say, how the numeric value is to be interpreted. You specify `%tc`... for datetime/c variables, `%tC`... for datetime/C, `%td`... for date, and so on.

The default format for datetime/c and datetime/C variables omits the fraction of seconds; 15:15:30.000 is displayed as 15:15:30. If you wish to see the fractional seconds, specify the format

```
%tcDDmonCCYY_HH:MM:SS.sss
```

or

```
%tCDDmonCCYY_HH:MM:SS.sss
```

as appropriate.

Times are truncated, not rounded, when displayed

Consider the time 11:32:59.999. Other, less precise, ways of writing that time are

11:32:59.99
11:32:59.9
11:32:59
11:32

That is, when you suppress the display of more-detailed components of the time, the parts that are displayed are not rounded. Stata displays time just as a digital clock would; the time is 11:32 right up until the instant that it becomes 11:33.

Also see

[D] **Datetime** — Date and time values and variables

[D] **Datetime business calendars** — Business calendars

[D] **Datetime conversion** — Converting strings to Stata dates

[D] **Datetime durations** — Obtaining and working with durations

[D] **Datetime relative dates** — Obtaining dates and date information from other dates

[D] **Datetime values from other software** — Date and time conversion from other software

Description

This entry describes functions that calculate durations, such as the number of years between two dates (for example, a person's age). These functions account for leap years and leap days and produce results that are more consistent than simply taking arithmetic differences of numerical dates and converting to another unit.

This entry also describes functions that convert durations from one unit (for example, milliseconds) to another (for example, hours).

Quick start

Calculate age of a subject in integer years on the date of a survey based on a numerically encoded Stata date `dob` that gives the subject's date of birth and a numerically encoded Stata date `date_of_survey`

```
generate subject_age = age(dob, date_of_survey)
```

Same as above, but calculate the age as a noninteger; that is, include the fractional part

```
generate subject_fage = age_frac(dob, date_of_survey)
```

Calculate age on date `d` for persons born on 29feb as having their birthday on 28feb in nonleap years (rather than the default of 01mar)

```
generate celebrate = age(dob, d, "28feb")
```

Calculate the difference in number of months, rounded down to an integer, between two Stata dates, `d1` and `d2`

```
generate diff_months = datediff(d1, d2, "month")
```

Same as above, but include the fractional part of the difference

```
generate diff_fmonths = datediff_frac(d1, d2, "month")
```

Calculate the difference in number of hours, rounded down to an integer, between two Stata datetime/c variables, `t1` and `t2`

```
generate diff_hours = clockdiff(t1, t2, "hour")
```

Same as above, but include the fractional part of the difference

```
generate diff_fhours = clockdiff_frac(t1, t2, "hour")
```

Same as above, but use a conversion function to calculate hours with a fractional part

```
generate diff_fhours2 = hours(t2 - t1)
```

Calculate the difference in number of minutes, rounded down to an integer, between two Stata datetime/C variables, `tvar1` and `tvar2`

```
generate diff_minutes = Clockdiff(tvar1, tvar2, "minute")
```

Calculate the number of days since the previous Monday relative to Stata date `d`

```
generate ndays = dayssinceweekday(d, "Monday")
```

Syntax

Syntax is presented under the following headings:

Functions for calculating durations
Functions for converting units of a duration

Functions for calculating durations

Description	Function	Value returned
age	age($e_{d\,\text{DOB}}$,e_d[,s_{nl}])	years rounded down to an integer
age with fraction	age_frac($e_{d\,\text{DOB}}$,e_d[,s_{nl}])	years with fractional part
datetime/C difference	Clockdiff(e_{tC1},e_{tC2},s_{tu})	integer (rounded down)
datetime/c difference	clockdiff(e_{tc1},e_{tc2},s_{tu})	integer (rounded down)
datetime/C difference with fraction	Clockdiff_frac(e_{tC1},e_{tC2},s_{tu})	floating point
datetime/c difference with fraction	clockdiff_frac(e_{tc1},e_{tc2},s_{tu})	floating point
date difference	datediff(e_{d1},e_{d2},s_{du}[,s_{nl}])	integer (rounded down)
date difference with fraction	datediff_frac(e_{d1},e_{d2},s_{du}[,s_{nl}])	floating point
days since previous day of week	dayssinceweekday(e_d,d) or dayssincedow(e_d,d)	integers 1 to 7
days until next day of week	daysuntilweekday(e_d,d) or daysuntildow(e_d,d)	integers 1 to 7

e_d, $e_{d\,\text{DOB}}$, e_{d1}, and e_{d2} are Stata dates.
e_{tC1} and e_{tC2} are Stata datetime/C values.
e_{tc1} and e_{tc2} are Stata datetime/c values.
s_{nl} is a string specifying nonleap-year birthdays or anniversaries of 29feb and may be
"01mar", "1mar", "mar01", or "mar1" (the default); or
"28feb" or "feb28" (case insensitive).
s_{tu} is a string specifying time units:
"day" or "d" for day;
"hour" or "h" for hour;
"minute", "min", or "m" for minute;
"second", "sec", or "s" for second; or
"millisecond" or "ms" for millisecond (case insensitive).
s_{du} is a string specifying date units:
"day" or "d" for day;
"month", "mon", or "m" for month; or
"year" or "y" for year (case insensitive).
d is a numeric day of week (0=Sunday, 1=Monday, ..., 6=Saturday); alternatively,
it is a string specifying the first two or more letters of the day of week (case insensitive).

Notes:

1. The string s_{nl} specifying nonleap-year birthdays or anniversaries is an optional argument. It rarely needs to be specified. See example 3 below.
2. When $e_d < e_{d\,\mathrm{DOB}}$, age($e_{d\,\mathrm{DOB}}$,$e_d$[,$s_{nl}$]) and age_frac($e_{d\,\mathrm{DOB}}$,$e_d$[,$s_{nl}$]) return *missing* (.).
3. Clockdiff(e_{tC1},e_{tC2},s_{tu}) = −Clockdiff(e_{tC2},e_{tC1},s_{tu}). clockdiff(), Clockdiff_frac(), clockdiff_frac(), datediff(), and datediff_frac() have the same anticommutative property.

Functions for converting units of a duration

Desired conversion	Function	Value returned
milliseconds to hours	hours(*ms*)	$ms/(60 \times 60 \times 1000)$
milliseconds to minutes	minutes(*ms*)	$ms/(60 \times 1000)$
milliseconds to seconds	seconds(*ms*)	$ms/1000$
hours to milliseconds	msofhours(*h*)*	$h \times 60 \times 60 \times 1000$
minutes to milliseconds	msofminutes(*m*)*	$m \times 60 \times 1000$
seconds to milliseconds	msofseconds(*s*)*	$s \times 1000$

* Stata datetime values are in milliseconds and must be stored as doubles. When using millisecond results to add to or subtract from a Stata datetime, store the results as doubles.

Remarks and examples

Remarks are presented under the following headings:

Calculating ages and differences of dates
Calculating differences of datetimes

We assume you have read [D] **Datetime** and are familiar with how Stata stores dates and datetimes. String dates and times must be converted into numeric values to become Stata dates and datetimes. Stata date and time values are durations (positive or negative) from 01jan1960. Stata date values record the number of days from 01jan1960. Stata datetime/c values record the number of milliseconds from 01jan1960 00:00:00. Stata datetime/C is the same as datetime/c, except that it accounts for leap seconds and encodes Coordinated Universal Time (UTC).

There are other types of Stata date and time values, ones for weeks, months, quarters, half years, and years, but the functions described here are intended for use with daily dates or datetimes.

Calculating ages and differences of dates

The age() function calculates age just as one would expect. Typing

```
. generate subject_age = age(date_of_birth, current_date)
```

produces integers that are a person's age in years on current_date given birthdate date_of_birth. The variables date_of_birth and current_date must be Stata dates.

The arguments of `age()` need not be variables, but they must be Stata date values, which are numeric. To get Stata date values for literal dates, we can use the date pseudofunction `td()` and use its results as arguments to `age()`. For example,

```
. display age(td(05feb1927), td(24may2006))
79
```

shows that an individual born on 05feb1927 was 79 years old on 24may2006.

`age_frac()` returns age including the fractional part. For example, let's use `age_frac()` with the dates we specified above:

```
. display age_frac(td(05feb1927), td(24may2006))
79.29589
```

The `datediff()` and `datediff_frac()` functions produce results in units of years, months, or days. For example, to determine the number of months between 05feb1927 and 24may2006, first as an integer (rounded down) and as a number including the fractional part, we type

```
. display datediff(td(05feb1927), td(24may2006), "month")
951
. display datediff_frac(td(05feb1927), td(24may2006), "month")
951.6129
```

The optional last argument, s_{nl}, for `age()`, `age_frac()`, `datediff()`, and `datediff_frac()` was not specified in any of the above examples. It applies only to a date of birth (or starting date) on 29feb when the ending date is not in a leap year. The argument controls whether to use 01mar (the default) or 28feb as the birthday (or anniversary) in nonleap years. Setting this argument is important only when the data you are using have a set rule for determining the age of persons born on 29feb. For example, you might have data on the dates when people first get their driver's licenses. You would want the argument to match the legal rule for the data. See example 3.

The functions `age()` and `age_frac()` are based on `datediff()` and `datediff_frac()`, respectively,

$$\texttt{age(}e_{d\,\mathrm{DOB}}\texttt{,}e_d\texttt{,}s_{nl}\texttt{)} = \texttt{datediff(}e_{d\,\mathrm{DOB}}\texttt{,}e_d\texttt{,"year",}s_{nl}\texttt{)}$$

and

$$\texttt{age\_frac(}e_{d\,\mathrm{DOB}}\texttt{,}e_d\texttt{,}s_{nl}\texttt{)} = \texttt{datediff\_frac(}e_{d\,\mathrm{DOB}}\texttt{,}e_d\texttt{,"year",}s_{nl}\texttt{)}$$

when $e_d \geq e_{d\,\mathrm{DOB}}$. When $e_d < e_{d\,\mathrm{DOB}}$, `age()` and `age_frac()` return *missing* (`.`).

`datediff(...,"year",...)` and `datediff_frac(...,"year",...)` calculate the number of years between two dates just as one would expect. The only wrinkles are leap days and leap years. See *Methods and formulas* in [FN] **Date and time functions** for details.

The usefulness of these functions is solely in the way they handle leap days and leap years. Suppose, for example, you are doing an analysis of age of onset of some disorder. If you use values from `age_frac()` as time in a survival model, these times will match up perfectly with recorded ages (or ages from `age()` of course). If instead you used

```
. generate time_years = (onset_date - date_of_birth)/365.25
```

as your time variable, there would be minor discrepancies between this time and ages at birthdays. See examples below.

datediff(...,"month",...) and datediff_frac(...,"month",...) calculate the number of months between two dates as one would expect for starting days 1–28. For example, a starting date on the 28th of the month will have month anniversaries on the 28th of all other months. When the day of the starting date is 29, 30, or 31, other months may not have this day of the month. The last day of February will be 28 or 29. When the starting date is on the 31st, the months ending on the 30th obviously do not have a 31st. In these cases, the first day of the next month is considered the month anniversary. (This is consistent with the default handling of 29feb start dates when calculating year anniversaries in nonleap years; the nonleap year anniversaries are on 01mar.)

Fractional months are also a bit tricky because lengths of months vary. There is an example below, and see *Methods and formulas* in [FN] **Date and time functions** for how they are calculated.

Note that datediff(...,"year",...), datediff_frac(...,"year",...), datediff(..., "month",...), and datediff_frac(...,"month",...) all match up. That is, on an ending date on which datediff(...,"year",...) increases by one from the previous day, the value of datediff_frac(...,"year",...) is exactly an integer and equal to datediff(...,"year",...). On this ending date, datediff_frac(...,"month",...) is also an integer and equal to 12 times the year difference.

datediff(e_{d1},e_{d2},"day",s_{nl}) and datediff_frac(e_{d1},e_{d2},"day",s_{nl}) have no complications in how they are calculated. Both are equal to $e_{d2} - e_{d1}$ and are always integers. The optional argument s_{nl} has no bearing on the calculation and is ignored if specified.

▷ Example 1: Ages

Calculating ages is straightforward, but we do need to show how age_frac() calculates the fractional part of age. Here is an example.

We have a dataset with string dates. Date of birth is recorded in the variable str_dob, and the end date for calculating age is in str_end_date.

```
. use https://www.stata-press.com/data/r19/ages
(Fictional data for calculating ages)

. describe

Contains data from https://www.stata-press.com/data/r19/ages.dta
 Observations:             5                  Fictional data for calculating
                                                ages
    Variables:             2                  30 Oct 2024 17:35
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
str_dob         str9    %9s                   Date of birth
str_end_date    str9    %9s                   End date
-------------------------------------------------------------------------------
Sorted by:

. list, abbreviate(12)

     +--------------------------+
     |   str_dob   str_end_date |
     |--------------------------|
  1. | 28/8/1967      27/8/2019 |
  2. | 28/8/1967      28/8/2019 |
  3. | 28/8/1967      29/8/2019 |
  4. | 28/8/1967      28/8/2020 |
  5. | 28/8/1967      29/8/2020 |
     +--------------------------+
```

We must convert the strings to numeric Stata dates, which we do using the date() function with a mask of "DMY" because the date components are in the order day, month, year. We format the new encoded date variables using format %td, the simplest format specification for daily dates.

```
. generate dob = date(str_dob, "DMY")
. generate end_date = date(str_end_date, "DMY")
. format dob end_date %td
. list str_dob dob str_end_date end_date, abbreviate(12)
```

	str_dob	dob	str_end_date	end_date
1.	28/8/1967	28aug1967	27/8/2019	27aug2019
2.	28/8/1967	28aug1967	28/8/2019	28aug2019
3.	28/8/1967	28aug1967	29/8/2019	29aug2019
4.	28/8/1967	28aug1967	28/8/2020	28aug2020
5.	28/8/1967	28aug1967	29/8/2020	29aug2020

This person was born on 28aug1967, and we compute his or her age and age with the fractional part on the dates in end_date.

```
. generate age = age(dob, end_date)
. generate double fage = age_frac(dob, end_date)
. format fage %12.0g
. list dob end_date age fage
```

	dob	end_date	age	fage
1.	28aug1967	27aug2019	51	51.99726027
2.	28aug1967	28aug2019	52	52
3.	28aug1967	29aug2019	52	52.00273224
4.	28aug1967	28aug2020	53	53
5.	28aug1967	29aug2020	53	53.00273973

Note that the fractional parts on end dates of 29aug2019 and 29aug2020 differ. There are 366 days between 28aug2019 and 28aug2020 because 2020 is a leap year. So the fractional part for 29aug2019 is $1/366 = 0.00273224$. There are 365 days between 28aug2020 and 28aug2021, so the fractional part for 29aug2020 is $1/365 = 0.00273973$.

◁

▷ Example 2: Differences in months

Here we show an example of how datediff() and datediff_frac() calculate date differences in units of months.

We load a dataset with Stata date variables start and end. First, we generate months using datediff(start, end, "month") to get the integer difference (rounded down) in months. Then, we generate fmonths using datediff_frac(start, end, "month") to get the difference including the fractional part. We also put datediff(start, end, "day") into a variable to get differences in days to help us see how the fractional parts are calculated.

```
. use https://www.stata-press.com/data/r19/month_differences, clear
(Fictional data for calculating date differences)
. generate months = datediff(start, end, "month")
. generate double fmonths = datediff_frac(start, end, "month")
```

```
. generate days = datediff(start, end, "day")
. format fmonths %12.0g
. list start end months fmonths days, sepby(start)
```

	start	end	months	fmonths	days
1.	15jan2019	15jan2019	0	0	0
2.	15jan2019	16jan2019	0	.0322580645	1
3.	15jan2019	15feb2019	1	1	31
4.	15jan2019	16feb2019	1	1.035714286	32
5.	15jan2019	15mar2019	2	2	59
6.	15jan2019	16mar2019	2	2.032258065	60
7.	15jan2019	15apr2019	3	3	90
8.	15jan2019	16apr2019	3	3.033333333	91
9.	31jan2019	01feb2019	0	.0344827586	1
10.	31jan2019	28feb2019	0	.9655172414	28
11.	31jan2019	01mar2019	1	1	29
12.	31jan2019	02mar2019	1	1.033333333	30
13.	31jan2019	31mar2019	2	2	59
14.	31jan2019	01apr2019	2	2.032258065	60
15.	31jan2019	30apr2019	2	2.967741935	89
16.	31jan2019	01may2019	3	3	90

Let's first look at the start date 15jan2019. `months` increases by one on 15feb2019 and then again on 15mar2019 and 15apr2019. On these days, `datediff_frac(..., "month")` is an integer.

The fractional month difference between 15jan2019 and 16jan2019 is $1/31 = 0.032258$. The denominator is 31 because the next month anniversary is 15feb2019, which is 31 days from 15jan2019. The fractional part of the difference between 15jan2019 and 16feb2019 is $1/28 = 0.035714$ because there are 28 days between the month anniversaries 15feb2019 and 15mar2019. The fractional part of the difference between 15jan2019 and 16apr2019 is $1/30 = 0.033333$ because there are 30 days between the month anniversaries 15apr2019 and 15may2019.

For the start date 31jan2019, monthly anniversaries are 01mar2019, 31mar2019, and 01may2019. Fractional differences are calculated based on the number of days between the monthly anniversaries. For example, there are 29 days between 31jan2019 and 01mar2019, so the fractional difference between 31jan2019 and 01feb2019 is $1/29 = 0.034483$.

The optional fourth argument, s_{nl}, of `datediff(`e_{d1}`,`e_{d2}`,"month",`s_{nl}`)` applies only when the start date, e_{d1}, falls on 29feb. See the next example for what this option does with ages in years. It works similarly when units are months.

◁

▷ Example 3: Born on a leap day

If you are a "leapling"—born on 29feb—when do you have a birthday in nonleap years? On 28feb or 01mar? Or do you not have a birthday at all in nonleap years (Sullivan 1923)?

In the United Kingdom, a leapling legally becomes 18 on 01mar. In Taiwan, it is 28feb. In the United States, there is no legal statute concerning leap-day birthdates.

The functions `age()`, `age_frac()`, `datediff()`, and `datediff_frac()` all have an optional last argument that sets the day of the birthday (or anniversary) in nonleap years. Here is an example using `age()` and `age_frac()`.

We load a dataset with Stata date variables dob (containing date of birth) and end_date. We generate age1 using age() with the "01mar" argument (which is the default if it is not specified). The age2 variable is generated using "28feb". We also generate the variables fage1 and fage2 using age_frac() with different last arguments.

```
. use https://www.stata-press.com/data/r19/leap_day, clear
(Fictional leapling data)
. generate age1 = age(dob, end_date, "01mar")
. generate double fage1 = age_frac(dob, end_date, "01mar")
. generate age2 = age(dob, end_date, "28feb")
. generate double fage2 = age_frac(dob, end_date, "28feb")
. generate year = year(end_date)
. format fage1 fage2 %12.0g
. list dob end_date age1 age2 fage1 fage2, sepby(year)
```

	dob	end_date	age1	age2	fage1	fage2
1.	29feb2004	27feb2019	14	14	14.99452055	14.99726027
2.	29feb2004	28feb2019	14	15	14.99726027	15
3.	29feb2004	01mar2019	15	15	15	15.00273224
4.	29feb2004	28feb2020	15	15	15.99726027	15.99726776
5.	29feb2004	29feb2020	16	16	16	16
6.	29feb2004	01mar2020	16	16	16.00273224	16.00273973

Changes in age1 and age2 (that is, birthdays) in nonleap years occur on the day specified by the last argument to age(). Note that birthdays in leap years are, of course, on 29feb regardless of the last argument. Fractional parts from age_frac() differ because they are based on the number of days between birthdays on either side of end_date, which will be 365 or 366. So fractional parts are multiples of 1/365 or 1/366.

It is worth mentioning again that age(), age_frac(), datediff(), and datediff_frac() all match up sensibly, but if there are leaplings, the last argument must be the same (or not be specified) for them to match up. See *Methods and formulas* in [FN] **Date and time functions**.

◁

Calculating differences of datetimes

The clockdiff() function calculates differences of datetime/c values in units of days, hours, minutes, seconds, or milliseconds, with the result rounded down to an integer. The Clockdiff() function does the same, except it calculates differences for datetime/C values (UTC times with leap seconds).

The clockdiff_frac() and Clockdiff_frac() functions calculate the corresponding differences for datetime/c and datetime/C values, respectively, but the fractional part of the difference is also included.

▷ Example 4: Differences of datetime/c values

We have a dataset with string datetimes. A start datetime is recorded in the variable str_start, and an end datetime is in str_end.

```
. use https://www.stata-press.com/data/r19/time_differences, clear
(Fictional data for calculating time differences)
. list, abbreviate(9)
```

	str_start	str_end
1.	2015-06-30 00:00:00	2015-06-30 23:59:59
2.	2015-06-30 00:00:00	2015-06-30 23:59:60
3.	2015-06-30 00:00:00	2015-07-01 00:00:00
4.	2015-06-30 00:00:00	2015-07-01 23:59:59
5.	2015-06-30 00:00:00	2015-07-02 00:00:00

We must convert the strings to numeric Stata datetimes, which we do using the `clock()` function with a mask of `"YMDhms"`. We format the new encoded datetime variables using format `%tc`, the simplest format specification for datetime/c.

```
. generate double cstart = clock(str_start, "YMDhms")
. generate double cend   = clock(str_end,   "YMDhms")
(1 missing value generated)
. format cstart cend %tc
. list str_end cend
```

	str_end	cend
1.	2015-06-30 23:59:59	30jun2015 23:59:59
2.	2015-06-30 23:59:60	.
3.	2015-07-01 00:00:00	01jul2015 00:00:00
4.	2015-07-01 23:59:59	01jul2015 23:59:59
5.	2015-07-02 00:00:00	02jul2015 00:00:00

One of the string values became missing when it was encoded. It was the value `"2015-06-30 23:59:60"`. This is a leap second, which was added to the end of the day on 30jun2015. There is no encoding for leap seconds in datetime/c. That is why it is missing. We snuck in this leap second to illustrate a point later about datetime/C.

We now use `clockdiff()` to calculate differences in seconds and hours between the datetime/c variables `cstart` and `cend`.

```
. generate csecs  = clockdiff(cstart, cend, "second")
(1 missing value generated)
. generate chours = clockdiff(cstart, cend, "hour")
(1 missing value generated)
. list cstart cend csecs chours
```

	cstart	cend	csecs	chours
1.	30jun2015 00:00:00	30jun2015 23:59:59	86399	23
2.	30jun2015 00:00:00	.	.	.
3.	30jun2015 00:00:00	01jul2015 00:00:00	86400	24
4.	30jun2015 00:00:00	01jul2015 23:59:59	172799	47
5.	30jun2015 00:00:00	02jul2015 00:00:00	172800	48

`clockdiff()` calculates values rounded down to integers, and the results are what we expect. Integer hours starting at 30jun2015 00:00:00 are 23 hours at 30jun2015 23:59:59. Integer hours become 24 hours one second later at 01jul2015 00:00:00.

Rather than use `clockdiff()`, we could take the difference between the datetime/c variables `cstart` and `cend` and use the conversion functions `seconds()` and `hours()`.

```
. generate double csecs2  = seconds(cend - cstart)
(1 missing value generated)

. generate double chours2 = hours(cend - cstart)
(1 missing value generated)

. format %12.0g chours2

. list csecs csecs2 chours chours2
```

	csecs	csecs2	chours	chours2
1.	86399	86399	23	23.99972222
2.	.	.	.	.
3.	86400	86400	24	24
4.	172799	172799	47	47.99972222
5.	172800	172800	48	48

The results are consistent with our earlier results. The number of seconds are exactly the same in `csecs` and `csecs2` because they are integers. Hours in `chours2` are not integers, but rounded down to integers, they agree with hours produced by `clockdiff()`.

If we want to calculate the difference between `cstart` and `cend` in hours with the fractional part, we can use `clockdiff_frac()` as follows:

```
. generate double fchours = clockdiff_frac(cstart, cend, "hour")
(1 missing value generated)

. format %12.0g fchours

. list chours chours2 fchours
```

	chours	chours2	fchours
1.	23	23.99972222	23.99972222
2.	.	.	.
3.	24	24	24
4.	47	47.99972222	47.99972222
5.	48	48	48

As expected, `fchours` is the same as `chours2`.

◁

▷ Example 5: Differences of datetime/C values

What if we are using datetime/C values, that is, datetimes with leap seconds? Let's redo the previous example encoding the strings using `Clock()` to produce `Cstart` and `Cend` as datetime/C. Then, we generate a variable `Csecs` using `Clockdiff(Cstart, Cend, "second")`, `Chours` using `clockdiff(Cstart, Cend, "hour")`, and `fChours` using `Clockdiff_frac(Cstart, Cend, "hour")`.

```
. generate double Cstart = Clock(str_start, "YMDhms")

. generate double Cend   = Clock(str_end,   "YMDhms")
```

```
. format Cstart Cend %tC
. generate Csecs  = Clockdiff(Cstart, Cend, "second")
. generate Chours = Clockdiff(Cstart, Cend, "hour")
. generate double fChours = Clockdiff_frac(Cstart, Cend, "hour")
. format %12.0g fChours
. list Cstart Cend Csecs Chours fChours

     +-------------------------------------------------------------------+
  1. |             Cstart                 Cend   Csecs   Chours  |
     | 30jun2015 00:00:00   30jun2015 23:59:59   86399       23  |
     |-------------------------------------------------------------------|
     |                             fChours                                |
     |                          23.9994446                                |
     +-------------------------------------------------------------------+

     +-------------------------------------------------------------------+
  2. |             Cstart                 Cend   Csecs   Chours  |
     | 30jun2015 00:00:00   30jun2015 23:59:60   86400       23  |
     |-------------------------------------------------------------------|
     |                             fChours                                |
     |                          23.9997223                                |
     +-------------------------------------------------------------------+

     +-------------------------------------------------------------------+
  3. |             Cstart                 Cend   Csecs   Chours  |
     | 30jun2015 00:00:00   01jul2015 00:00:00   86401       24  |
     |-------------------------------------------------------------------|
     |                             fChours                                |
     |                                  24                                |
     +-------------------------------------------------------------------+

     +-------------------------------------------------------------------+
  4. |             Cstart                 Cend    Csecs   Chours  |
     | 30jun2015 00:00:00   01jul2015 23:59:59   172800       47  |
     |-------------------------------------------------------------------|
     |                             fChours                                |
     |                         47.99972222                                |
     +-------------------------------------------------------------------+

     +-------------------------------------------------------------------+
  5. |             Cstart                 Cend    Csecs   Chours  |
     | 30jun2015 00:00:00   02jul2015 00:00:00   172801       48  |
     |-------------------------------------------------------------------|
     |                             fChours                                |
     |                                  48                                |
     +-------------------------------------------------------------------+
```

In the previous example, the difference between the times of the first observation was 23.99972222 hours; now it is 23.99944460 hours. The difference for the first observation in this example is further from 24 hours because there are now two seconds between `Cend` and 24 hours from `Cstart`, whereas before there was only one second because the leap second was treated as if it did not exist.

The other difference is the denominator of the fractional part. From the earlier example using datetime/c values and `clockdiff_frac()`, we note that $1 - 0.99972222 = 0.00027778 = 1/3600$, where 3,600 is the number of seconds in an hour. In this example using datetime/C values and `Clockdiff_frac()`, we see that $1 - 0.99944460 = 0.00055540 = 2/3601$, where 3,601 is the number of seconds in the hour containing the leap second.

For the second-to-last observation, the fractional part of the difference is 0.99972222, the same as the fractional part in the previous example. So in this example, the hour differences with the fractional part are not evenly spaced, and this would be true even without the second observation with the leap second in the data. If the lack of uniform spacing is a problem and there are no leap seconds in your data, you may want to consider converting your datetime/C data to datetime/c.

◁

Reference

Sullivan, A. 1923. *The Pirates of Penzance or the Slave of Duty*, libretto by W. S. Gilbert. New York: G. Schirmer.

Also see

[D] **Datetime** — Date and time values and variables

[D] **Datetime business calendars** — Business calendars

[D] **Datetime conversion** — Converting strings to Stata dates

[D] **Datetime display formats** — Display formats for dates and times

[D] **Datetime relative dates** — Obtaining dates and date information from other dates

[D] **Datetime values from other software** — Date and time conversion from other software

Datetime relative dates — Obtaining dates and date information from other dates

Description   Quick start   Syntax   Remarks and examples   Also see

Description

This entry describes functions that calculate dates from other dates, such as the date of a birthday in another year or the next leap year after a given year. It also describes functions that return the current date and current datetime.

Quick start

Display today's date

```
display %td today()
```

Save the current date and time in a scalar

```
scalar ctime = now()
```

Calculate the date of a birthday in the year given by numeric variable y based on a numerically encoded Stata date variable dob that gives date of birth

```
generate bday_future = birthday(dob, y)
```

Same as above, but for persons born on 29feb have their birthdays on 28feb in nonleap years (rather than the default of 01mar)

```
generate bday_future = birthday(dob, y, "28feb")
```

Calculate the date of the first birthday after Stata date date_today based on date of birth dob

```
generate next_bday = nextbirthday(dob, date_today)
```

Calculate the number of days in the year y

```
generate ndays = cond(isleapyear(y), 366, 365)
```

Calculate the year of the leap year immediately before the year y

```
generate yleap = previousleapyear(y)
```

Calculate the number of days in the month on which the values of Stata date variable d fall

```
generate ndays = daysinmonth(d)
```

Calculate the date of the first Friday of month m and year y

```
generate firstfriday = firstweekdayofmonth(m, y, "Friday")
```

Calculate the date of the previous Saturday relative to Stata date d

```
generate previous = previousweekday(d, "sat")
```

Syntax

Description	Function	Value returned
today	`today()`	Stata date
current date and time	`now()`	Stata datetime/c
birthday in year	`birthday(`$e_{d\,\text{DOB}}$`,`Y[`,`s_{nl}]`)`	Stata date
previous birthday	`previousbirthday(`$e_{d\,\text{DOB}}$`,`e_d[`,`s_{nl}]`)`	Stata date
next birthday	`nextbirthday(`$e_{d\,\text{DOB}}$`,`e_d[`,`s_{nl}]`)`	Stata date
days in month	`daysinmonth(`e_d`)`	28–31
first day of month	`firstdayofmonth(`e_d`)`	Stata date
last day of month	`lastdayofmonth(`e_d`)`	Stata date
leap year indicator	`isleapyear(`Y`)`	0 or 1
previous leap year	`previousleapyear(`Y`)`	year
next leap year	`nextleapyear(`Y`)`	year
leap second indicator	`isleapsecond(`e_{tC}`)`	0 or 1
first day of week of month	`firstweekdayofmonth(`M`,`Y`,`d`)` or `firstdowofmonth(`M`,`Y`,`d`)`	Stata date
last day of week of month	`lastweekdayofmonth(`M`,`Y`,`d`)` or `lastdowofmonth(`M`,`Y`,`d`)`	Stata date
previous day of week	`previousweekday(`e_d`,`d`)` or `previousdow(`e_d`,`d`)`	Stata date
next day of week	`nextweekday(`e_d`,`d`)` or `nextdow(`e_d`,`d`)`	Stata date

e_d and $e_{d\,\text{DOB}}$ are Stata dates.
e_{tC} is a Stata datetime/C value (UTC time with leap seconds).
s_{nl} is a string specifying nonleap-year birthdays of 29feb and may be
`"01mar"`, `"1mar"`, `"mar01"`, or `"mar1"` (the default); or
`"28feb"` or `"feb28"` (case insensitive).
Y is a numeric year.
d is a numeric day of week (`0`=Sunday, `1`=Monday, …, `6`=Saturday); alternatively,
it is a string specifying the first two or more letters of the day of week (case insensitive).

Note: The string s_{nl} specifying nonleap-year birthdays is an optional argument. It rarely needs to be specified. See example 3 in [D] **Datetime durations**.

Remarks and examples

Remarks are presented under the following headings:

We assume you have read [D] **Datetime** and are familiar with how Stata stores and formats dates.

Current date and time

`today()` and `now()` return date and datetime/c values for today's date and the current datetime, respectively. Note that the datetime value returned by `now()` is not adjusted for leap seconds.

Birthdays and anniversaries

The `birthday()` function returns a Stata date giving the birthday in a specified year. For example, suppose `date_of_birth` is a variable containing Stata dates and `yvar` is a numeric variable containing years; typing

```
. generate bday = birthday(date_of_birth, yvar)
```

produces a Stata date variable `bday` containing birthdays in those years. However, it will not be formatted as a date variable. If you list `bday`, you will see numbers, not dates. To see dates, you must give it a date format, such as

```
. format bday %td
```

We used the format `%td`, the simplest format specification for daily dates.

Of course, `birthday()` can be used for more than just birthdays. It can be used to give anniversary dates of any date in different years.

The `previousbirthday()` and `nextbirthday()` functions do what their names suggest. Typing

```
. generate pbday = previousbirthday(date_of_birth, current_date)
. format pbday %td
```

gives birthdays immediately before `current_date`. Typing

```
. generate nbday = nextbirthday(date_of_birth, current_date)
. format nbday %td
```

gives birthdays immediately after `current_date`. Note that if `current_date` is a birthday, `previousbirthday()` returns the previous birthday, not the value of `current_date`. Similarly, `nextbirthday()` returns the next birthday when the argument is a birthday.

The optional last argument, s_{nl}, for `birthday()`, `previousbirthday()`, and `nextbirthday()` applies only to a date of birth on 29feb. The argument controls whether to use 01mar (the default) or 28feb as the birthday in nonleap years. See example 3 in [D] **Datetime durations** and the example below.

▷ Example 1: Birthdays in other years

Here we show how to use `birthday()` and `nextbirthday()` to calculate birthdays in other years. We load a dataset with Stata date variables `dob` and `date` and a numeric variable `year`.

```
. use https://www.stata-press.com/data/r19/birthdays
(Fictional data for calculating birthdays)

. list, sepby(dob)

     +-------------------------------------------+
     |             dob              date    year |
     |-------------------------------------------|
  1. | Mon 28 Aug 1967   Thu 27 Aug 2020    2020 |
  2. | Mon 28 Aug 1967   Sat 28 Aug 2021    2021 |
  3. | Mon 28 Aug 1967   Mon 29 Aug 2022    2022 |
     |-------------------------------------------|
  4. | Thu 29 Feb 1968   Tue 28 Feb 2023    2023 |
  5. | Thu 29 Feb 1968   Thu 29 Feb 2024    2024 |
  6. | Thu 29 Feb 1968   Sat 01 Mar 2025    2025 |
     +-------------------------------------------+
```

To calculate the birthday in `year` based on date of birth `dob`, we type

```
. generate bday = birthday(dob, year)

. format bday %tdDay_DD_Mon_CCYY

. list dob year bday, sepby(dob)

     +-------------------------------------------+
     |             dob   year               bday |
     |-------------------------------------------|
  1. | Mon 28 Aug 1967   2020    Fri 28 Aug 2020 |
  2. | Mon 28 Aug 1967   2021    Sat 28 Aug 2021 |
  3. | Mon 28 Aug 1967   2022    Sun 28 Aug 2022 |
     |-------------------------------------------|
  4. | Thu 29 Feb 1968   2023    Wed 01 Mar 2023 |
  5. | Thu 29 Feb 1968   2024    Thu 29 Feb 2024 |
  6. | Thu 29 Feb 1968   2025    Sat 01 Mar 2025 |
     +-------------------------------------------+
```

We see that for a date of birth of 28 Aug 1967, the birthday in 2020 is on 28 Aug 2020, which is a Friday. For persons born on leap day 29 Feb 1968, their birthdays in nonleap years will be on 01 Mar. In leap years, of course, they will be on 29 Feb.

Note that we used the fancy date format `%tdDay_DD_Mon_CCYY`. The `%td` at the beginning means it is a format for daily dates. `Day` displays the day of the week abbreviated. The underscore (`_`) means put in a space. `DD` displays the day with a leading zero. `Mon` displays the month abbreviated. `CCYY` displays the year with the century. See [D] **Datetime display formats** for all the format variants.

For persons born on leap days (“leaplings”), we can change the day of their birthdays in nonleap years from the default of 01 Mar to 28 Feb by specifying the optional argument `"28feb"`. For example,

```
. generate abday = birthday(dob, year, "28feb")
. format abday %tdDay_DD_Mon_CCYY
. list dob year abday, sepby(dob)
```

	dob	year	abday
1.	Mon 28 Aug 1967	2020	Fri 28 Aug 2020
2.	Mon 28 Aug 1967	2021	Sat 28 Aug 2021
3.	Mon 28 Aug 1967	2022	Sun 28 Aug 2022
4.	Thu 29 Feb 1968	2023	Tue 28 Feb 2023
5.	Thu 29 Feb 1968	2024	Thu 29 Feb 2024
6.	Thu 29 Feb 1968	2025	Fri 28 Feb 2025

Birthdays of leaplings are now on 28 Feb in nonleap years. Birthdays for nonleaplings are unaffected by this argument.

Suppose we want a birthday relative to another date. Say we want the date of the first birthday after `date`. We can do this by typing

```
. generate nbday = nextbirthday(dob, date)
. format nbday %tdDay_DD_Mon_CCYY
. list dob date nbday, sepby(dob)
```

	dob	date	nbday
1.	Mon 28 Aug 1967	Thu 27 Aug 2020	Fri 28 Aug 2020
2.	Mon 28 Aug 1967	Sat 28 Aug 2021	Sun 28 Aug 2022
3.	Mon 28 Aug 1967	Mon 29 Aug 2022	Mon 28 Aug 2023
4.	Thu 29 Feb 1968	Tue 28 Feb 2023	Wed 01 Mar 2023
5.	Thu 29 Feb 1968	Thu 29 Feb 2024	Sat 01 Mar 2025
6.	Thu 29 Feb 1968	Sat 01 Mar 2025	Sun 01 Mar 2026

We see that the first birthday after 27 Aug 2020 for someone born on 28 Aug is 28 Aug 2020. The first birthday after 28 Aug 2021 (a birthday) for someone born on 28 Aug is the birthday in the next year, 28 Aug 2022.

The first birthday after 29 Feb 2024 for someone born on 29 Feb is 01 Mar 2025. Again, we can specify the argument `"28feb"` to change the nonleap-year birthdays of leaplings to 28 Feb.

```
. generate anbday = nextbirthday(dob, date, "28feb")
. format anbday %tdDay_DD_Mon_CCYY
. list dob date anbday, sepby(dob)
```

	dob	date	anbday
1.	Mon 28 Aug 1967	Thu 27 Aug 2020	Fri 28 Aug 2020
2.	Mon 28 Aug 1967	Sat 28 Aug 2021	Sun 28 Aug 2022
3.	Mon 28 Aug 1967	Mon 29 Aug 2022	Mon 28 Aug 2023
4.	Thu 29 Feb 1968	Tue 28 Feb 2023	Thu 29 Feb 2024
5.	Thu 29 Feb 1968	Thu 29 Feb 2024	Fri 28 Feb 2025
6.	Thu 29 Feb 1968	Sat 01 Mar 2025	Sat 28 Feb 2026

Now the first birthday after 29 Feb 2024 for someone born on 29 Feb is 28 Feb 2025.

◁

Months: Number of days, first day, and last day

`daysinmonth(`e_d`)`, `firstdayofmonth(`e_d`)`, and `lastdayofmonth(`e_d`)` each take a Stata date e_d as an argument and determine the month of that date. `daysinmonth()` returns the number of days in that month. `firstdayofmonth()` returns the date of the first day of that month. `lastdayofmonth()` returns the date of the last day of that month.

For example, for any day in the month of February of leap year 2020 (such as 15feb2020), these functions return the following:

```
. display daysinmonth(mdy(2,15,2020))
29
. display %td firstdayofmonth(mdy(2,15,2020))
01feb2020
. display %td lastdayofmonth(mdy(2,15,2020))
29feb2020
```

Determining leap years

`isleapyear(`Y`)`, `previousleapyear(`Y`)`, and `nextleapyear(`Y`)` are functions that make it easier to handle leap years. Each takes a single argument that is a numeric year.

`isleapyear(`Y`)` returns 1 if Y is a leap year and 0 otherwise. The argument Y can be a numeric variable or a literal value. Here are some examples with literal values:

```
. display isleapyear(2020)
1
. display isleapyear(2021)
0
. display isleapyear(2100)
0
. display isleapyear(2400)
1
```

The year 2020 is a leap year, and 2021 is not. The year 2100 is not because it is divisible by 100 and not by 400. The year 2400 is divisible by 400, so it is a leap year.

`previousleapyear(`Y`)` returns the leap year immediately before year Y. `nextleapyear(`Y`)` returns the first leap year after year Y. Here are examples:

```
. display previousleapyear(2023)
2020
. display nextleapyear(2023)
2024
. display previousleapyear(2024)
2020
. display nextleapyear(2024)
2028
```

As you can see, when the argument is a leap year, these functions return the next leap year or previous leap year and not the leap year argument.

Determining leap seconds

`isleapsecond()` takes a datetime/C value (UTC time) as an argument and returns 1 (true) if that datetime is one of the 1,000 milliseconds of a leap second and 0 (false) otherwise. For example, the first leap second was introduced on 30jun1972, after the last millisecond of the day. Here is what `isleapsecond()` returns at various points in time, including right before the leap second was added on 30jun1972 (at 23:59.999) and right after the leap second was added on 01jul1972 (at 00:00.000). We use `tC()` to create datetime/C values.

```
. display isleapsecond(tC(30jun1972 23:59:59.999))
0

. display isleapsecond(tC(30jun1972 23:59:60.000))
1

. display isleapsecond(tC(30jun1972 23:59:60.999))
1

. display isleapsecond(tC(01jul1972 00:00:0))
0
```

`isleapsecond()` is useful for determining whether datetime/C values can be converted to datetime/c without any loss of information. Suppose we have a variable `admitTime` that contains times of patient admissions as datetime/C values. We can type the following:

```
. generate anyleapsec = isleapsecond(admitTime)

. tabulate anyleapsec
```

anyleapsec	Freq.	Percent	Cum.
0	1,064	100.00	100.00
Total	1,064	100.00	

`anyleapsec` is all zero, so no patient was admitted on a leap second, and we can convert `admitTime` to datetime/c without any times being altered.

```
. generate newTime = cofC(admitTime)
```

Had there been leap seconds in the data, `cofC()` would have converted the leap-second times to times one second later. For example,

```
. display %tc cofC(tC(31dec2016 23:59:60))
01jan2017 00:00:00
```

Dates of days of week

`firstweekdayofmonth(`M`,`Y`,`d`)` and `lastweekdayofmonth(`M`,`Y`,`d`)` return the Stata date of the first and last day-of-week d, respectively, in month M of year Y. For example, we can find the first Monday of January 2000 with the command

```
. display %td firstweekdayofmonth(1, 2000, "Monday")
03jan2000
```

`previousweekday(`e_d`,`d`)` returns the Stata date corresponding to the last day-of-week d before the Stata date e_d. `nextweekday(`e_d`,`d`)` returns the Stata date corresponding to the first day-of-week d after the Stata date e_d. For example, the date of the first Saturday after today can be found with the command

```
. display %td nextweekday(today(), "sat")
25mar2023
```

Note that day-of-week d can be specified as an integer (0 = Sunday, 1 = Monday, ..., 6 = Saturday) or as a string with the first two or more letters of the day of the week (case insensitive). For example, Sunday can be specified as 0 or "Sunday", "Sun", "su", etc.

Also see

[D] **Datetime** — Date and time values and variables

[D] **Datetime business calendars** — Business calendars

[D] **Datetime conversion** — Converting strings to Stata dates

[D] **Datetime display formats** — Display formats for dates and times

[D] **Datetime durations** — Obtaining and working with durations

[D] **Datetime values from other software** — Date and time conversion from other software

Description Remarks and examples Reference Also see

Description

Most software packages store dates and times numerically as durations from some base date in specified units, but they differ on the base date and the units. In this entry, we discuss how to convert date and time values that you have imported from other packages to Stata dates.

Remarks and examples

Remarks are presented under the following headings:

Introduction

Different software packages use different base dates for storing dates and times numerically. If you are using one of the specialized subcommands for importing data from another package, you do not need to convert your numeric dates after importing them into Stata. `import sas`, `import spss`, and `import excel` will properly convert those dates to Stata dates. However, if you store data from another package into a more general format, like a text file, you will need to do one of two things.

1. If you bring the date variable into Stata as a string, you will have to convert it to a numeric variable.
2. If you import the date variable as a numeric variable, with values representing the underlying numeric values that the other package used, you will have to convert that value to the numeric value for a Stata date.

Below, we discuss the date systems for different software packages and how to convert their date and time values to Stata dates.

Converting SAS dates

If you have data in a SAS-format file, you may want to use the `import sas` command. If the SAS file contains numerically encoded dates, `import sas` will read those dates and properly store them as Stata dates. You do not need to perform any conversion after importing your data with `import sas`.

On the other hand, if you import data originally from SAS that have been saved into another format, such as a text file, dates and datetimes may exist as the underlying numeric values that SAS used. The discussion below concerns converting those numeric values to Stata dates.

SAS provides dates measured as the number of days since 01jan1960 (positive or negative). This is the same coding as used by Stata:

```
. generate statadate = sasdate
. format statadate %td
```

SAS provides datetimes measured as the number of seconds since 01jan1960 00:00:00, assuming 86,400 seconds/day. SAS datetimes do not have leap seconds. To convert to a Stata datetime/c variable, type

```
. generate double statatime = (sastime*1000)
. format statatime %tc
```

It is important that variables containing SAS datetimes, such as `sastime` above, be imported into Stata as `doubles`.

Converting SPSS dates

If you have data in an SPSS-format file, you may want to use the `import spss` command. If the SPSS file contains numerically encoded dates, `import spss` will read those dates and properly store them as Stata dates. You do not need to perform any conversion after importing your data with `import spss`.

On the other hand, if you import data originally from SPSS that have been saved into another format, such as a text file, dates and datetimes may exist as the underlying numeric values that SPSS used. The discussion below concerns converting those numeric values to Stata dates.

SPSS provides dates and datetimes measured as the number of seconds since 14oct1582 00:00:00, assuming 86,400 seconds/day. SPSS datetimes do not have leap seconds. To convert to a Stata datetime/c variable, type

```
. generate double statatime = (spsstime*1000) + tc(14oct1582 00:00)
. format statatime %tc
```

To convert to a Stata date, type

```
. generate statadate = dofc((spsstime*1000) + tc(14oct1582 00:00))
. format statadate %td
```

Converting R dates

R stores dates as days since 01jan1970. To convert to a Stata date, type

```
. generate statadate = rdate - td(01jan1970)
. format statadate %td
```

R stores datetimes as the number of UTC-adjusted seconds (that is, with leap seconds) since 01jan1970 00:00:00. To convert to a Stata datetime/C variable, type

```
. generate double statatime = rtime - tC(01jan1970 00:00)
. format statatime %tC
```

To convert to a Stata datetime/c variable, type

```
. generate double statatime = cofC(rtime - tC(01jan1970 00:00))
. format statatime %tc
```

There are issues of which you need to be aware when working with datetime/C values; see *Why there are two datetime encodings* and *Advice on using datetime/c and datetime/C*, both in [D] **Datetime conversion**.

Converting Excel dates

If you have data in an Excel format file, you may want to use the `import excel` command. If the Excel file contains numerically encoded dates, `import excel` will read those dates and properly store them as Stata dates. You do not need to perform any conversion after importing your data with `import excel`.

On the other hand, if you are not using `import excel` and you need to manually convert Excel's numerically encoded dates to Stata dates, you can refer to the discussion below.

Excel has used different date systems across operating systems. Excel for Windows used the "1900 date system". Excel for Mac used the "1904 date system". More recently, Excel has been standardizing on the 1900 date system on all operating systems.

Regardless of operating system, Excel can use either encoding. See https://support.microsoft.com/kb/214330 for instructions on converting workbooks between date systems.

Converted dates will be off by four years if you choose the wrong date system.

Converting Excel 1900 date-system dates:

Excel's 1900 date system stores dates as days since 31dec1899 (0jan1900), and it treats 1900 as a leap year, although it was not. Therefore, this date system contains the nonexistent day 29feb1900, which is not recognized by Stata. You can see http://www.cpearson.com/excel/datetime.htm for more information on how dates and times are handled in Excel.

Because of this behavior, we need to account for that additional day when converting these numerically encoded dates to Stata dates. In other words, to convert Excel dates on or after 01mar1900 to Stata dates, we instead use 30dec1899 as the base.

```
. generate statadate = exceldate + td(30dec1899)
. format statadate %td
```

To convert Excel dates on or before 28feb1900 to Stata dates, we use 31dec1899 as the base. For an example of working with these dates, see the technical note following example 1.

Stata stores date and datetime values differently, with dates recorded as the number of days since 01jan1960 and datetimes recorded as the number of milliseconds from 01jan1960 00:00:00. However, Excel stores date and time values together in a single number. For datetimes on or after 01mar1900 00:00:00, Excel stores datetimes as days plus fraction of day since 30dec1899 00:00:00, such as `ddddddd.tttttt`. The integer records the days, and the fractional part records the number of seconds from 00:00:00, the beginning of the day, divided by the number of seconds in 24 hours (24*60*60 = 86400).

To convert with a one-second resolution to a Stata datetime, type

```
. generate double statatime = round((exceltime+td(30dec1899))*86400)*1000
. format statatime %tc
```

Converting Excel 1904 date-system dates:

For dates on or after 01jan1904, Excel stores dates as days since 01jan1904. To convert to a Stata date, type

```
. generate statadate = exceldate + td(01jan1904)
. format statadate %td
```

For datetimes on or after 01jan1904 00:00:00, Excel stores datetimes as days plus the fraction of the day since 01jan1904 00:00:00. To convert with a one-second resolution to a Stata datetime, type

```
. generate double statatime = round((exceltime+td(01jan1904))*86400)*1000
. format statatime %tc
```

Example 1: Converting Excel dates to Stata dates

We have some Excel 1900 date-system dates saved in a tab-delimited file. The file contains patients' ID numbers and their dates of birth. The numeric variable `bdate` contains the numeric values that Excel used to store those dates.

```
. clear
. import delimited "exceldates.txt"
(encoding automatically selected: ISO-8859-1)
(2 vars, 3 obs)
. list
```

	patid	bdate
1.	1	33106
2.	2	31305
3.	3	37327

Stata dates measure the number of days since January 1, 1960. For dates on or after March 1, 1900, Excel's base date is December 30, 1899. To convert `bdate` to a Stata date, we need to add the number of days from January 1, 1960, to December 30, 1899 (which is a negative number of days).

```
. generate statadate = bdate + td(30dec1899)
. format statadate %td
. list
```

	patid	bdate	statadate
1.	1	33106	21aug1990
2.	2	31305	15sep1985
3.	3	37327	12mar2002

If you would like to confirm that the conversion has been done properly, you can copy those values of `bdate` into an Excel spreadsheet and format them as dates. You will see the same dates as those listed under `statadate`.

❑ Technical note

Suppose we were working with data in Excel that contained dates between January 1, 1900, and February 28, 1900. If we saved these data to a `.txt` or `.csv` file and brought in those numerically encoded dates into Stata, we could not use the conversion function above. The reason these dates are treated differently is that Excel treats 1900 as a leap year, even though it was not; therefore, Excel behaves as if 29feb1900 was an actual date. If you are curious, the purpose of this behavior was to be compatible with a spreadsheet software that was dominant at the time. In short, what this means for us is that if we are working with these particular dates, we need to modify Excel's base date.

Below, we import a text file with dates between January 1, 1900, and February 28, 1900, to demonstrate.

```
. clear

. import delimited "exceldates2.txt"
(encoding automatically selected: ISO-8859-1)
(2 vars, 3 obs)

. list

     +---------------+
     | patid   bdate |
     |---------------|
  1. |     1       1 |
  2. |     2      15 |
  3. |     3      43 |
     +---------------+
```

Instead of using December 30, 1899, as Excel's base date, as we did previously, we will now use December 31, 1899.

```
. generate statadate = bdate + td(31dec1899)

. format statadate %td

. list

     +---------------------------+
     | patid   bdate   statadate |
     |---------------------------|
  1. |     1       1   01jan1900 |
  2. |     2      15   15jan1900 |
  3. |     3      43   12feb1900 |
     +---------------------------+
```

Now we have a Stata date recording dates between January 1, 1900, and February 28, 1900.

❏

Converting OpenOffice dates

OpenOffice uses the Excel 1900 date system described above.

Converting Unix time

Unix time is stored as the number of seconds since midnight, 01jan1970. To convert to a Stata datetime, type

```
. generate double statatime = unixtime * 1000 + mdyhms(1,1,1970,0,0,0)
```

To convert to a Stata date, type

```
. generate statadate = dofc(unixtime * 1000 + mdyhms(1,1,1970,0,0,0))
```

Reference

Gould, W. W. 2011. Using dates and times from other software. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2011/01/05/using-dates-and-times-from-other-software/.

Also see

[D] **Datetime** — Date and time values and variables

[D] **Datetime business calendars** — Business calendars

[D] **Datetime conversion** — Converting strings to Stata dates

[D] **Datetime display formats** — Display formats for dates and times

[D] **Datetime durations** — Obtaining and working with durations

[D] **Datetime relative dates** — Obtaining dates and date information from other dates

describe — Describe data in memory or in a file

Description

`describe` produces a summary of the dataset in memory or of the data stored in a Stata-format dataset.

For a compact listing of variable names, use `describe, simple`.

Quick start

Describe all variables in the dataset

    describe

Describe all variables starting with `code`

    describe code*

Describe properties of the dataset

    describe, short

Describe without abbreviating variable names

    describe, fullnames

Create a dataset containing variable descriptions

    describe, replace

Describe contents of `mydata.dta` without opening the dataset

    describe using mydata

Menu

Data > Describe data > Describe data in memory or in a file

Syntax

Describe data in memory

`describe` [*varlist*] [, *memory_options*]

Describe data in a file

`describe` [*varlist*] `using` *filename* [, *file_options*]

memory_options	Description
`simple`	display only variable names
`short`	display only general information
`fullnames`	do not abbreviate variable names
`numbers`	display variable number along with name
`replace`	make dataset, not written report, of description
`clear`	for use with `replace`
`varlist`	store `r(varlist)` and `r(sortlist)` in addition to usual stored results; programmer's option

`varlist` does not appear in the dialog box.

file_options	Description
`short`	display only general information
`simple`	display only variable names
`varlist`	store `r(varlist)` and `r(sortlist)` in addition to usual stored results; programmer's option

`varlist` does not appear in the dialog box.

`collect` is allowed; see **[U] 11.1.10 Prefix commands**.

Options to describe data in memory

`simple` displays only the variable names in a compact format. `simple` may not be combined with other options.

`short` suppresses the specific information for each variable. Only the general information (number of observations, number of variables, and sort order) is displayed.

`fullnames` specifies that `describe` display the full names of the variables. The default is to present an abbreviation when the variable name is longer than 15 characters. `describe using` always shows the full names of the variables, so `fullnames` may not be specified with `describe using`.

`numbers` specifies that `describe` present the variable number with the variable name. If `numbers` is specified, variable names are abbreviated when the name is longer than eight characters. The `numbers` and `fullnames` options may not be specified together. `numbers` may not be specified with `describe using`.

replace and clear are alternatives to the options above. describe usually produces a written report, and the options above specify what the report is to contain. If you specify replace, however, no report is produced; the data in memory are instead replaced with data containing the information that the report would have presented. Each observation of the new data describes a variable in the original data; see *describe, replace* below.

clear may be specified only when replace is specified. clear specifies that the data in memory be cleared and replaced with the description information, even if the original data have not been saved to disk.

The following option is available with describe but is not shown in the dialog box:

varlist, an option for programmers, specifies that, in addition to the usual stored results, r(varlist) and r(sortlist) be stored, too. r(varlist) will contain the names of the variables in the dataset. r(sortlist) will contain the names of the variables by which the data are sorted.

Options to describe data in a file

short suppresses the specific information for each variable. Only the general information (number of observations, number of variables, and sort order) is displayed.

simple displays only the variable names in a compact format. simple may not be combined with other options.

The following option is available with describe but is not shown in the dialog box:

varlist, an option for programmers, specifies that, in addition to the usual stored results, r(varlist) and r(sortlist) be stored, too. r(varlist) will contain the names of the variables in the dataset. r(sortlist) will contain the names of the variables by which the data are sorted.

Because Stata/MP and Stata/SE can create truly large datasets, there might be too many variables in a dataset for their names to be stored in r(varlist), given the current maximum length of macros, as determined by set maxvar. Should that occur, describe using will issue the error message "too many variables", r(103).

Remarks and examples

Remarks are presented under the following headings:

describe

If describe is typed with no operands, the contents of the dataset currently in memory are described.

The *varlist* in the describe using syntax differs from standard Stata varlists in two ways. First, you cannot abbreviate variable names; that is, you have to type displacement rather than displ. However, you can use the abbreviation character (~) to indicate abbreviations, for example, displ~. Second, you may not refer to a range of variables; specifying price-trunk is considered an error.

If you are using frames to work with multiple datasets in memory, you can use frames describe to describe data from one or more frames. However, you might also want to create alias variables, which is similar to copying variables across frames but is more memory efficient. When the dataset in memory contains alias variables, describe tries to report the storage type of the linked variable. If an alias variable's linkage is broken, then describe will report unknown for the storage type. In either case, the storage type text will be a clickable link that runs command fralias describe on the associated variable. For examples of describe output and behavior with alias variables, see [D] **fralias**.

For alias variables in *filename*, describe using reports alias for the storage type.

▷ Example 1

The basic description includes some general information on the number of variables and observations, along with a description of every variable in the dataset:

```
. use https://www.stata-press.com/data/r19/states
(State data)

. describe, numbers

Contains data from https://www.stata-press.com/data/r19/states.dta
 Observations:            50                  State data
    Variables:             5                  3 Jan 2024 15:17
                                              (_dta has notes)
-------------------------------------------------------------------------------
    Variable  Storage   Display    Value
        name     type    format    label      Variable label
-------------------------------------------------------------------------------
    1. state     str8    %9s
    2. region    int     %8.0g      reg        Census Region
    3. median~e  float   %9.0g                 Median Age
    4. marria~e  long    %12.0g                Marriages per 100,000
    5. divorc~e  long    %12.0g                Divorces per 100,000
-------------------------------------------------------------------------------
Sorted by: region
```

In this example, the dataset in memory comes from the file states.dta and contains 50 observations on 5 variables. The dataset is labeled "State data" and was last modified on January 3, 2024, at 15:17 (3:17 p.m.). The "_dta has notes" message indicates that a note is attached to the dataset; see **[U] 12.7 Notes attached to data**.

The first variable, state, is stored as a str8 and has a display format of %9s.

The next variable, region, is stored as an int and has a display format of %8.0g. This variable has associated with it a *value label* called reg, and the variable is labeled Census Region.

The third variable, which is abbreviated median~e, is stored as a float, has a display format of %9.0g, has no value label, and has a variable label of Median Age. The variables that are abbreviated marria~e and divorc~e are both stored as longs and have display formats of %12.0g. These last two variables are labeled Marriages per 100,000 and Divorces per 100,000, respectively.

The data are sorted by region.

Because we specified the numbers option, the variables are numbered; for example, region is variable 2 in this dataset.

◁

▷ Example 2

To view the full variable names, we could omit the `numbers` option and specify the `fullnames` option.

```
. describe, fullnames

Contains data from https://www.stata-press.com/data/r19/states.dta
 Observations:            50                  State data
    Variables:             5                  3 Jan 2024 15:17
                                              (_dta has notes)
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
state           str8    %9s
region          int     %8.0g      reg        Census Region
median_age      float   %9.0g                 Median Age
marriage_rate   long    %12.0g                Marriages per 100,000
divorce_rate    long    %12.0g                Divorces per 100,000
--------------------------------------------------------------------------------
Sorted by: region
```

Here we did not need to specify the `fullnames` option to see the unabbreviated variable names because the longest variable name is 13 characters. Omitting the `numbers` option results in 15-character variable names being displayed.

◁

❑ Technical note

The output from `describe` allows you to compute the size of the dataset. If you are curious, you can compute it for this dataset as follows:

$$(8 + 2 + 4 + 4 + 4) \times 50 = 1100$$

The numbers 8, 2, 4, 4, and 4 are the storage requirements for a `str8`, `int`, `float`, `long`, and `long`, respectively; see **[U] 12.2.2 Numeric storage types**. Fifty is the number of observations in the dataset.

❑

▷ Example 3

If we specify the `short` option, only general information about the data is presented:

```
. describe, short

Contains data from https://www.stata-press.com/data/r19/states.dta
 Observations:            50                  State data
    Variables:             5                  3 Jan 2024 15:17
Sorted by: region
```

◁

If we specify *varlist*, only the variables in that *varlist* are described.

▷ Example 4

Let's change datasets. The `describe` *varlist* command is particularly useful when combined with the '*' wildcard character. For instance, we can describe all the variables whose names start with `pop` by typing `describe pop*`:

```
. use https://www.stata-press.com/data/r19/census
(1980 Census data by state)

. describe pop*

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------

pop             long    %12.0gc               Population
poplt5          long    %12.0gc               Pop, < 5 year
pop5_17         long    %12.0gc               Pop, 5 to 17 years
pop18p          long    %12.0gc               Pop, 18 and older
pop65p          long    %12.0gc               Pop, 65 and older
popurban        long    %12.0gc               Urban population
```

We can `describe` the variables `state`, `region`, and `pop18p` by specifying them:

```
. describe state region pop18p

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------

state           str14   %-14s                 State
region          int     %-8.0g     cenreg     Census region
pop18p          long    %12.0gc               Pop, 18 and older
```

◁

Typing `describe using` *filename* describes the data stored in *filename*. If an extension is not specified, `.dta` is assumed.

▷ Example 5

We can `describe` the contents of `states.dta` without disturbing the data that we currently have in memory by typing

```
. describe using https://www.stata-press.com/data/r19/states

Contains data                                 State data
 Observations:            50                  3 Jan 2024 15:17
    Variables:             5
-------------------------------------------------------------------------------

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------

state           str8    %9s
region          int     %8.0g      reg        Census Region
median_age      float   %9.0g                 Median Age
marriage_rate   long    %12.0g                Marriages per 100,000
divorce_rate    long    %12.0g                Divorces per 100,000
-------------------------------------------------------------------------------

Sorted by: region
```

◁

describe, replace

`describe` with the `replace` option is rarely used, although you may sometimes find it convenient.

Think of `describe, replace` as separate from but related to `describe` without the `replace` option. Rather than producing a written report, `describe, replace` produces a new dataset that contains the same information a written report would. For instance, try the following:

```
. sysuse auto, clear
. describe
```
(report appears; data in memory unchanged)

```
. list
```
(visual proof that data are unchanged)

```
. describe, replace
```
(no report appears, but the data in memory are changed!)

```
. list
```
(visual proof that data are changed)

`describe, replace` changes the original data in memory into a dataset containing an observation for each variable in the original data. Each observation in the new data describes a variable in the original data. The new variables are

1. `position`, a variable containing the numeric position of the original variable (1, 2, 3, . . .).
2. `name`, a variable containing the name of the original variable, such as `"make"`, `"price"`, `"mpg"`, ...
3. `type`, a variable containing the storage type of the original variable, such as `"str18"`, `"int"`, `"float"`, ...
4. `isnumeric`, a variable equal to 1 if the original variable was numeric and equal to 0 if it was string.
5. `format`, a variable containing the display format of the original variable, such as `"%-18s"`, `"%8.0gc"`, ...
6. `vallab`, a variable containing the name of the value label associated with the original variable, if any.
7. `varlab`, a variable containing the variable label of the original variable, such as `"Make and model"`, `"Price"`, `"Mileage (mpg)"`, ...

In addition, the data contain the following characteristics:

`_dta[d_filename]`, the name of the file containing the original data.

`_dta[d_filedate]`, the date and time the file was written.

`_dta[d_N]`, the number of observations in the original data.

`_dta[d_sortedby]`, the variables on which the original data were sorted, if any.

Stored results

`describe` stores the following in `r()`:

Scalars

`r(N)`	number of observations
`r(k)`	number of variables
`r(width)`	width of dataset
`r(changed)`	flag indicating data have changed since last saved

Macros

`r(datalabel)`	dataset label
`r(varlist)`	variables in dataset (if `varlist` specified)
`r(sortlist)`	variables by which data are sorted (if `varlist` specified)

`describe, replace` stores nothing in `r()`.

References

Cox, N. J. 2015. Speaking Stata: A set of utilities for managing missing values. *Stata Journal* 15: 1174–1185.

Dietz, T., and L. Kalof. 2009. *Introduction to Social Statistics: The Logic of Statistical Reasoning*. Chichester, UK: Wiley.

Also see

[D] **ds** — Compactly list variables with specified properties

[D] **varmanage** — Manage variable labels, formats, and other properties

[D] **cf** — Compare two datasets

[D] **codebook** — Describe data contents

[D] **compare** — Compare two variables

[D] **compress** — Compress data in memory

[D] **format** — Set variables' output format

[D] **fralias** — Alias variables from linked frames

[D] **label** — Manipulate labels

[D] **lookfor** — Search for string in variable names and labels

[D] **notes** — Place notes in data

[D] **order** — Reorder variables in dataset

[D] **rename** — Rename variable

[SVY] **svydescribe** — Describe survey data

[U] 6 Managing memory

destring — Convert string variables to numeric variables and vice versa

Description

`destring` converts variables in *varlist* from string to numeric. If *varlist* is not specified, `destring` will attempt to convert all variables in the dataset from string to numeric. Characters listed in `ignore()` are removed. Variables in *varlist* that are already numeric will not be changed. `destring` treats both empty strings “” and “`.`” as indicating sysmiss (`.`) and interprets the strings “`.a`”, “`.b`”, ..., “`.z`” as the extended missing values `.a`, `.b`, ..., `.z`; see **[U] 12.2.1 Missing values**. `destring` also ignores any leading or trailing spaces so that, for example, “ ” is equivalent to “” and “ `.` ” is equivalent to “`.`”.

`tostring` converts variables in *varlist* from numeric to string. The most compact string format possible is used. Variables in *varlist* that are already string will not be converted.

Quick start

Convert `strg1` from string to numeric, and place result in `num1`

    destring strg1, generate(num1)

Same as above, but ignore the % character in `strg1`

    destring strg1, generate(num1) ignore(%)

Same as above, but return `.` for observations with nonnumeric characters

    destring strg1, generate(num1) force

Convert `num2` from numeric to string, and place result in `strg2`

    tostring num2, generate(strg2)

Same as above, but format with a leading zero and 3 digits after the decimal

    tostring num2, generate(strg2) format(%09.3f)

Menu

destring

Data > Create or change data > Other variable-transformation commands > Convert variables from string to numeric

tostring

Data > Create or change data > Other variable-transformation commands > Convert variables from numeric to string

Syntax

Convert string variables to numeric variables

`destring` [*varlist*] , { generate(*newvarlist*) | replace } [*destring_options*]

Convert numeric variables to string variables

`tostring` *varlist* , { generate(*newvarlist*) | replace } [*tostring_options*]

destring_options	Description
* generate(*newvarlist*)	generate *newvar*$_1$, ..., *newvar*$_k$ for each variable in *varlist*
* replace	replace string variables in *varlist* with numeric variables
ignore("*chars*" [, *ignoreopts*])	remove specified nonnumeric characters, as characters or as bytes, and illegal Unicode characters
force	convert nonnumeric strings to missing values
float	generate numeric variables as type float
percent	convert percent variables to fractional form
dpcomma	convert variables with commas as decimals to period-decimal format

* Either generate(*newvarlist*) or replace is required.

tostring_options	Description
* generate(*newvarlist*)	generate *newvar*$_1$, ..., *newvar*$_k$ for each variable in *varlist*
* replace	replace numeric variables in *varlist* with string variables
force	force conversion ignoring information loss
format(*format*)	convert using specified format
usedisplayformat	convert using display format

* Either generate(*newvarlist*) or replace is required.

Options for destring

Either generate() or replace must be specified. With either option, if any string variable contains nonnumeric characters not specified with ignore(), then no corresponding variable will be generated, nor will that variable be replaced (unless force is specified).

generate(*newvarlist*) specifies that a new variable be created for each variable in *varlist*. *newvarlist* must contain the same number of new variable names as there are variables in *varlist*. If *varlist* is not specified, destring attempts to generate a numeric variable for each variable in the dataset; *newvarlist* must then contain the same number of new variable names as there are variables in the dataset. Any variable labels or characteristics will be copied to the new variables created.

replace specifies that the variables in *varlist* be converted to numeric variables. If *varlist* is not specified, destring attempts to convert all variables from string to numeric. Any variable labels or characteristics will be retained.

`ignore("`*chars*`"` [, *ignoreopts*]`)` specifies nonnumeric characters be removed. *ignoreopts* may be `aschars`, `asbytes`, or `illegal`. The default behavior is to remove characters as characters, which is the same as specifying `aschars`. `asbytes` specifies removal of all bytes included in all characters in the ignore string, regardless of whether these bytes form complete Unicode characters. `illegal` specifies removal of all illegal Unicode characters, which is useful for removing high-ASCII characters. `illegal` may not be specified with `asbytes`. If any string variable still contains any nonnumeric or illegal Unicode characters after the ignore string has been removed, no action will take place for that variable unless `force` is also specified. Note that to Stata the comma is a nonnumeric character; see also the `dpcomma` option below.

`force` specifies that any string values containing nonnumeric characters, in addition to any specified with `ignore()`, be treated as indicating missing numeric values.

`float` specifies that any new numeric variables be created initially as type `float`. The default is type `double`; see [D] **Data types**. `destring` attempts automatically to compress each new numeric variable after creation.

`percent` removes any percent signs found in the values of a variable, and all values of that variable are divided by 100 to convert the values to fractional form. `percent` by itself implies that the percent sign, "`%`", is an argument to `ignore()`, but the converse is not true.

`dpcomma` specifies that variables with commas as decimal values should be converted to have periods as decimal values.

Options for tostring

Either `generate()` or `replace` must be specified. If converting any numeric variable to string would result in loss of information, no variable will be produced unless `force` is specified. For more details, see `force` below.

`generate(`*newvarlist*`)` specifies that a new variable be created for each variable in *varlist*. *newvarlist* must contain the same number of new variable names as there are variables in *varlist*. Any variable labels or characteristics will be copied to the new variables created.

`replace` specifies that the variables in *varlist* be converted to string variables. Any variable labels or characteristics will be retained.

`force` specifies that conversions be forced even if they entail loss of information. Loss of information means one of two circumstances: 1) The result of `real(strofreal(`*varname*`, "`*format*`"))` is not equal to *varname*; that is, the conversion is not reversible without loss of information; 2) `replace` was specified, but a variable has associated value labels. In circumstance 1, it is usually best to specify `usedisplayformat` or `format()`. In circumstance 2, value labels will be ignored in a forced conversion. `decode` (see [D] **encode**) is the standard way to generate a string variable based on value labels.

`format(`*format*`)` specifies that a numeric format be used as an argument to the `strofreal()` function, which controls the conversion of the numeric variable to string. For example, a format of `%7.2f` specifies that numbers are to be rounded to two decimal places before conversion to string. See *Remarks and examples* below and [FN] **String functions** and [D] **format**. `format()` cannot be specified with `usedisplayformat`.

`usedisplayformat` specifies that the current display format be used for each variable. For example, this option could be useful when using US Social Security numbers or daily or other dates with some `%d` or `%t` format assigned. `usedisplayformat` cannot be specified with `format()`.

Remarks and examples

Remarks are presented under the following headings:

destring

▷ Example 1

We read in a dataset, but somehow all the variables were created as strings. The variables contain no nonnumeric characters, and we want to convert them all from string to numeric data types.

```
. use https://www.stata-press.com/data/r19/destring1

. describe

Contains data from https://www.stata-press.com/data/r19/destring1.dta
 Observations:            10
    Variables:             5                  3 Mar 2024 10:15
────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
────────────────────────────────────────────────────────────────────────────────
id              str3    %9s
num             str3    %9s
code            str4    %9s
total           str5    %9s
income          str5    %9s
────────────────────────────────────────────────────────────────────────────────
Sorted by:

. list

     ┌────────────────────────────────────┐
     │  id   num   code   total   income  │
     ├────────────────────────────────────┤
  1. │ 111   243   1234     543    23423  │
  2. │ 111   123   2345   67854    12654  │
  3. │ 111   234   3456     345    43658  │
  4. │ 222   345   4567      57    23546  │
  5. │ 333   456   5678      23    21432  │
     ├────────────────────────────────────┤
  6. │ 333   567   6789   23465    12987  │
  7. │ 333   678   7890      65     9823  │
  8. │ 444   789   8976      23    32980  │
  9. │ 444   901   7654      23    18565  │
 10. │ 555   890   6543     423    19234  │
     └────────────────────────────────────┘

. destring, replace
id: all characters numeric; replaced as int
num: all characters numeric; replaced as int
code: all characters numeric; replaced as int
total: all characters numeric; replaced as long
income: all characters numeric; replaced as long
```

```
. describe

Contains data from https://www.stata-press.com/data/r19/destring1.dta
 Observations:            10
    Variables:             5                  3 Mar 2024 10:15
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
id              int     %10.0g
num             int     %10.0g
code            int     %10.0g
total           long    %10.0g
income          long    %10.0g
--------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.

. list

     +-----------------------------------+
     |  id   num   code   total   income |
     |-----------------------------------|
  1. | 111   243   1234     543    23423 |
  2. | 111   123   2345   67854    12654 |
  3. | 111   234   3456     345    43658 |
  4. | 222   345   4567      57    23546 |
  5. | 333   456   5678      23    21432 |
     |-----------------------------------|
  6. | 333   567   6789   23465    12987 |
  7. | 333   678   7890      65     9823 |
  8. | 444   789   8976      23    32980 |
  9. | 444   901   7654      23    18565 |
 10. | 555   890   6543     423    19234 |
     +-----------------------------------+
```

◁

▷ Example 2

Our dataset contains the variables `date`, `price`, and `percent`. These variables were accidentally read into Stata as string variables because they contain spaces, dollar signs, commas, and percent signs. We will leave the `date` variable as a string so that we can use the `date()` function to convert it to a numeric date. For `price` and `percent`, we want to remove all of the nonnumeric characters and create new variables containing numeric values. After removing the percent sign, we want to convert the `percent` variable to decimal form.

```
. use https://www.stata-press.com/data/r19/destring2, clear

. describe

Contains data from https://www.stata-press.com/data/r19/destring2.dta
 Observations:            10
    Variables:             3                  3 Mar 2024 22:50
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
date            str14   %10s
price           str11   %11s
percent         str3    %9s
--------------------------------------------------------------------------------
Sorted by:

. list

     +-------------------------------------+
     |       date         price    percent |
     |-------------------------------------|
  1. | 1999 12 10     $2,343.68        34% |
  2. | 2000 07 08     $7,233.44        86% |
  3. | 1997 03 02    $12,442.89        12% |
  4. | 1999 09 00   $233,325.31         6% |
  5. | 1998 10 04     $1,549.23        76% |
     |-------------------------------------|
  6. | 2000 03 28    $23,517.03        35% |
  7. | 2000 08 08         $2.43        69% |
  8. | 1997 10 20     $9,382.47        32% |
  9. | 1998 01 16   $289,209.32        45% |
 10. | 1999 11 12     $8,282.49         1% |
     +-------------------------------------+

. destring price percent, generate(price2 percent2) ignore("$,%") percent
price: characters $ , removed; price2 generated as double
percent: character % removed; percent2 generated as double

. describe

Contains data from https://www.stata-press.com/data/r19/destring2.dta
 Observations:            10
    Variables:             5                  3 Mar 2024 22:50
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
date            str14   %10s
price           str11   %11s
price2          double  %10.0g
percent         str3    %9s
percent2        double  %10.0g
--------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

```
. list
```

	date	price	price2	percent	percent2
1.	1999 12 10	$2,343.68	2343.68	34%	.34
2.	2000 07 08	$7,233.44	7233.44	86%	.86
3.	1997 03 02	$12,442.89	12442.89	12%	.12
4.	1999 09 00	$233,325.31	233325.31	6%	.06
5.	1998 10 04	$1,549.23	1549.23	76%	.76
6.	2000 03 28	$23,517.03	23517.03	35%	.35
7.	2000 08 08	$2.43	2.43	69%	.69
8.	1997 10 20	$9,382.47	9382.47	32%	.32
9.	1998 01 16	$289,209.32	289209.32	45%	.45
10.	1999 11 12	$8,282.49	8282.49	1%	.01

◁

tostring

Conversion of numeric data to string equivalents can be problematic. Stata, like most software, holds numeric data to finite precision and in binary form. See the discussion in **[U] 13.12 Precision and problems therein**. If no `format()` is specified, `tostring` uses the format `%12.0g`. This format is, in particular, sufficient to convert integers held as bytes, ints, or longs to string equivalent without loss of precision.

However, users will often need to specify a format themselves, especially when the numeric data have fractional parts and for some reason a conversion to string is required.

▷ Example 3

Our dataset contains a string month variable and numeric year and day variables. We want to convert the three variables to a `%td` date.

```
. use https://www.stata-press.com/data/r19/tostring, clear
. list
```

	id	month	day	year
1.	123456789	jan	10	2001
2.	123456710	mar	20	2001
3.	123456711	may	30	2001
4.	123456712	jun	9	2001
5.	123456713	oct	17	2001
6.	123456714	nov	15	2001
7.	123456715	dec	28	2001
8.	123456716	apr	29	2001
9.	123456717	mar	11	2001
10.	123456718	jul	3	2001

```
. tostring year day, replace
year was float now str4
day was float now str2
. generate date = month + "/" + day + "/" + year
. generate edate = date(date, "MDY")
```

```
. format edate %td
. list
```

	id	month	day	year	date	edate
1.	123456789	jan	10	2001	jan/10/2001	10jan2001
2.	123456710	mar	20	2001	mar/20/2001	20mar2001
3.	123456711	may	30	2001	may/30/2001	30may2001
4.	123456712	jun	9	2001	jun/9/2001	09jun2001
5.	123456713	oct	17	2001	oct/17/2001	17oct2001
6.	123456714	nov	15	2001	nov/15/2001	15nov2001
7.	123456715	dec	28	2001	dec/28/2001	28dec2001
8.	123456716	apr	29	2001	apr/29/2001	29apr2001
9.	123456717	mar	11	2001	mar/11/2001	11mar2001
10.	123456718	jul	3	2001	jul/3/2001	03jul2001

◁

Saved characteristics

Each time the `destring` or `tostring` commands are issued, an entry is made in the characteristics list of each converted variable. You can type `char list` to view these characteristics.

After example 2, we could use `char list` to find out what characters were removed by the `destring` command.

```
. char list
  price2[destring]:           Characters removed were: $ ,
  price2[destring_cmd]:       destring price percent, generate(price2 percent..
  percent2[destring]:         Character removed was: %
  percent2[destring_cmd]:     destring price percent, generate(price2 percent..
```

Video example

How to convert a string variable to a numeric variable

Acknowledgment

`destring` and `tostring` were originally written by Nicholas J. Cox of the Department of Geography at Durham University, UK, who is coeditor of the *Stata Journal* and author of *Speaking Stata Graphics*.

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Also see

[D] **egen** — Extensions to generate

[D] **encode** — Encode string into numeric and vice versa

[D] **generate** — Create or change contents of variable

[D] **split** — Split string variables into parts

[FN] **String functions**

Description Quick start Syntax Option Remarks and examples
Also see

Description

`dir` and `ls`—they work the same way—list the names of files in the specified directory; the names of the commands come from names popular on Unix and Windows computers.

Quick start

List the names of all files in the current directory using Stata for Windows

```
dir
```

Same as above, but for Mac or Unix

```
ls
```

List Stata datasets in the current directory using Stata for Windows

```
dir *.dta
```

Same as above, but for Mac or Unix

```
ls *.dta
```

List dataset name for all `.dta` files in the `C:\` directory using Stata for Windows

```
dir C:\*.dta
```

List dataset name for all `.dta` files in the home directory using Stata for Windows

```
dir ~\*.dta
```

Same as above, but for Mac or Unix

```
ls ~/*.dta
```

Syntax

{`dir` | `ls`} ["][*filespec*]["] [, <u>w</u>`ide`]

filespec is any valid Mac, Unix, or Windows file path or file specification (see **[U] 11.6 Filenaming conventions**) and may include "*" to indicate any string of characters.

Note: Double quotes must be used to enclose *filespec* if the name contains spaces.

Option

`wide` under Mac and Windows produces an effect similar to specifying `/W` with the DOS `dir` command—it compresses the resulting listing by placing more than one filename on a line. Under Unix, it produces the same effect as typing `ls -F -C`. Without the `wide` option, `ls` is equivalent to typing `ls -F -l`.

Remarks and examples

Mac and Unix: The only difference between the Stata and Unix `ls` commands is that piping through the `more`(1) or pg(1) filter is unnecessary—Stata always pauses when the screen is full.

Windows: Other than minor differences in presentation format, there is only one difference between the Stata and DOS `dir` commands: the DOS `/P` option is unnecessary, because Stata always pauses when the screen is full.

▷ Example 1

If you use Stata for Windows and wish to obtain a list of all your Stata-format data files, type

```
. dir *.dta
   3.9k   7/07/15 13:51  auto.dta
   0.6k   8/04/15 10:40  cancer.dta
   3.5k   7/06/08 17:06  census.dta
   3.4k   1/25/08  9:20  hsng.dta
   0.3k   1/26/08 16:54  kva.dta
   0.7k   4/27/11 11:39  sysage.dta
   0.5k   5/09/07  2:56  systolic.dta
  10.3k   7/13/08  8:37  Household Survey.dta
```

You could also include the `wide` option:

```
. dir *.dta, wide
   3.9k auto.dta             0.6k cancer.dta           3.5k census.dta
   3.4k hsng.dta             0.3k kva.dta              0.7k sysage.dta
   0.5k systolic.dta        10.3k Household Survey.dta
```

Unix users will find it more natural to type

```
. ls *.dta
-rw-r-----  1 roger     2868 Mar  4 15:34 highway.dta
-rw-r-----  1 roger      941 Apr  5 09:43 hoyle.dta
-rw-r-----  1 roger    19312 May 14 10:36 p1.dta
-rw-r-----  1 roger    11838 Apr 11 13:26 p2.dta
```

but they could type `dir` if they preferred. Mac users may also type either command.

```
. dir *.dta
-rw-r-----  1 roger     2868 Mar  4 15:34 highway.dta
-rw-r-----  1 roger      941 Apr  5 09:43 hoyle.dta
-rw-r-----  1 roger    19312 May 14 10:36 p1.dta
-rw-r-----  1 roger    11838 Apr 11 13:26 p2.dta
```

◁

❑ Technical note

There is a macro function named `dir` that allows you to obtain a list of files in a macro for later processing. See *Macro functions for filenames and file paths* in [P] **macro**.

❑

Also see

[D] **cd** — Change directory

[D] **copy** — Copy file from disk or URL

[D] **erase** — Erase a disk file

[D] **mkdir** — Create directory

[D] **rmdir** — Remove directory

[D] **shell** — Temporarily invoke operating system

[D] **type** — Display contents of a file

[U] 11.6 Filenaming conventions

drawnorm — Draw sample from multivariate normal distribution

Description | Quick start | Menu | Syntax | Options
Remarks and examples | Methods and formulas | References | Also see

Description

drawnorm draws a sample from a multivariate normal distribution with desired means and covariance matrix. The default is orthogonal data with mean 0 and variance 1. The covariance matrix may be singular. The values generated are a function of the current random-number seed or the number specified with set seed(); see [R] **set seed**.

Quick start

Generate independent variables x and y, where x has mean 2 and standard deviation 0.5 and y has mean 3 and standard deviation 1

```
drawnorm x y, means(2,3) sds(.5,1)
```

Same as above, but create dataset of 1,000 observations on x and y with means stored in vector m and standard deviations stored in vector sd

```
drawnorm x y, means(m) sds(sd) n(1000)
```

Same as above, and set the seed for the random-number generator to reproduce results

```
drawnorm x y, means(m) sds(sd) n(1000) seed(81625)
```

Sample from bivariate standard normal distribution with covariance between x and y of 0.5 stored in variance–covariance matrix C

```
matrix C = (1, .5 \ .5, 1)
drawnorm x y, cov(C)
```

Sample from a trivariate standard normal distribution with correlation between x and y of 0.4, x and z of 0.3, and y and z of 0.6 stored in correlation matrix C

```
matrix C = (1, .4, .3 \ .4, 1, .6 \ .3, .6, 1)
drawnorm x y z, corr(C)
```

Same as above, but avoid typing full matrix by specifying correlations in vector v treated as a lower triangular matrix

```
matrix v = (1, .4, 1, .3, .6, 1)
drawnorm x y z, corr(v) cstorage(lower)
```

Menu

Data > Create or change data > Other variable-creation commands > Draw sample from normal distribution

Syntax

drawnorm *newvarlist* [, *options*]

options	Description
Main	
clear	replace the current dataset
double	generate variable type as double; default is float
n(#)	generate # observations; default is current number
sds(*vector*)	standard deviations of generated variables
corr(*matrix* | *vector*)	correlation matrix
cov(*matrix* | *vector*)	covariance matrix
cstorage(full)	store correlation/covariance structure as a symmetric $k \times k$ matrix
cstorage(lower)	store correlation/covariance structure as a lower triangular matrix
cstorage(upper)	store correlation/covariance structure as an upper triangular matrix
forcepsd	force the covariance/correlation matrix to be positive semidefinite
means(*vector*)	means of generated variables; default is means(0)
Options	
seed(#)	seed for random-number generator

Options

Main

clear specifies that the dataset in memory be replaced, even though the current dataset has not been saved on disk.

double specifies that the new variables be stored as Stata doubles, meaning 8-byte reals. If double is not specified, variables are stored as floats, meaning 4-byte reals. See [D] **Data types**.

n(#) specifies the number of observations to be generated. The default is the current number of observations. If n(#) is not specified or is the same as the current number of observations, drawnorm adds the new variables to the existing dataset; otherwise, drawnorm replaces the data in memory.

sds(*vector*) specifies the standard deviations of the generated variables. sds() may not be specified with cov().

corr(*matrix* | *vector*) specifies the correlation matrix. If neither corr() nor cov() is specified, the default is orthogonal data.

cov(*matrix* | *vector*) specifies the covariance matrix. If neither cov() nor corr() is specified, the default is orthogonal data.

cstorage(full | lower | upper) specifies the storage mode for the correlation or covariance structure in corr() or cov(). The following storage modes are supported:

full specifies that the correlation or covariance structure is stored (recorded) as a symmetric $k \times k$ matrix.

`lower` specifies that the correlation or covariance structure is recorded as a lower triangular matrix. With k variables, the matrix should have $k(k+1)/2$ elements in the following order:

$$\mathrm{C}_{11}\ \mathrm{C}_{21}\ \mathrm{C}_{22}\ \mathrm{C}_{31}\ \mathrm{C}_{32}\ \mathrm{C}_{33}\ \ldots\ \mathrm{C}_{k1}\ \mathrm{C}_{k2}\ \ldots\ \mathrm{C}_{kk}$$

`upper` specifies that the correlation or covariance structure is recorded as an upper triangular matrix. With k variables, the matrix should have $k(k+1)/2$ elements in the following order:

$$\mathrm{C}_{11}\ \mathrm{C}_{12}\ \mathrm{C}_{13}\ \ldots\ \mathrm{C}_{1k}\ \mathrm{C}_{22}\ \mathrm{C}_{23}\ \ldots\mathrm{C}_{2k}\ \ldots\ \mathrm{C}_{(k-1k-1)}\ \mathrm{C}_{(k-1k)}\ \mathrm{C}_{kk}$$

Specifying `cstorage(full)` is optional if the matrix is square. `cstorage(lower)` or `cstorage(upper)` is required for the vectorized storage methods. See *Example 2: Storage modes for correlation and covariance matrices*.

`forcepsd` modifies the matrix *C* to be positive semidefinite (psd), and so be a proper covariance matrix. If *C* is not positive semidefinite, it will have negative eigenvalues. By setting negative eigenvalues to 0 and reconstructing, we obtain the least-squares positive-semidefinite approximation to *C*. This approximation is a singular covariance matrix.

`means(`*vector*`)` specifies the means of the generated variables. The default is `means(0)`.

Options

`seed(#)` specifies the initial value of the random-number seed used by the `runiform()` function. The default is the current random-number seed. Specifying `seed(#)` is the same as typing `set seed #` before issuing the `drawnorm` command.

Remarks and examples

▷ Example 1

Suppose that we want to draw a sample of 1,000 observations from a normal distribution $N(\mathbf{M},\mathbf{V})$, where **M** is the mean matrix and **V** is the covariance matrix:

```
. matrix M = 5, -6, 0.5
. matrix V = (9, 5, 2 \ 5 , 4 , 1 \ 2, 1, 1)
. matrix list M
M[1,3]
    c1  c2  c3
r1   5  -6  .5
. matrix list V
symmetric V[3,3]
    c1  c2  c3
r1   9
r2   5   4
r3   2   1   1
. drawnorm x y z, n(1000) cov(V) means(M)
(obs 1,000)
```

```
. summarize

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
           x |      1,000      5.0424    3.061953  -5.065592   15.96129
           y |      1,000   -5.914462    2.012488  -12.25234   .3326397
           z |      1,000    .5181909    1.017397   -2.59316   3.884182

. correlate, cov
(obs=1,000)

             |        x        y        z
-------------+---------------------------
           x |  9.37556
           y |  5.14201  4.05011
           z |  2.17972  1.07222   1.0351
```

◁

❑ Technical note

The values generated by `drawnorm` are a function of the current random-number seed. To reproduce the same dataset each time `drawnorm` is run with the same setup, specify the same seed number in the `seed()` option.

❑

▷ Example 2: Storage modes for correlation and covariance matrices

The three storage modes for specifying the correlation or covariance matrix in `corr2data` and `drawnorm` can be illustrated with a correlation structure, `C`, of 4 variables. In full storage mode, this structure can be entered as a 4×4 Stata matrix:

```
. matrix C = ( 1.0000,  0.3232,  0.1112,  0.0066 \ ///
               0.3232,  1.0000,  0.6608, -0.1572 \ ///
               0.1112,  0.6608,  1.0000, -0.1480 \ ///
               0.0066, -0.1572, -0.1480,  1.0000 )
```

Elements within a row are separated by commas, and rows are separated by a backslash, \. We use the input continuation operator `///` for convenient multiline input; see [P] **comments**. In this storage mode, we probably want to set the row and column names to the variable names:

```
.  matrix rownames C = price trunk headroom rep78
.  matrix colnames C = price trunk headroom rep78
```

This correlation structure can be entered more conveniently in one of the two vectorized storage modes. In these modes, we enter the lower triangle or the upper triangle of `C` in rowwise order; these two storage modes differ only in the order in which the $k(k+1)/2$ matrix elements are recorded. The lower storage mode for C comprises a vector with $4(4+1)/2 = 10$ elements, that is, a 1×10 or 10×1 Stata matrix, with one row or column,

```
.  matrix C = ( 1.0000,  ///
                0.3232,  1.0000,  ///
                0.1112,  0.6608,  1.0000,  ///
                0.0066, -0.1572, -0.1480,  1.0000)
```

or more compactly as

```
.  matrix C = ( 1, 0.3232, 1, 0.1112, 0.6608, 1, 0.0066, -0.1572, -0.1480, 1 )
```

C may also be entered in upper storage mode as a vector with $4(4+1)/2 = 10$ elements, that is, a 1×10 or 10×1 Stata matrix,

```
. matrix C = ( 1.0000,  0.3232,  0.1112,  0.0066, ///
                        1.0000,  0.6608, -0.1572, ///
                                 1.0000, -0.1480, ///
                                          1.0000 )
```

or more compactly as

```
. matrix C = ( 1, 0.3232, 0.1112, 0.0066, 1, 0.6608, -0.1572, 1, -0.1480, 1 )
```

◁

Methods and formulas

Results are asymptotic. The more observations generated, the closer the correlation matrix of the dataset is to the desired correlation structure.

Let $\mathbf{V} = \mathbf{A}'\mathbf{A}$ be the desired covariance matrix and $\mathbf{M}$ be the desired mean matrix. We first generate $\mathbf{X}$, such that $\mathbf{X} \sim N(\mathbf{0}, \mathbf{I})$. Let $\mathbf{Y} = \mathbf{A}'\mathbf{X} + \mathbf{M}$, then $\mathbf{Y} \sim N(\mathbf{M}, \mathbf{V})$.

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Also see

[D] **corr2data** — Create dataset with specified correlation structure

[R] **set seed** — Specify random-number seed and state

drop — Drop variables or observations

Description | Quick start | Menu | Syntax
Remarks and examples | Stored results | Also see

Description

drop eliminates variables or observations from the data in memory.

keep works the same way as drop, except that you specify the variables or observations to be kept rather than the variables or observations to be deleted.

Warning: drop and keep are not reversible. Once you have eliminated observations, you cannot read them back in again. You would need to go back to the original dataset and read it in again. Instead of applying drop or keep for a subset analysis, consider using if or in to select subsets temporarily. This is usually the best strategy. Alternatively, applying preserve followed in due course by restore may be a good approach. You can also use frame put to place a subset of variables or observations from the current dataset into another frame; see [D] **frame put**.

Quick start

Remove v1, v2, and v3 from memory

```
drop v1 v2 v3
```

Remove all variables whose name begins with code from memory

```
drop code*
```

Remove observations where v1 is equal to 99

```
drop if v1==99
```

Also drop observations where v1 equals 88 or v2 is missing

```
drop if inlist(v1,88,99) | missing(v2)
```

Keep observations where v3 is not missing

```
keep if !missing(v3)
```

Keep the first observation from each cluster identified by cvar

```
by cvar: keep if _n==1
```

Menu

Drop or keep variables

Data > Variables Manager

Drop or keep observations

Data > Create or change data > Drop or keep observations

Syntax

Drop variables

`drop` *varlist*

Drop observations

`drop if` *exp*

Drop a range of observations

`drop in` *range* [`if` *exp*]

Keep variables

`keep` *varlist*

Keep observations that satisfy specified condition

`keep if` *exp*

Keep a range of observations

`keep in` *range* [`if` *exp*]

`by` and `collect` are allowed with the second syntax of `drop` and the second syntax of `keep`; see **[U] 11.1.10 Prefix commands**.

Remarks and examples

You can clear the entire dataset by typing `drop _all` without affecting value labels, macros, and programs. (Also see **[U] 12.6 Dataset, variable, and value labels**, **[U] 18.3 Macros**, and **[P] program**.)

▷ Example 1

We will systematically eliminate data until, at the end, no data are left in memory. We begin by describing the data:

```
. use https://www.stata-press.com/data/r19/census11
(1980 Census data by state)

. describe

Contains data from https://www.stata-press.com/data/r19/census11.dta
 Observations:            50                  1980 Census data by state
    Variables:            15                  2 Dec 2024 14:31
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
state           str13   %-13s                 State
state2          str2    %-2s                  Two-letter state abbreviation
region          byte    %-8.0g     cenreg     Census region
pop             long    %12.0gc               Population
poplt5          long    %12.0gc               Pop, < 5 year
pop5_17         long    %12.0gc               Pop, 5 to 17 years
pop18p          long    %12.0gc               Pop, 18 and older
pop65p          long    %12.0gc               Pop, 65 and older
popurban        long    %12.0gc               Urban population
medage          float   %9.2f                 Median age
death           long    %12.0gc               Number of deaths
marriage        long    %12.0gc               Number of marriages
divorce         long    %12.0gc               Number of divorces
mrgrate         float   %9.0g                 Marriage rate
dvcrate         float   %9.0g                 Divorce rate
--------------------------------------------------------------------------------
Sorted by: region
```

We can eliminate all the variables with names that begin with pop by typing `drop pop*`:

```
. drop pop*
. describe
Contains data from https://www.stata-press.com/data/r19/census11.dta
 Observations:            50                  1980 Census data by state
    Variables:             9                  2 Dec 2024 14:31
────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
────────────────────────────────────────────────────────────────────────────────
state           str13   %-13s                 State
state2          str2    %-2s                  Two-letter state abbreviation
region          byte    %-8.0g     cenreg     Census region
medage          float   %9.2f                 Median age
death           long    %12.0gc               Number of deaths
marriage        long    %12.0gc               Number of marriages
divorce         long    %12.0gc               Number of divorces
mrgrate         float   %9.0g                 Marriage rate
dvcrate         float   %9.0g                 Divorce rate
────────────────────────────────────────────────────────────────────────────────
Sorted by: region
     Note: Dataset has changed since last saved.
```

Let's eliminate more variables and then eliminate observations:

```
. drop marriage divorce mrgrate dvcrate
. describe
Contains data from https://www.stata-press.com/data/r19/census11.dta
 Observations:            50                  1980 Census data by state
    Variables:             5                  2 Dec 2024 14:31
────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
────────────────────────────────────────────────────────────────────────────────
state           str13   %-13s                 State
state2          str2    %-2s                  Two-letter state abbreviation
region          byte    %-8.0g     cenreg     Census region
medage          float   %9.2f                 Median age
death           long    %12.0gc               Number of deaths
────────────────────────────────────────────────────────────────────────────────
Sorted by: region
     Note: Dataset has changed since last saved.
```

Next we will drop any observation for which `medage` is greater than 32.

```
. drop if medage > 32
(3 observations deleted)
```

Let's drop the first observation in each region:

```
. by region: drop if _n==1
(4 observations deleted)
```

Now we drop all but the last observation in each region:

```
. by region: drop if _n!=_N
(39 observations deleted)
```

Let's now drop the first 2 observations in our dataset:

```
. drop in 1/2
(2 observations deleted)
```

Finally, let's get rid of everything:

```
. drop _all
. describe
Contains data
 Observations:            0
    Variables:            0
Sorted by:
```

◁

Typing `keep in 10/l` is the same as typing `drop in 1/9`.

Typing `keep if x==3` is the same as typing `drop if x !=3`.

`keep` is especially useful for keeping a few variables from a large dataset. Typing `keep myvar1 myvar2` is the same as typing `drop` followed by all the variables in the dataset *except* `myvar1` and `myvar2`.

❑ Technical note

In addition to dropping variables and observations, `drop _all` removes any business calendars; see [D] **Datetime business calendars**.

❑

Stored results

`drop` and `keep` store the following in `r()`:

Scalars

`r(N_drop)`	number of observations dropped
`r(k_drop)`	number of variables dropped

Also see

[D] **clear** — Clear memory

[D] **frame put** — Copy selected variables or observations to a new frame

[D] **varmanage** — Manage variable labels, formats, and other properties

[U] **11 Language syntax**

[U] **13 Functions and expressions**

ds — Compactly list variables with specified properties

Description | Quick start | Menu | Syntax | Options
Remarks and examples | Stored results | Acknowledgments | Also see

Description

ds lists variable names of the dataset currently in memory in a compact or detailed format, and lets you specify subsets of variables to be listed, either by name or by properties (for example, the variables are numeric). In addition, ds leaves behind in r(varlist) the names of variables selected so that you can use them in a subsequent command.

ds, typed without arguments, lists all variable names of the dataset currently in memory in a compact form.

Quick start

List variables in alphabetical order

```
ds, alpha
```

List all string variables

```
ds, has(type string)
```

List all numeric variables

```
ds, has(type numeric)
```

Same as above, but exclude date-formatted variables

```
ds, not(format %td* type string)
```

List all variables whose label includes the phrase "my text" regardless of case

```
ds, has(varlabel "*my text*") insensitive
```

Menu

Data > Describe data > Compactly list variable names

Syntax

Simple syntax

ds [, alpha]

Advanced syntax

ds [*varlist*] [, *options*]

options	Description
Main	
not	list variables not specified in *varlist*
alpha	list variables in alphabetical order
detail	display additional details
varwidth(#)	display width for variable names; default is varwidth(12)
skip(#)	gap between variables; default is skip(2)
Advanced	
has(*spec*)	describe subset that matches *spec*
not(*spec*)	describe subset that does not match *spec*
insensitive	perform case-insensitive pattern matching
indent(#)	indent output; seldom used

collect is allowed; see **[U] 11.1.10 Prefix commands**.

insensitive and indent(#) are not shown in the dialog box.

spec	Description
type *typelist*	specified types
format *patternlist*	display format matching *patternlist*
varlabel [*patternlist*]	variable label or variable label matching *patternlist*
char [*patternlist*]	characteristic or characteristic matching *patternlist*
vallabel [*patternlist*]	value label or value label matching *patternlist*
linkname *namelist*	link name matching *namelist*

typelist used in has(type *typelist*) and not(type *typelist*) is a list of one or more types, each of which may be alias, unknown, numeric, string, str#, strL, byte, int, long, float, or double or may be a *numlist* such as 1/8 to mean "str1 str2 ... str8". Examples include

has(type alias)	was created by fralias add; see [D] **fralias**
has(type unknown)	is type alias, but the link is broken
has(type int)	is of type int
has(type byte int long)	is of integer type
not(type int)	is not of type int
not(type byte int long)	is not of the integer types
has(type numeric)	is a numeric variable
not(type string)	is not a string (str# or strL) variable (same as above)
has(type 1/40)	is str1, str2, ..., str40
has(type str#)	is str1, str2, ..., str2045 but not strL
has(type strL)	is of type strL but not str#
has(type numeric 1/2)	is numeric or str1 or str2

patternlist used in, for instance, has(format *patternlist*), is a list of one or more *patterns*. A pattern is the expected text with the addition of the characters * and ?. * indicates 0 or more characters go here, and ? indicates exactly 1 character goes here. Examples include

has(format *f)	format is %#.#f
has(format %t*)	has time or date format
has(format %-*s)	is a left-justified string
has(varl *weight*)	variable label includes word weight
has(varl *weight* *Weight*)	variable label has weight or Weight

To match a phrase, enclose the phrase in quotes.

has(varl "*some phrase*")	variable label has some phrase

If instead you used has(varl *some phrase*), then only variables having labels ending in some or starting with phrase would be listed.

namelist used in, for instance, has(linkname *namelist*) is a list of one or more names. linkname refers to the linkage variables used to create alias variables; see [D] **fralias**. Abbreviations in *namelist* are not supported.

Options

Main

not specifies that the variables in *varlist* not be listed. For instance, ds pop*, not specifies that all variables not starting with the letters pop be listed. The default is to list all the variables in the dataset or, if *varlist* is specified, the variables specified.

alpha specifies that the variables be listed in alphabetical order. If the variable contains Unicode characters other than plain ASCII, the sort order is determined strictly by the underlying byte order. See [U] **12.4.2.5 Sorting strings containing Unicode characters**.

detail specifies that detailed output identical to that of describe be produced. If detail is specified, varwidth(), skip(), and indent() are ignored.

`varwidth(#)` specifies the display width of the variable names; the default is `varwidth(12)`.

`skip(#)` specifies the number of spaces between variable names, where all variable names are assumed to be the length of the longest variable name; the default is `skip(2)`.

Advanced

`has(`*spec*`)` and `not(`*spec*`)` select from the dataset (or from *varlist*) the subset of variables that meet or fail the specification *spec*. Selection may be made on the basis of storage type, variable label, value label, display format, or characteristics. Only one `not`, `has()`, or `not()` option may be specified.

`has(type string)` selects all string variables. Typing `ds, has(type string)` would list all string variables in the dataset, and typing `ds pop*, has(type string)` would list all string variables whose names begin with the letters `pop`.

`has(format` *patternlist*`)` specifies variables whose format matches any of the patterns in *patternlist*. `has(format *f)` would select all variables with formats ending in `f`, which presumably would be all `%#.#f`, `%0#.#f`, and `%-#.#f` formats. `has(format *f *fc)` would select all variables with formats ending in `f` or `fc`. `not(format %t* %-t*)` would select all variables except those with date or time-series formats.

`has(varlabel)` selects variables with defined variable labels. `has(varlabel *weight*)` selects variables with variable labels including the word "weight". `not(varlabel)` would select all variables with no variable labels.

`has(char)` selects all variables with defined characteristics. `has(char problem)` selects all variables with a characteristic named `problem`.

`has(vallabel)` selects variables with defined value labels. `has(vallabel yesno)` selects variables whose value label is `yesno`. `has(vallabel *no)` selects variables whose value label ends in the letters `no`.

`has(linkname)` selects variables to create alias variables; see [D] **fralias**.

The following options are available with `ds` but are not shown in the dialog box:

`insensitive` specifies that the matching of the *pattern* in `has()` and `not()` be case insensitive. Note that the case insensitivity applies only to ASCII characters.

`indent(#)` specifies the amount the lines are indented.

Remarks and examples

If `ds` is typed without any operands, then a compact list of the variable names for the data currently in memory is displayed.

▷ Example 1

`ds` can be especially useful if you have a dataset with over 1,000 variables, but you may find it convenient even if you have considerably fewer variables.

```
. use https://www.stata-press.com/data/r19/educ3
(ccdb46, 52-54)
. ds
fips      popcol    medhhinc  tlf       emp       clfbls    z
crimes    perhspls  medfinc   clf       empmanuf  clfuebls  adjinc
pcrimes   perclpls  state     clffem    emptrade  famnw     perman
crimrate  prcolhs   division  clfue     empserv   fam2w     pertrade
pop25pls  medage    region    empgovt   osigind   famwsamp  perserv
pophspls  perwhite  dc        empself   osigindp  pop18pls  perother
```

◁

▷ Example 2

You might wonder why you would ever specify *varlist* with this command. Remember that *varlist* understands the '*' abbreviation character and the '-' dash notation; see **[U] 11.4 varname and varlists**.

```
. ds p*
pcrimes   pophspls  perhspls  prcolhs   pop18pls  pertrade  perother
pop25pls  popcol    perclpls  perwhite  perman    perserv
. ds popcol-clfue
popcol    perclpls  medage    medhhinc  state     region    tlf       clffem
perhspls  prcolhs   perwhite  medfinc   division  dc        clf       clfue
```

◁

▷ Example 3

Because the primary use of ds is to inspect the names of variables, it is sometimes useful to let ds display the variable names in alphabetical order.

```
. ds, alpha
adjinc    crimes    empmanuf  famwsamp  osigindp  perserv   pophspls
clf       crimrate  empself   fips      pcrimes   pertrade  prcolhs
clfbls    dc        empserv   medage    perclpls  perwhite  region
clffem    division  emptrade  medfinc   perhspls  pop18pls  state
clfue     emp       fam2w     medhhinc  perman    pop25pls  tlf
clfuebls  empgovt   famnw     osigind   perother  popcol    z
```

◁

Stored results

ds stores the following in r():

Macros
r(varlist)   the varlist of found variables

Acknowledgments

ds was originally written by StataCorp. It was redesigned and rewritten by Nicholas J. Cox of the Department of Geography at Durham University, UK, who is coeditor of the *Stata Journal* and author of *Speaking Stata Graphics*. The purpose was to include the selection options not, has(), and not(); to produce better-formatted output; and to be faster. Cox thanks Richard Goldstein, William Gould, Kenneth Higbee, Jay Kaufman, Jean Marie Linhart, and Fred Wolfe for their helpful suggestions on previous versions.

Also see

[D] **cf** — Compare two datasets

[D] **codebook** — Describe data contents

[D] **compare** — Compare two variables

[D] **compress** — Compress data in memory

[D] **describe** — Describe data in memory or in a file

[D] **format** — Set variables' output format

[D] **fralias** — Alias variables from linked frames

[D] **label** — Manipulate labels

[D] **lookfor** — Search for string in variable names and labels

[D] **notes** — Place notes in data

[D] **order** — Reorder variables in dataset

[D] **rename** — Rename variable

duplicates — Report, tag, or drop duplicate observations

Description | Quick start | Menu | Syntax | Options
Remarks and examples | Stored results | Acknowledgments | References | Also see

Description

`duplicates` reports, displays, lists, tags, or drops duplicate observations, depending on the subcommand specified. Duplicates are observations with identical values either on all variables if no *varlist* is specified or on a specified *varlist*.

`duplicates report` produces a table showing observations that occur as one or more copies and indicating how many observations are "surplus" in the sense that they are the second (third, ...) copy of the first of each group of duplicates.

`duplicates examples` lists one example for each group of duplicated observations. Each example represents the first occurrence of each group in the dataset.

`duplicates list` lists all duplicated observations.

`duplicates tag` generates a variable representing the number of duplicates for each observation. This will be 0 for all unique observations.

`duplicates drop` drops all but the first occurrence of each group of duplicated observations. The word `drop` may not be abbreviated.

Any observations that do not satisfy specified `if` and/or `in` conditions are ignored when you use `report`, `examples`, `list`, or `drop`. The variable created by `tag` will have missing values for such observations.

Quick start

Report the total number of observations and the number of duplicates

```
duplicates report
```

Same as above, but only check for duplicates jointly by `v1`, `v2`, and `v3`

```
duplicates report v1 v2 v3
```

Generate `newv` equal to the number of duplicate observations or 0 for unique observations

```
duplicates tag, generate(newv)
```

List all duplicate observations

```
duplicates list
```

Same as above, but determine duplicates by `v1`, `v2`, and `v3` and separate list by values of `v1`

```
duplicates list v1 v2 v3, sepby(v1)
```

Drop duplicate observations

```
duplicates drop
```

Force dropping observations with duplicates for `v1`, `v2`, and `v3` if observations are unique by other variables

```
duplicates drop v1 v2 v3, force
```

Menu

duplicates report, duplicates examples, and duplicates list

Data > Data utilities > Report and list duplicated observations

duplicates tag

Data > Data utilities > Tag duplicated observations

duplicates drop

Data > Data utilities > Drop duplicated observations

Syntax

Report duplicates

`duplicates report` [*varlist*] [*if*] [*in*]

List one example for each group of duplicates

`duplicates examples` [*varlist*] [*if*] [*in*] [, *options*]

List all duplicates

`duplicates list` [*varlist*] [*if*] [*in*] [, *options*]

Tag duplicates

`duplicates tag` [*varlist*] [*if*] [*in*] , `generate(`*newvar*`)`

Drop duplicates

`duplicates drop` [*if*] [*in*]

`duplicates drop` *varlist* [*if*] [*in*] , `force`

options	Description
Main	
compress	compress width of columns in both table and display formats
nocompress	use display format of each variable
fast	synonym for nocompress; no delay in output of large datasets
abbreviate(#)	abbreviate variable names to # characters; default is ab(8)
string(#)	truncate string variables to # characters; default is string(10)
Options	
table	force table format
display	force display format
header	display variable header once; default is table mode
noheader	suppress variable header
header(#)	display variable header every # lines
clean	force table format with no divider or separator lines
divider	draw divider lines between columns
separator(#)	draw a separator line every # lines; default is separator(5)
sepby(*varlist*)	draw a separator line whenever *varlist* values change
nolabel	display numeric codes rather than label values
Summary	
mean[(*varlist*)]	add line reporting the mean for each of the (specified) variables
sum[(*varlist*)]	add line reporting the sum for each of the (specified) variables
N[(*varlist*)]	add line reporting the number of nonmissing values for each of the (specified) variables
labvar(*varname*)	substitute Mean, Sum, or N for value of *varname* in last row of table
Advanced	
constant[(*varlist*)]	separate and list variables that are constant only once
notrim	suppress string trimming
absolute	display overall observation numbers when using by *varlist*:
nodotz	display numerical values equal to .z as field of blanks
subvarname	substitute characteristic for variable name in header
linesize(#)	columns per line; default is linesize(79)

collect is allowed with all duplicates commands; see [U] **11.1.10 Prefix commands**.

Options

Options are presented under the following headings:

Options for duplicates examples and duplicates list
Option for duplicates tag
Option for duplicates drop

Options for duplicates examples and duplicates list

Main

compress, nocompress, fast, abbreviate(#), string(#); see [D] **list**.

Options

`table`, `display`, `header`, `noheader`, `header(#)`, `clean`, `divider`, `separator(#)`, `sepby(`*varlist*`)`, `nolabel`; see [D] **list**.

Summary

`mean`[`(`*varlist*`)`], `sum`[`(`*varlist*`)`], `N`[`(`*varlist*`)`], `labvar(`*varname*`)`; see [D] **list**.

Advanced

`constant`[`(`*varlist*`)`], `notrim`, `absolute`, `nodotz`, `subvarname`, `linesize(#)`; see [D] **list**.

Option for duplicates tag

`generate(`*newvar*`)` is required and specifies the name of a new variable that will tag duplicates.

Option for duplicates drop

`force` specifies that observations duplicated with respect to a named *varlist* be dropped. The `force` option is required when such a *varlist* is given as a reminder that information may be lost by dropping observations, given that those observations may differ on any variable not included in *varlist*.

Remarks and examples

Current data management and analysis may hinge on detecting (and sometimes dropping) duplicate observations. In Stata terms, *duplicates* are observations with identical values, either on all variables if no *varlist* is specified or on a specified *varlist*; that is, 2 or more observations that are identical on all specified variables form a group of duplicates. When the specified variables are a set of explanatory variables, such a group is often called a *covariate pattern* or a *covariate class*.

Linguistic purists will point out that duplicate observations are strictly only those that occur in pairs, and they might prefer a more literal term, although the most obvious replacement, “replicates”, already has another statistical meaning. However, the looser term appears in practice to be much more frequently used for this purpose and to be as easy to understand.

Observations may occur as duplicates through some error; for example, the same observations might have been entered more than once into your dataset. In contrast, some researchers deliberately enter a dataset twice. Each entry is a check on the other, and all observations should occur as identical pairs, assuming that one or more variables identify unique records. If there is just one copy, or more than two copies, there has been an error in data entry.

Or duplicate observations may also arise simply because some observations just happen to be identical, which is especially likely with categorical variables or large datasets. In this second situation, consider whether `contract`, which automatically produces a count of each distinct set of observations, is more appropriate for your problem. See [D] **contract**.

Observations unique on all variables in *varlist* occur as single copies. Thus there are no surplus observations in the sense that no observation may be dropped without losing information about the contents of observations. (Information will inevitably be lost on the frequency of such observations. Again, if recording frequency is important to you, `contract` is the better command to use.) Observations that are duplicated twice or more occur as copies, and in each case, all but one copy may be considered surplus.

This command helps you produce a dataset, usually smaller than the original, in which each observation is *unique* (literally, each occurs only once) and *distinct* (each differs from all the others). If you are familiar with Unix systems, or with sets of Unix utilities ported to other platforms, you will know the `uniq` command, which removes duplicate adjacent lines from a file, usually as part of a pipe.

▷ Example 1

Suppose that we are given a dataset in which some observations are unique (no other observation is identical on all variables) and other observations are duplicates (in each case, at least 1 other observation exists that is identical). Imagine dropping all but 1 observation from each group of duplicates, that is, dropping the surplus observations. Now all the observations are unique. This example helps clarify the difference between 1) identifying unique observations before dropping surplus copies and 2) identifying unique observations after dropping surplus copies (whether in truth or merely in imagination). `codebook` (see [D] **codebook**) reports the number of unique values for each variable in this second sense.

Suppose that we have typed in a dataset for 200 individuals. However, a simple `describe` or `count` shows that we have 202 observations in our dataset. We guess that we may have typed in 2 observations twice. `duplicates report` gives a quick report of the occurrence of duplicates:

```
. use https://www.stata-press.com/data/r19/dupxmpl
. duplicates report
Duplicates in terms of all variables

--------------------------------------
   Copies | Observations       Surplus
----------+---------------------------
        1 |          198             0
        2 |            4             2
--------------------------------------
```

Our hypothesis is supported: 198 observations are unique (just 1 copy of each), whereas 4 occur as duplicates (2 copies of each; in each case, 1 may be dubbed surplus). We now wish to see which observations are duplicates, so the next step is to ask for a `duplicates list`.

```
. duplicates list
Duplicates in terms of all variables

  +------------------------------+
  | Group   Obs    id    x    y  |
  |------------------------------|
  |     1    42    42    0    2  |
  |     1    43    42    0    2  |
  |     2   145   144    4    4  |
  |     2   146   144    4    4  |
  +------------------------------+
```

The records for `id` 42 and `id` 144 were evidently entered twice. Satisfied, we now issue `duplicates drop`.

```
. duplicates drop
Duplicates in terms of all variables
(2 observations deleted)
```

◁

The `report`, `list`, and `drop` subcommands of `duplicates` are perhaps the most useful, especially for a relatively small dataset. For a larger dataset with many duplicates, a full listing may be too long to be manageable, especially as you see repetitions of the same data. `duplicates examples` gives you a more compact listing in which each group of duplicates is represented by just 1 observation, the first to occur.

A subcommand that is occasionally useful is `duplicates tag`, which generates a new variable containing the number of duplicates for each observation. Thus unique observations are tagged with value 0, and all duplicate observations are tagged with values greater than 0. For checking double data entry, in which you expect just one surplus copy for each individual record, you can generate a tag variable and then look at observations with tag not equal to 1 because both unique observations and groups with two or more surplus copies need inspection.

```
. duplicates tag, gen(tag)
Duplicates in terms of all variables
```

As of Stata 11, the `browse` subcommand is no longer available. To open duplicates in the Data Browser, use the following commands:

```
. duplicates tag, generate(newvar)
. browse if newvar > 0
```

See [D] **edit** for details on the `browse` command.

Video example

How to identify and remove duplicate observations

Stored results

`duplicates report`, `duplicates examples`, `duplicates list`, `duplicates tag`, and `duplicates drop` store the following in `r()`:

Scalars

`r(N)`	number of observations

`duplicates report` also stores the following in `r()`:

Scalars

`r(unique_value)`	number of unique observations

`duplicates drop` also stores the following in `r()`:

Scalars

`r(N_drop)`	number of observations dropped

Acknowledgments

`duplicates` was written by Nicholas J. Cox of the Department of Geography at Durham University, UK, who is coeditor of the *Stata Journal* and author of *Speaking Stata Graphics*. He in turn thanks Thomas Steichen (retired) of RJRT for ideas contributed to an earlier jointly written program (Steichen and Cox 1998).

References

Bjärkefur, K., L. Cardoso de Andrade, and B. Daniels. 2020. iefieldkit: Commands for primary data collection and cleaning. *Stata Journal* 20: 892–915.

———. 2023. iefieldkit: Commands for primary data collection and cleaning (update). *Stata Journal* 23: 875–883.

Steichen, T. J., and N. J. Cox. 1998. dm53: Detection and deletion of duplicate observations. *Stata Technical Bulletin* 41: 2–4. Reprinted in *Stata Technical Bulletin Reprints*, vol. 7, pp. 52–55. College Station, TX: Stata Press.

Also see

[D] **codebook** — Describe data contents

[D] **contract** — Make dataset of frequencies and percentages

[D] **edit** — Browse or edit data with Data Editor

[D] **isid** — Check for unique identifiers

[D] **list** — List values of variables

dyngen — Dynamically generate new values of variables

Description   Menu   Syntax   Option   Remarks and examples   Also see

Description

dyngen replaces the value of variables when two or more variables depend on each other's lagged values. Use dyngen when the values for the whole set of variables must be computed for an observation before moving to the next observation.

Menu

Data > Create or change data > Dynamically generate new values

Syntax

```
dyngen {
      update varname_1 = exp [if] [, missval(#)]
      ⋮
      update varname_N = exp [if] [, missval(#)]
} [if] [in]
```

varname$_n$, $n = 1, \ldots, N$, must already exist in the dataset and cannot be an alias variable; see [D] **frunalias**.

exp must be a valid expression and may include time-series operators; see **[U] 11.4.4 Time-series varlists**.

Option

missval(#) specifies the value to use in place of missing values when performing calculations. This option is particularly useful when referring to lags that exist prior to the data.

Remarks and examples

Like replace, dyngen modifies the contents of existing variables. However, dyngen works observation by observation. If you are doing a computation only on a single variable that relies only on its own lagged values or those of other variables, you do not need dyngen because generate and replace work their way through the data sequentially. Use dyngen when you need to modify two or more variables at the same time.

The examples in this entry use the following data:

```
. input time x1 x2
          time         x1         x2
  1. 1    3    1
  2. 2    4    4
  3. 3    5    2
  4. 4    5    1
  5. 5    2    1
  6. end
```

▷ Example 1: Using dyngen

We want to update our values of x1 and x2 such that x1 depends on its current value and the previous value of x2, and x2 depends on previous values of x1 and x2. We will be using these same values of x1 and x2 in subsequent examples, so we do not want to overwrite their values. We create a copy of each in the variables d1 and d2, where the d prefix is used to remind us that these variables contain dynamically updated values.

```
. generate d1=x1
. generate d2=x2
```

Because we are using previous values, we need to specify a value for dyngen to substitute in place of missings; in this case, we use the means.

```
. summarize d1 d2
    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
          d1 |          5         3.8     1.30384          2          5
          d2 |          5         1.8     1.30384          1          4
```

Within the dyngen command, we specify an update statement for d1 and d2. We also use observation subscripts to indicate the previous values as needed; see [U] 13.7 Explicit subscripting. With time-series data, we could also use time-series operators; see example 3 for an illustration.

```
. dyngen {
.     update d1 = .4*d1 + .1*d2[_n-1], missval(3.8)
.     update d2 = .2*d1[_n-1] + .3*d2[_n-1], missval(1.8)
. }
. list x1 x2 d*

     +----------------------------+
     | x1   x2       d1       d2  |
     |----------------------------|
  1. |  3    1      3.8      1.8  |
  2. |  4    4     1.78      1.3  |
  3. |  5    2     2.13     .746  |
  4. |  5    1   2.0746    .6498  |
  5. |  2    1   .86498   .60986  |
     +----------------------------+
```

In observation 1, dyngen has substituted 3.8 for d1 and 1.8 for d2, values that would otherwise be missing because there are no data preceding the first observation. In observation 2, the updated value of d1 is $0.4 \times 4 + 0.1 \times 1.8 = 1.78$ and that of d2 is $0.2 \times 3.8 + 0.3 \times 1.8 = 1.3$, and so on.

◁

▷ Example 2: Distinction between dyngen and replace

We can compare the results from example 1 with those from replace to see how dyngen operates differently.

As in example 1, we create two new variables, r1 and r2, that will hold values we update using replace. There is no automatic way to handle missing values with replace, so we need to set the first values to the means "by hand" to avoid missing values later. We then have a replace command for each variable, restricted to observations 2 through 5.

```
. generate r1=x1
. generate r2=x2
. replace r1 = 3.8 in 1
(1 real change made)
. replace r2 = 1.8 in 1
(1 real change made)
. replace r1 = .4*r1 + .1*r2[_n-1] in 2/5
(4 real changes made)
. replace r2 = .2*r1[_n-1] + .3*r2[_n-1] in 2/5
(4 real changes made)
```

Now, we can compare the results side by side.

```
. list x* d* r*
```

	x1	x2	d1	d2	r1	r2
1.	3	1	3.8	1.8	3.8	1.8
2.	4	4	1.78	1.3	1.78	1.3
3.	5	2	2.13	.746	2.4	.746
4.	5	1	2.0746	.6498	2.2	.7038
5.	2	1	.86498	.60986	.9	.65114

For the first two observations, the inputs are exactly the same, so there is no difference in the outcome. We see differences starting in the third row.

At the time that replace is updating the value of r1 in observation 3, it is making the calculation

$$0.4 \times 5 + 0.1 \times 4 = 2.4$$

because the value of r2 is still 4, the original value of x2. Compare this with the results of dyngen, which uses

$$0.4 \times 5 + 0.1 \times 1.3 = 2.13$$

That is, the key distinction is dyngen has fully updated observation 2 before moving on to observation 3. replace will make a full pass through r1 before moving on to r2.

◁

▷ Example 3: Processing if conditions

Each `update` statement within the `dyngen` command can take an `if` condition. To illustrate, we replace `d1` and `d2` with the original values of `x1` and `x2` and `update` them again, this time restricting the updated observations to just those observations where `time` ≥ 3.

```
. replace d1=x1
(5 real changes made)

. replace d2=x2
(5 real changes made)
```

Here, we `tsset` the data and use the lag operator instead of subscripting observations, but that is not required.

```
. tsset time

Time variable: time, 1 to 5
        Delta: 1 unit

. dyngen {
.     update d1 = .4*d1 + .1*L.d2 if time>=3
.     update d2 = .2*L.d1 + .3*L.d2 if time>=3
. }

. list x* d*
```

	x1	x2	d1	d2
1.	3	1	3	1
2.	4	4	4	4
3.	5	2	2.4	2
4.	5	1	2.2	1.08
5.	2	1	.908	.764

When the same `if` condition is specified on all `update` statements, the results are equivalent to specifying one `if` condition on the entire `dyngen` block. We used the same `if` statement on both `update` statements above, so typing the following produces the same results as the code above.

```
dyngen {
    update d1 = .4*d1 + .1*L.d2
    update d2 = .2*L.d1 + .3*L.d2
} if time>=3
```

You may also specify an `in` qualifier with the `dyngen` command. If you specify an `if` or `in` qualifier, `dyngen` loops over the observations that meet the `if` condition or `in` range but will reference values outside that range if needed.

◁

Also see

[D] **frunalias** — Change storage type of alias variables

[D] **generate** — Create or change contents of variable

[U] **12 Data**

[U] **13 Functions and expressions**

edit — Browse or edit data with Data Editor

Description

`edit` brings up a spreadsheet-style data editor for entering new data and editing existing data. `edit` is a better alternative to `input`; see [D] **input**.

`browse` is similar to `edit`, except that modifications to the data by editing in the grid are not permitted. `browse` is a convenient alternative to `list`; see [D] **list**.

See [GS] **6 Using the Data Editor** (GSM, GSU, or GSW) for a tutorial discussion of the Data Editor. This entry provides the technical details.

Quick start

Open dataset in the Data Editor for entering new data or editing existing data

```
edit
```

Same as above, but include only `v1`, `v2`, and `v3`

```
edit v1 v2 v3
```

Same as above, but only for observations where `v3` is missing

```
edit v1 v2 v3 if v3 >= .
```

Open dataset in the Data Editor with no ability to edit data

```
browse
```

Same as above, but include only `v1`, `v2`, and `v3` and suppress value labels

```
browse v1 v2 v3, nolabel
```

Menu

edit

Data > Data Editor > Data Editor (Edit)

browse

Data > Data Editor > Data Editor (Browse)

Syntax

Edit using Data Editor

`edit` [*varlist*] [*if*] [*in*] [, `nolabel`]

Browse using Data Editor

`browse` [*varlist*] [*if*] [*in*] [, `nolabel`]

Option

`nolabel` causes the underlying numeric values, rather than the label values (equivalent strings), to be displayed for variables with value labels; see [D] **label**.

Remarks and examples

Remarks are presented under the following headings:

Clicking on Stata's **Data Editor (Edit)** button is equivalent to typing `edit` by itself. Clicking on Stata's **Data Editor (Browse)** button is equivalent to typing `browse` by itself.

`edit`, typed by itself, opens the Data Editor with all observations on all variables displayed. If you specify *varlist*, only the specified variables are displayed in the Editor. If you specify one or both of `in` *range* and `if` *exp*, only the observations specified are displayed.

Modes

We will refer to the Data Editor in the singular with `edit` and `browse` referring to two of its three modes.

Full-edit mode. This is the Editor's mode that you enter when you type `edit` or type `edit` followed by a list of variables. All features of the Editor are turned on.

Filtered mode. This is the Editor's mode that you enter when you use `edit` with or without a list of variables but include `in` *range*, `if` *exp*, or both, or if you filter the data from within the Editor. A few of the Editor's features are turned off, most notably, the ability to sort data and the ability to paste data into the Editor.

Browse mode. This is the Editor's mode that you enter when you use `browse` or when you change the Editor's mode to **Browse** after you start the Editor. The ability to type in the Editor, thereby changing data, is turned off, ensuring that the data cannot accidentally be changed. One feature that is left on may surprise you: the ability to sort data. Sorting, in Stata's mind, is not really a change to the dataset. On the other hand, if you enter using `browse` and specify `in` *range* or `if` *exp*, sorting is not allowed. You can think of this as restricted-browse mode.

Actually, the Editor does not set its mode to filtered just because you specify an `in` *range* or `if` *exp*. It sets its mode to filtered if you specify `in` or `if` and if this restriction is effective, that is, if the `in` or `if` would actually cause some data to be omitted. For instance, typing `edit if x>0` would result in unrestricted full-edit mode if `x` were greater than zero for all observations.

The current observation and current variable

The Data Editor looks much like a spreadsheet, with rows and columns corresponding to observations and variables, respectively. At all times, one of the cells is highlighted. This is called the current cell. The observation (row) of the current cell is called the current observation. The variable (column) of the current cell is called the current variable.

You change the current cell by clicking with the mouse on another cell or by using the arrow keys.

To help distinguish between the different types of variables in the Editor, string values are displayed in red, value labels are displayed in blue, and all other values are displayed in black. You can change the colors for strings and value labels by right-clicking on the Data Editor window and selecting **Preferences...**.

Assigning value labels to variables

You can assign a value label to a nonstring variable by right-clicking any cell on the variable column, choosing the **Data > Value Labels** menu, and selecting a value label from the **Attach Value Label to Variable '*varname*'** menu. You can define a value label by right-clicking on the Data Editor window and selecting **Data > Value Labels > Manage Value Labels...**. You can also accomplish these tasks by using the Properties pane; see [GS] **6 Using the Data Editor** (GSM, GSU, or GSW) for details.

Changing values of existing cells

Make the cell you wish to change the current cell. Type the new value, and press *Enter*. When updating string variables, do not type double quotes around the string. For variables that have a value label, you can right-click on the cell to display a list of values for the value label. You can assign a new value to the cell by selecting a value from the list.

❑ Technical note

Stata experts will wonder about storage types. Say that variable `mpg` is stored as an `int` and you want to change the fourth observation to contain 22.5. The Data Editor will change the storage type of the variable. Similarly, if the variable is a `str4` and you type `alpha`, it will be changed to `str5`.

The Editor will not, however, change numeric variable types to strings (unless the numeric variable contains only missing values). This is intentional, as such a change could result in a loss of data and is probably the result of a mistake.

❑

❑ Technical note

Stata can store long strings in the `strL` storage type. Although the `strL` type can hold very long strings, these strings may only be edited if they are 2045 characters or less. Similarly, `strL`s that hold binary data may not be edited. For more information on storage types, see [D] **Data types**.

❑

Adding new variables

Go to the first empty column, and begin entering your data. The first entry that you make will create the variable and determine whether that variable is numeric or string. The variable will be given a name like `var1`, but you can rename it by using the Properties pane.

❑ Technical note

Stata experts: The storage type will be determined automatically. If you type a number, the created variable will be numeric; if you type a string, it will be a string. Thus if you want a string variable, be sure that your first entry cannot be interpreted as a number. A way to achieve this is to use surrounding quotes so that `"123"` will be taken as the string `"123"`, not the number `123`. If you want a numeric variable, do not worry about whether it is `byte`, `int`, `float`, etc. If a `byte` will hold your first number but you need a `float` to hold your second number, the Editor will recast the variable later.

❑

❑ Technical note

If you do not type in the first empty column but instead type in one to the right of it, the Editor will create variables for all the intervening columns.

❑

Adding new observations

Go to the first empty row, and begin entering your data. As soon as you add one cell below the last row of the dataset, an observation will be created.

❑ Technical note

If you do not enter data in the first empty row but, instead, enter data in a row below it, the Data Editor will create observations for all the intervening rows.

❑

Copying and pasting

You can copy and paste data between Stata's Data Editor and other applications.

First, select the data you wish to copy. In Stata, click on a cell and drag the mouse across other cells to select a range of cells. If you want to select an entire column, click once on the variable name at the top of that column. If you want to select an entire row, click once on the observation number at the left of that row. You can hold down the mouse button after clicking and drag to select multiple columns or rows.

Once you have selected the data, copy the data to the Clipboard. In Stata, right-click on the selected data, and select **Copy**.

You can copy data to the Clipboard from Stata with or without the variable names at the top of each column by right-clicking on the Data Editor window, selecting **Preferences...**, and checking or unchecking *Include variable names on copy to Clipboard*.

You can choose to copy either the value labels or the underlying numeric values associated with the selected data by right-clicking on the Data Editor window, selecting **Preferences...**, and checking or unchecking *Copy value labels instead of numbers*. For more information about value labels, see [U] **12.6.3 Value labels** and [D] **label**.

After you have copied data to the Clipboard from Stata's Data Editor or another spreadsheet, you can paste the data into Stata's Data Editor. First, select the top-left cell of the area into which you wish to paste the data by clicking on it once. Then right-click on the cell and select **Paste**. Stata will paste the data from the Clipboard into the Editor, overwriting any data below and to the right of the cell you selected as the top left of the paste area. If the Data Editor is in filtered mode or in browse mode, **Paste** will be disabled, meaning that you cannot paste into the Data Editor. You can have more control over how data are pasted by selecting **Paste Special...**.

❑ Technical note

If you attempt to paste one or more string values into numeric variables, the original numeric values will be left unchanged for those cells. Stata will display a message box to let you know that this has happened: "You attempted to paste one or more string values into numeric variables. The contents of these cells, if any, are unchanged."

If you see this message, you should look carefully at the data that you pasted into Stata's Data Editor to make sure that you pasted into the area that you intended. We recommend that you take a snapshot of your data before pasting into Stata's Data Editor so that you can restore the data from the snapshot if you make a mistake. See [GS] **6 Using the Data Editor** (GSM, GSU, or GSW) to read about snapshots.

❑

Logging changes

When you use `edit` to enter new data or change existing data, you will find output in the Stata Results window documenting the changes that you made. For example, a line of this output might be

```
. replace mpg = 22.5 in 5
```

The Editor submits a command to Stata for everything you do in it except pasting. If you are logging your results, you will have a permanent record of what you did in the Editor.

Advice

- People who care about data integrity know that editors are dangerous—it is too easy to make changes accidentally. Never use `edit` when you want to `browse`.
- Protect yourself when you edit existing data by limiting exposure. If you need to change `mpg` and need to see `model` to know which value of `mpg` to change, do not click on the **Data Editor** button. Instead, type `edit model mpg`. It is now impossible for you to change (damage) variables other than `model` and `mpg`. Furthermore, if you know that you need to change `mpg` only if it is missing, you can reduce your exposure even more by typing '`edit model mpg if mpg>=.`'.
- Stata's Data Editor is safer than most because it logs changes to the Results window. Use this feature—look at the log afterward, and verify that the changes you made are the changes you wanted to make.

Also see

[D] **import** — Overview of importing data into Stata

[D] **input** — Enter data from keyboard

[D] **list** — List values of variables

[D] **save** — Save Stata dataset

[GSM] 6 Using the Data Editor

[GSW] 6 Using the Data Editor

[GSU] 6 Using the Data Editor

egen — Extensions to generate

Description | Quick start | Menu | Syntax
Remarks and examples | Acknowledgments | References | Also see

Description

`egen` creates a new variable of the optionally specified storage type equal to the given function based on arguments of that function. The functions are specifically written for `egen`, as documented below or as written by users.

Quick start

Generate `newv1` for distinct groups of `v1` and `v2`, and create and apply value label `mylabel`

```
egen newv1 = group(v1 v2), label(mylabel)
```

Generate `newv2` equal to the minimum of `v1`, `v2`, and `v3` for each observation

```
egen newv2 = rowmin(v1 v2 v3)
```

Generate `newv3` equal to the overall sum of `v1`

```
egen newv3 = total(v1)
```

Same as above, but calculate total within each level of `catvar`

```
egen newv3 = total(v1), by(catvar)
```

Generate `newv4` equal to the number of nonmissing numeric values across `v1`, `v2`, and `v3` for each observation

```
egen newv4 = rownonmiss(v1 v2 v3)
```

Same as above, but allow string values

```
egen newv4 = rownonmiss(v1 v2 v3), strok
```

Generate `newv5` as the concatenation of numeric `v1` and string `v4` separated by a space

```
egen newv5 = concat(v1 v4), punct(" ")
```

Menu

Data > Create or change data > Create new variable (extended)

Syntax

egen [*type*] *newvar* = *fcn*(*arguments*) [*if*] [*in*] [, *options*]

by is allowed with some of the egen functions, as noted below.

Depending on *fcn*, *arguments* refers to an expression, *varlist*, or *numlist*, and the *options* are also *fcn* dependent. *fcn* and its dependencies are listed below.

anycount(*varlist*) , values(*integer numlist*)
: may not be combined with by. It returns the number of variables in *varlist* for which values are equal to any integer value in a supplied *numlist*. Values for any observations excluded by either if or in are set to 0 (not missing). Also see anyvalue(*varname*) and anymatch(*varlist*).

anymatch(*varlist*) , values(*integer numlist*)
: may not be combined with by. It is 1 if any variable in *varlist* is equal to any integer value in a supplied *numlist* and 0 otherwise. Values for any observations excluded by either if or in are set to 0 (not missing). Also see anyvalue(*varname*) and anycount(*varlist*).

anyvalue(*varname*) , values(*integer numlist*)
: may not be combined with by. It takes the value of *varname* if *varname* is equal to any integer value in a supplied *numlist* and is missing otherwise. Also see anymatch(*varlist*) and anycount(*varlist*).

concat(*varlist*) [, format(*%fmt*) decode maxlength(#) punct(*pchars*)]
: may not be combined with by. It concatenates *varlist* to produce a string variable. Values of string variables are unchanged. Values of numeric variables are converted to string, as is, or are converted using a numeric format under the format(*%fmt*) option or decoded under the decode option, in which case maxlength() may also be used to control the maximum label length used. By default, variables are added end to end: punct(*pchars*) may be used to specify punctuation, such as a space, punct(" "), or a comma, punct(,).

count(*exp*) (allows by *varlist*:)
: creates a constant (within *varlist*) containing the number of nonmissing observations of *exp*. Also see rownonmiss() and rowmiss().

cut(*varname*), { at(*numlist*) | group(#) } [icodes label]
: may not be combined with by. Either at() or group() must be specified. When at() is specified, it creates a new categorical variable coded with the left-hand ends of the grouping intervals specified in the at() option. When group() is specified, groups of roughly equal frequencies are created.

  at(*numlist)* with *numlist* in ascending order supplies the breaks for the groups. *newvar* is set to missing for observations with *varname* less than the first number specified in at() and for observations with *varname* greater than or equal to the last number specified in at().

  group(#) specifies the number of equal-frequency grouping intervals when breaks are not specified. Specifying this option automatically invokes icodes.

  icodes requests that the codes 0, 1, 2, etc., be used in place of the left-hand ends of the intervals.

  label requests that the integer-coded values of the grouped variable be labeled with the left-hand ends of the grouping intervals. Specifying this option automatically invokes icodes.

diff(*varlist*)
: may not be combined with by. It creates an indicator variable equal to 1 if the variables in *varlist* are not equal and 0 otherwise.

`ends(`*strvar*`)` [`, punct(`*pchars*`) trim` [`head` | `last` | `tail`]]

may not be combined with `by`. It gives the first "word" or head (with the `head` option), the last "word" (with the `last` option), or the remainder or tail (with the `tail` option) from string variable *strvar*.

`head`, `last`, and `tail` are determined by the occurrence of *pchars*, which is by default one space (" ").

The head is whatever precedes the first occurrence of *pchars*, or the whole of the string if it does not occur. For example, the head of "frog toad" is "frog" and that of "frog" is "frog". With `punct(,)`, the head of "frog,toad" is "frog".

The last word is whatever follows the last occurrence of *pchars* or is the whole of the string if a space does not occur. The last word of "frog toad newt" is "newt" and that of "frog" is "frog". With `punct(,)`, the last word of "frog,toad" is "toad".

The remainder or tail is whatever follows the first occurrence of *pchars*, which will be the empty string `""` if *pchars* does not occur. The tail of "frog toad newt" is "toad newt" and that of "frog" is `""`. With `punct(,)`, the tail of "frog,toad" is "toad".

The `trim` option trims any leading or trailing spaces.

`fill(`*numlist*`)`

may not be combined with `by`. It creates a variable of ascending or descending numbers or complex repeating patterns. *numlist* must contain at least two numbers and may be specified using standard *numlist* notation; see **[U] 11.1.8 numlist**. `if` and `in` are not allowed with `fill()`.

`group(`*varlist*`)` [`, missing autotype label` [`(`*lblname* [`, replace truncate(#)`] `)`]]

may not be combined with `by`. It creates one variable taking on values 1, 2, ... for the groups formed by *varlist*. *varlist* may contain numeric variables, string variables, or a combination of the two. The order of the groups is that of the sort order of *varlist*.

`missing` indicates that missing values in *varlist* (either `.` or `""`) are to be treated like any other value when assigning groups. By default, any observation with a missing value is assigned to the group with *newvar* equal to missing (`.`).

`autotype` specifies that *newvar* be the smallest *type* possible to hold the integers generated. The resulting *type* will be `byte`, `int`, `long`, or `double`.

`label` or `label(`*lblname*`)` creates a value label for *newvar*. The integers in *newvar* are labeled with the values of *varlist* or their value labels, if they exist. `label(`*lblname*`)` specifies *lblname* as the name of the value label. If `label` alone is specified, the name of the value label is *newvar*. `label(..., replace)` allows an existing value label to be redefined. `label(..., truncate(#))` truncates the values contributed to the label from each variable in *varlist* to the length specified by the integer argument #.

`iqr(`*exp*`)` [`, autotype`] (allows `by` *varlist*`:`)

creates a constant (within *varlist*) containing the interquartile range of *exp*. `autotype` specifies that *newvar* be the smallest *type* possible to hold the result. The resulting *type* will be `byte`, `int`, `long`, or `double`. Also see `pctile()`.

`kurt(`*exp*`)` (allows `by` *varlist*`:`)

returns the kurtosis (within *varlist*) of *exp*.

`mad(`*exp*`)` (allows `by` *varlist*`:`)

returns the median absolute deviation from the median (within *varlist*) of *exp*.

max(*exp*) [, missing] (allows by *varlist*:)
: creates a constant (within *varlist*) containing the maximum value of *exp*. missing indicates that missing values be treated like other values.

mdev(*exp*) (allows by *varlist*:)
: returns the mean absolute deviation from the mean (within *varlist*) of *exp*.

mean(*exp*) (allows by *varlist*:)
: creates a constant (within *varlist*) containing the mean of *exp*.

median(*exp*) [, autotype] (allows by *varlist*:)
: creates a constant (within *varlist*) containing the median of *exp*. autotype specifies that *newvar* be the smallest *type* possible to hold the result. The resulting *type* will be byte, int, long, or double. Also see pctile().

min(*exp*) [, missing] (allows by *varlist*:)
: creates a constant (within *varlist*) containing the minimum value of *exp*. missing indicates that missing values be treated like other values.

mode(*varname*) [, minmode maxmode nummode(*integer*) missing] (allows by *varlist*:)
: produces the mode (within *varlist*) for *varname*, which may be numeric or string. The mode is the value occurring most frequently. If two or more modes exist or if *varname* contains all missing values, the mode produced will be a missing value. To avoid this, the minmode, maxmode, or nummode() option may be used to specify choices for selecting among the multiple modes. minmode returns the lowest value, and maxmode returns the highest value. nummode(#) returns the #th mode, counting from the lowest up. missing indicates that missing values be treated like other values.

pc(*exp*) [, prop] (allows by *varlist*:)
: returns *exp* (within *varlist*) scaled to be a percentage of the total, between 0 and 100. The prop option returns *exp* scaled to be a proportion of the total, between 0 and 1.

pctile(*exp*) [, p(#) autotype] (allows by *varlist*:)
: creates a constant (within *varlist*) containing the #th percentile of *exp*. If p(#) is not specified, 50 is assumed, meaning medians. autotype specifies that *newvar* be the smallest *type* possible to hold the result. The resulting *type* will be byte, int, long, or double. Also see median().

rank(*exp*) [, field | track | unique] (allows by *varlist*:)
: creates ranks (within *varlist*) of *exp*; by default, equal observations are assigned the average rank. The field option calculates the field rank of *exp*: the highest value is ranked 1, and there is no correction for ties. That is, the field rank is 1 + the number of values that are higher. The track option calculates the track rank of *exp*: the lowest value is ranked 1, and there is no correction for ties. That is, the track rank is 1 + the number of values that are lower. The unique option calculates the unique rank of *exp*: values are ranked 1, . . . , #, and values and ties are broken arbitrarily. Two values that are tied for second are ranked 2 and 3.

rowfirst(*varlist*)
: may not be combined with by. It gives the first nonmissing value in *varlist* for each observation (row). If all values in *varlist* are missing for an observation, *newvar* is set to missing for that observation.

rowlast(*varlist*)
: may not be combined with by. It gives the last nonmissing value in *varlist* for each observation (row). If all values in *varlist* are missing for an observation, *newvar* is set to missing for that observation.

`rowmax(`*varlist*`)`
may not be combined with `by`. It gives the maximum value (ignoring missing values) in *varlist* for each observation (row). If all values in *varlist* are missing for an observation, *newvar* is set to missing for that observation.

`rowmean(`*varlist*`)`
may not be combined with `by`. It creates the (row) means of the variables in *varlist*, ignoring missing values. For example, if three variables are specified and, in some observations, one of the variables is missing, in those observations *newvar* will contain the mean of the two variables that do exist. Other observations will contain the mean of all three variables. If all values in *varlist* are missing for an observation, *newvar* is set to missing for that observation.

`rowmedian(`*varlist*`)`
may not be combined with `by`. It gives the (row) median of the variables in *varlist*, ignoring missing values. If all values in *varlist* are missing for an observation, *newvar* is set to missing for that observation. Also see `rowpctile()`.

`rowmin(`*varlist*`)`
may not be combined with `by`. It gives the minimum value in *varlist* for each observation (row). If all values in *varlist* are missing for an observation, *newvar* is set to missing for that observation.

`rowmiss(`*varlist*`)`
may not be combined with `by`. It gives the number of missing values in *varlist* for each observation (row).

`rownonmiss(`*varlist*`)` [`, strok`]
may not be combined with `by`. It gives the number of nonmissing values in *varlist* for each observation (row).

String variables may not be specified unless the `strok` option is also specified. When `strok` is specified, *varlist* may contain a mixture of string and numeric variables.

`rowpctile(`*varlist*`)` [`, p(#)`]
may not be combined with `by`. It gives the #th percentile of the variables in *varlist*, ignoring missing values. If `p()` is not specified, `p(50)` is assumed, meaning medians. If all values in *varlist* are missing for an observation, *newvar* is set to missing for that observation. Also see `rowmedian()`.

`rowsd(`*varlist*`)`
may not be combined with `by`. It creates the (row) standard deviations of the variables in *varlist*, ignoring missing values. If all values in *varlist* are missing for an observation, *newvar* is set to missing for that observation.

`rowtotal(`*varlist*`)` [`, missing`]
may not be combined with `by`. It creates the (row) sum of the variables in *varlist*, treating missing values as 0. If `missing` is specified and all values in *varlist* are missing for an observation, *newvar* is set to missing for that observation.

`sd(`*exp*`)` (allows `by` *varlist*`:`)
creates a constant (within *varlist*) containing the standard deviation of *exp*. Also see `mean()`.

`seq()` [`, from(#) to(#) block(#)`] (allows `by` *varlist*`:`)
returns integer sequences. Values start from `from()` (default 1) and increase to `to()` (the default is the maximum number of values) in blocks (default size 1). If `to()` is less than the maximum number, sequences restart at `from()`. Numbering may also be separate within groups defined by *varlist* or decreasing if `to()` is less than `from()`. Sequences depend on the sort order of observa-

tions, following three rules: 1) observations excluded by `if` or `in` are not counted; 2) observations are sorted by *varlist*, if specified; and 3) otherwise, the order is that when called. No *arguments* are specified.

`skew(`*exp*`)` (allows `by` *varlist*`:`)
returns the skewness (within *varlist*) of *exp*.

`std(`*exp*`)` [`,` `mean(#)` `sd(#)`] (allows `by` *varlist*`:`)
creates the standardized values (within *varlist*) of *exp*. The options specify the desired mean and standard deviation. The default is `mean(0)` and `sd(1)`, producing a variable with mean 0 and standard deviation 1 (within each group defined by *varlist*).

`tag(`*varlist*`)` [`,` `missing`]
may not be combined with `by`. It tags just one observation in each distinct group defined by *varlist*. When all observations in a group have the same value for a summary variable calculated for the group, it will be sufficient to use just one value for many purposes. The result will be 1 if the observation is tagged and never missing, and 0 otherwise. Values for any observations excluded by either `if` or `in` are set to 0 (not missing). Hence, if `tag` is the variable produced by `egen tag = tag(`*varlist*`)`, the idiom `if tag` is always safe. `missing` specifies that missing values of *varlist* may be included.

`total(`*exp*`)` [`,` `missing`] (allows `by` *varlist*`:`)
creates a constant (within *varlist*) containing the sum of *exp* treating missing as 0. If `missing` is specified and all values in *exp* are missing, *newvar* is set to missing. Also see `mean()`.

Remarks and examples

Remarks are presented under the following headings:

See Mitchell (2020) for numerous examples using `egen`.

Summary statistics

The functions `count()`, `iqr()`, `kurt()`, `mad()`, `max()`, `mdev()`, `mean()`, `median()`, `min()`, `mode()`, `pc()`, `pctile()`, `sd()`, `skew()`, and `total()` create variables containing summary statistics. These functions take a `by ...:` prefix and, if specified, calculate the summary statistics within each by-group.

▷ Example 1: Without the by prefix

Without the by prefix, the result produced by these functions is a constant for every observation in the data. For instance, we have data on cholesterol levels (chol) and wish to have a variable that, for each patient, records the deviation from the average across all patients:

```
. use https://www.stata-press.com/data/r19/egenxmpl
. egen avg = mean(chol)
. generate deviation = chol - avg
```

◁

▷ Example 2: With the by prefix

These functions are most useful when the by prefix is specified. For instance, assume that our dataset includes dcode, a hospital–patient diagnostic code, and los, the number of days that the patient remained in the hospital. We wish to obtain the deviation in length of stay from the median for all patients having the same diagnostic code:

```
. use https://www.stata-press.com/data/r19/egenxmpl2, clear
. by dcode, sort: egen medstay = median(los)
. generate deltalos = los - medstay
```

◁

▷ Example 3: sum() function and egen total()

Distinguish carefully between Stata's sum() function and egen's total() function. Stata's sum() function creates the running sum, whereas egen's total() function creates a constant equal to the overall sum, for example,

```
. clear
. set obs 5
Number of observations (_N) was 0, now 5.
. generate a = _n
. generate sum1 = sum(a)
. egen sum2 = total(a)
. list
```

	a	sum1	sum2
1.	1	1	15
2.	2	3	15
3.	3	6	15
4.	4	10	15
5.	5	15	15

◁

Definitions of egen summary functions

The definitions and formulas used by egen summary functions are the same as those used by summarize; see [R] **summarize**. For comparison with summarize, mean() and sd() correspond to the mean and standard deviation. total() is the numerator of the mean, and count() is its denominator.

min() and max() correspond to the minimum and maximum. median()—or, equally well, pctile() with p(50)—is the median. pctile() with p(5) refers to the 5th percentile, and so on. iqr() is the difference between the 75th and 25th percentiles.

The mode is the most common value of a dataset, whether it contains numeric or string variables. It is perhaps most useful for categorical variables (whether defined by integers or strings) or for other integer-valued values, but mode() can be applied to variables of any type. Nevertheless, the modes of continuous (or nearly continuous) variables are perhaps better estimated either from inspection of a graph of a frequency distribution or from the results of some density estimation (see [R] **kdensity**).

Missing values need special attention. egen *newvar* = mode(*varname*) calculates the mode of all nonmissing observations, and the variable *newvar* containing the mode is filled in for all observations, even those for which *varname* is missing (except for observations excluded using an if or in statement). This allows use of mode() as a simple way to impute categorical variables.

Missing values are by default excluded from the determination of modes (whether missing is defined by the period [.] or extended missing values [.a, .b, ..., .z] for numeric variables or the empty string [""] for string variables). However, missing may be the most common value in a variable, and you want mode() to report this value as the mode. To include missing values as possible values for the mode, use the missing option. See *Missing values* below for more on missing values.

mad() and mdev() produce alternative measures of spread. The median absolute deviation from the median and even the mean deviation will both be more resistant than the standard deviation to heavy tails or outliers, in particular from distributions with heavier tails than the normal or Gaussian. The first measure was named the MAD by Andrews et al. (1972) but was already known to K. F. Gauss in 1816, according to Hampel et al. (1986). For more historical and statistical details, see David (1998) and Wilcox (2003, 72–73).

Missing values

Missing values in the argument to egen functions (typically, *varname*, an expression, or *varlist*) are generally handled in one of three ways. Functions that calculate a single statistic for *varname* or an expression (for example, mean() and total()) fill in the result for all observations, including those for which *varname* or the expression is missing.

Functions that calculate results that potentially differ observation by observation (for example, group() and rank()) generally generate missing values for the result for observations where *varname* or the expression is missing.

Functions that take *varlist* (for example, rowmean()) generally generate a missing value for the result only when every variable in *varlist* is missing for that observation.

▷ Example 4: How missing values are handled

Here's an example of how mean() handles missing values.

```
. use https://www.stata-press.com/data/r19/egenxmpl1, clear
. egen y = mean(x)
. list x y

     +--------+
     |  x   y |
     |--------|
  1. |  0   3 |
  2. |  5   3 |
  3. |  2   3 |
  4. |  5   3 |
  5. |  3   3 |
     |--------|
  6. |  .   3 |
  7. | .a   3 |
     +--------+
```

The result y is filled in for all observations, including the 6th and 7th observations where x is missing. If you do not want this behavior, you can explicitly exclude missing values using an if statement.

```
. egen z = mean(x) if !missing(x)
(2 missing values generated)
. list x z

     +--------+
     |  x   z |
     |--------|
  1. |  0   3 |
  2. |  5   3 |
  3. |  2   3 |
  4. |  5   3 |
  5. |  3   3 |
     |--------|
  6. |  .   . |
  7. | .a   . |
     +--------+
```

Other functions, such as group(), by default exclude missing values. If you want to treat missing values just like other values and let them be part of the enumerated groups as well, use the missing option.

```
. egen g1 = group(x)
(2 missing values generated)
. egen g2 = group(x), missing
. list x g1 g2

     +--------------+
     |  x   g1   g2 |
     |--------------|
  1. |  0    1    1 |
  2. |  5    4    4 |
  3. |  2    2    2 |
  4. |  5    4    4 |
  5. |  3    3    3 |
     |--------------|
  6. |  .    .    5 |
  7. | .a    .    6 |
     +--------------+
```

With the missing option, the missing values "." and ".a" are placed in two distinct groups, the 5th and 6th groups, in the result g2.

Here's an example of how rowmean() and rowtotal() handle missing values.

```
. egen m = rowmean(x1 x2 x3 x4)
(1 missing value generated)
. egen t1 = rowtotal(x1 x2 x3 x4)
. egen t2 = rowtotal(x1 x2 x3 x4), missing
(1 missing value generated)
. list x1 x2 x3 x4 m t1 t2
```

	x1	x2	x3	x4	m	t1	t2
1.	2	6	4	8	5	20	20
2.	9	.	0	3	4	12	12
3.	.	.a	.b	2	2	2	2
4.	.	.a	3	6	4.5	9	9
5.	4	5	5	2	4	16	16
6.	7	8	4	5	6	24	24
7.	.b	.a	.	.	.	0	.

rowmean() uses all the nonmissing values to calculate the mean of a row, ignoring any missing values. In the first row, all four variables are nonmissing, so the result is the mean of these four values. In the second row, three variables are nonmissing, and the result is the mean of these three values. In the third row, only one variable is nonmissing, and the result is simply the mean of this one value, that is, the value itself.

rowtotal() is similar to rowmean(), except that by default the total is 0 when all four variables are missing. See the 7th observation in this example. The result t1 is 0 in this case. If you want rowtotal() to behave like rowmean(), use the missing option. The result t2 is produced with this option, and you can see it is missing for the 7th observation, just like the rowmean() result.

Several egen functions have a missing option. See *Syntax* for the description of what missing does with each function that has this option—or better yet create a simple example, and run the function with and without the missing option.

◁

Generating patterns

To create a sequence of numbers, simply "show" the fill() function how the sequence should look. It must be a linear progression to produce the expected results. Stata does not understand geometric progressions. To produce repeating patterns, you present fill() with the pattern twice in the *numlist*.

▷ Example 5: Sequences produced by fill()

Here are some examples of ascending and descending sequences produced by fill():

```
. clear
. set obs 12
Number of observations (_N) was 0, now 12.
. egen i = fill(1 2)
. egen w = fill(100 99)
```

```
. egen x = fill(22 17)
. egen y = fill(1 1 2 2)
. egen z = fill(8 8 8 7 7 7)
. list, sep(4)
```

	i	w	x	y	z
1.	1	100	22	1	8
2.	2	99	17	1	8
3.	3	98	12	2	8
4.	4	97	7	2	7
5.	5	96	2	3	7
6.	6	95	-3	3	7
7.	7	94	-8	4	6
8.	8	93	-13	4	6
9.	9	92	-18	5	6
10.	10	91	-23	5	5
11.	11	90	-28	6	5
12.	12	89	-33	6	5

◁

▷ Example 6: Patterns produced by fill( )

Here are examples of patterns produced by `fill()`:

```
. clear
. set obs 12
Number of observations (_N) was 0, now 12.
. egen a = fill(0 0 1 0 0 1)
. egen b = fill(1 3 8 1 3 8)
. egen c = fill(-3(3)6 -3(3)6)
. egen d = fill(10 20 to 50   10 20 to 50)
. list, sep(4)
```

	a	b	c	d
1.	0	1	-3	10
2.	0	3	0	20
3.	1	8	3	30
4.	0	1	6	40
5.	0	3	-3	50
6.	1	8	0	10
7.	0	1	3	20
8.	0	3	6	30
9.	1	8	-3	40
10.	0	1	0	50
11.	0	3	3	10
12.	1	8	6	20

◁

▷ Example 7: seq()

seq() creates a new variable containing one or more sequences of integers. It is useful mainly for quickly creating observation identifiers or automatically numbering levels of factors or categorical variables.

```
. clear
. set obs 12
```

In the simplest case,

```
. egen a = seq()
```

is just equivalent to the common idiom

```
. generate a = _n
```

a may also be obtained from

```
. range a 1 _N
```

(the actual value of _N may also be used).

In more complicated cases, seq() with option calls is equivalent to calls to the versatile functions int and mod.

```
. egen b = seq(), b(2)
```

produces integers in blocks of 2, whereas

```
. egen c = seq(), t(6)
```

restarts the sequence after 6 is reached.

```
. egen d = seq(), f(10) t(12)
```

shows that sequences may start with integers other than 1, and

```
. egen e = seq(), f(3) t(1)
```

shows that they may decrease.

The results of these commands are shown by

```
. list, sep(4)
```

	a	b	c	d	e
1.	1	1	1	10	3
2.	2	1	2	11	2
3.	3	2	3	12	1
4.	4	2	4	10	3
5.	5	3	5	11	2
6.	6	3	6	12	1
7.	7	4	1	10	3
8.	8	4	2	11	2
9.	9	5	3	12	1
10.	10	5	4	10	3
11.	11	6	5	11	2
12.	12	6	6	12	1

All of these sequences could have been generated in one line with `generate` and with the use of the `int` and `mod` functions. The variables `b` through `e` are obtained with

```
. gen b = 1 + int((_n - 1)/2)
. gen c = 1 + mod(_n - 1, 6)
. gen d = 10 + mod(_n - 1, 3)
. gen e = 3 - mod(_n - 1, 3)
```

Nevertheless, `seq()` may save users from puzzling out such solutions or from typing in the needed values.

In general, the sequences produced depend on the sort order of observations, following three rules:

1. observations excluded by `if` or `in` are not counted;
2. observations are sorted by *varlist*, if specified; and
3. otherwise, the order is that specified when `seq()` is called.

◁

The `fill()` and `seq()` functions are alternatives. In essence, `fill()` requires a minimal example that indicates the kind of sequence required, whereas `seq()` requires that the rule be specified through options. There are sequences that `fill()` can produce that `seq()` cannot, and vice versa. `fill()` cannot be combined with `if` or `in`, in contrast to `seq()`, which can.

Marking differences among variables

▷ Example 8: diff()

We have three measures of respondents' income obtained from different sources. We wish to create the variable `differ` equal to 1 for disagreements:

```
. use https://www.stata-press.com/data/r19/egenxmpl3, clear
. egen byte differ = diff(inc*)
. list if differ==1
```

	inc1	inc2	inc3	id	differ
10.	42,491	41,491	41,491	110	1
11.	26,075	25,075	25,075	111	1
12.	26,283	25,283	25,283	112	1
78.	41,780	41,780	41,880	178	1
100.	25,687	26,687	25,687	200	1
101.	25,359	26,359	25,359	201	1
102.	25,969	26,969	25,969	202	1
103.	25,339	26,339	25,339	203	1
104.	25,296	26,296	25,296	204	1
105.	41,800	41,000	41,000	205	1
134.	26,233	26,233	26,133	234	1

Rather than typing `diff(inc*)`, we could have typed `diff(inc1 inc2 inc3)`.

◁

Ranks

▷ Example 9: rank( )

Most applications of `rank()` will be to one variable, but the argument *exp* can be more general, namely, an expression. In particular, `rank(-`*varname*`)` reverses ranks from those obtained by `rank(`*varname*`)`.

The default ranking and those obtained by using one of the `track`, `field`, and `unique` options differ principally in their treatment of ties. The default is to assign the same rank to tied values such that the sum of the ranks is preserved. The `track` option assigns the same rank but resembles the convention in track events; thus, if one person had the lowest time and three persons tied for second-lowest time, their ranks would be 1, 2, 2, and 2, and the next person(s) would have rank 5. The `field` option acts similarly except that the highest is assigned rank 1, as in field events in which the greatest distance or height wins. The `unique` option breaks ties arbitrarily: its most obvious use is assigning ranks for a graph of ordered values. See also `group()` for another kind of "ranking".

```
. use https://www.stata-press.com/data/r19/auto, clear
(1978 automobile data)
. keep in 1/10
(64 observations deleted)
. egen rank = rank(mpg)
. egen rank_r = rank(-mpg)
. egen rank_f = rank(mpg), field
. egen rank_t = rank(mpg), track
. egen rank_u = rank(mpg), unique
. egen rank_ur = rank(-mpg), unique
. sort rank_u
. list mpg rank*
```

	mpg	rank	rank_r	rank_f	rank_t	rank_u	rank_ur
1.	15	1	10	10	1	1	10
2.	16	2	9	9	2	2	9
3.	17	3	8	8	3	3	8
4.	18	4	7	7	4	4	7
5.	19	5	6	6	5	5	6
6.	20	6.5	4.5	4	6	6	5
7.	20	6.5	4.5	4	6	7	4
8.	22	8.5	2.5	2	8	8	3
9.	22	8.5	2.5	2	8	9	2
10.	26	10	1	1	10	10	1

◁

Standardized variables

▷ Example 10: std()

We have a variable called age recording the median age in the 50 states. We wish to create the standardized value of age and verify the calculation:

```
. use https://www.stata-press.com/data/r19/states1, clear
(State data)

. egen stdage = std(age)

. summarize age stdage

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
         age |         50       29.54    1.693445       24.2       34.7
      stdage |         50    6.41e-09           1  -3.153336   3.047044
. correlate age stdage
(obs=50)

             |      age   stdage
-------------+------------------
         age |   1.0000
      stdage |   1.0000   1.0000
```

summarize shows that the new variable has a mean of approximately zero; 10^{-9} is the precision of a float and is close enough to zero for all practical purposes. If we wanted, we could have typed egen double stdage = std(age), making stdage a double-precision variable, and the mean would have been 10^{-16}. In any case, summarize also shows that the standard deviation is 1. correlate shows that the new variable and the original variable are perfectly correlated.

We may optionally specify the mean and standard deviation for the new variable. For instance,

```
. egen newage1 = std(age), sd(2)

. egen newage2 = std(age), mean(2) sd(4)

. egen newage3 = std(age), mean(2)

. summarize age newage1-newage3

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
         age |         50       29.54    1.693445       24.2       34.7
     newage1 |         50    1.28e-08           2  -6.306671   6.094089
     newage2 |         50           2           4  -10.61334   14.18818
     newage3 |         50           2           1  -1.153336   5.047044
. correlate age newage1-newage3
(obs=50)

             |      age  newage1  newage2  newage3
-------------+------------------------------------
         age |   1.0000
     newage1 |   1.0000   1.0000
     newage2 |   1.0000   1.0000   1.0000
     newage3 |   1.0000   1.0000   1.0000   1.0000
```

◁

Row functions

▷ Example 11: rowtotal()

generate's sum() function creates the vertical, running sum of its argument, whereas egen's total() function creates a constant equal to the overall sum. egen's rowtotal() function, however, creates the horizontal sum of its arguments. They all treat missing as zero. However, if the missing option is specified with total() or rowtotal(), then *newvar* will contain missing values if all values of *exp* or *varlist* are missing.

```
. use https://www.stata-press.com/data/r19/egenxmpl4, clear
. egen hsum = rowtotal(a b c)
. generate vsum = sum(hsum)
. egen sum = total(hsum)
. list
```

	a	b	c	hsum	vsum	sum
1.	.	2	3	5	5	63
2.	4	.	6	10	15	63
3.	7	8	.	15	30	63
4.	10	11	12	33	63	63

◁

▷ Example 12: rowmean(), rowmedian(), rowpctile(), rowsd(), and rownonmiss()

summarize displays the mean and standard deviation of a variable across observations; program writers can access the mean in r(mean) and the standard deviation in r(sd) (see [R] **summarize**). egen's rowmean() function creates the means of observations across variables. rowmedian() creates the medians of observations across variables. rowpctile() returns the #th percentile of the variables specified in *varlist*. rowsd() creates the standard deviations of observations across variables. rownonmiss() creates a count of the number of nonmissing observations, the denominator of the rowmean() calculation:

```
. use https://www.stata-press.com/data/r19/egenxmpl4, clear
. egen avg = rowmean(a b c)
. egen median = rowmedian(a b c)
. egen pct25 = rowpctile(a b c), p(25)
. egen std = rowsd(a b c)
. egen n = rownonmiss(a b c)
. list
```

	a	b	c	avg	median	pct25	std	n
1.	.	2	3	2.5	2.5	2	.7071068	2
2.	4	.	6	5	5	4	1.414214	2
3.	7	8	.	7.5	7.5	7	.7071068	2
4.	10	11	12	11	11	10	1	3

◁

▷ Example 13: rowmiss( )

`rowmiss()` returns k − `rownonmiss()`, where k is the number of variables specified. `rowmiss()` can be especially useful for finding casewise-deleted observations caused by missing values.

```
. use https://www.stata-press.com/data/r19/auto3, clear
(1978 automobile data)

. correlate price weight mpg
(obs=70)

             |    price   weight      mpg
-------------+---------------------------
       price |   1.0000
      weight |   0.5309   1.0000
         mpg |  -0.4478  -0.7985   1.0000

. egen excluded = rowmiss(price weight mpg)

. list make price weight mpg if excluded~=0

     +-------------------------------------------+
     | make               price   weight   mpg  |
     |-------------------------------------------|
  5. | Buick Electra          .    4,080    15  |
 12. | Cad. Eldorado     14,500    3,900     .  |
 40. | Olds Starfire      4,195        .    24  |
 51. | Pont. Phoenix          .    3,420     .  |
     +-------------------------------------------+
```

◁

▷ Example 14: rowmin( ), rowmax( ), rowfirst( ), and rowlast( )

`rowmin()`, `rowmax()`, `rowfirst()`, and `rowlast()` return the minimum, maximum, first, or last nonmissing value, respectively, for the specified variables within an observation (row).

```
. use https://www.stata-press.com/data/r19/egenxmpl5, clear

. egen min = rowmin(x y z)
(1 missing value generated)

. egen max = rowmax(x y z)
(1 missing value generated)

. egen first = rowfirst(x y z)
(1 missing value generated)

. egen last = rowlast(x y z)
(1 missing value generated)

. list, sep(4)

     +--------------------------------------------+
     |  x    y    z   min   max   first   last   |
     |--------------------------------------------|
  1. | -1    2    3    -1     3      -1      3   |
  2. |  .   -6    .    -6    -6      -6     -6   |
  3. |  7    .   -5    -5     7       7     -5   |
  4. |  .    .    .     .     .       .      .   |
     |--------------------------------------------|
  5. |  4    .    .     4     4       4      4   |
  6. |  .    .    8     8     8       8      8   |
  7. |  .    3    7     3     7       3      7   |
  8. |  5   -1    6    -1     6       5      6   |
     +--------------------------------------------+
```

◁

Categorical and integer variables

▷ Example 15: anyvalue( ), anymatch( ), and anycount( )

`anyvalue()`, `anymatch()`, and `anycount()` are for categorical or other variables taking integer values. If we define a subset of values specified by an integer *numlist* (see **[U] 11.1.8 numlist**), `anyvalue()` extracts the subset, leaving every other value missing; `anymatch()` defines an indicator variable (1 if in subset, 0 otherwise); and `anycount()` counts occurrences of the subset across a set of variables. Therefore, with just one variable, `anymatch(`*varname*`)` and `anycount(`*varname*`)` are equivalent.

With the `auto` dataset, we can generate a variable containing the high values of `rep78` and a variable indicating whether `rep78` has a high value:

```
. use https://www.stata-press.com/data/r19/auto, clear
(1978 automobile data)
. egen hirep = anyvalue(rep78), v(3/5)
(15 missing values generated)
. egen ishirep = anymatch(rep78), v(3/5)
```

Here it is easy to produce the same results with official Stata commands:

```
. generate hirep = rep78 if inlist(rep78,3,4,5)
. generate byte ishirep = inlist(rep78,3,4,5)
```

However, as the specification becomes more complicated or involves several variables, the `egen` functions may be more convenient.

◁

▷ Example 16: group( )

`group()` maps the distinct groups of a varlist to a categorical variable that takes on integer values from 1 to the total number of groups. order of the groups is that of the sort order of *varlist*. The *varlist* may be of numeric variables, string variables, or a mixture of the two. The resulting variable can be useful for many purposes, including stepping through the distinct groups easily and systematically and cleaning up an untidy ordering. Suppose that the actual (and arbitrary) codes present in the data are 1, 2, 4, and 7, but we desire equally spaced numbers, as when the codes will be values on one axis of a graph. `group()` maps these to 1, 2, 3, and 4.

We have a variable `agegrp` that takes on the values 24, 40, 50, and 65, corresponding to age groups 18–24, 25–40, 41–50, and 51 and above. Perhaps we created this coding using the `recode()` function (see **[U] 13.3 Functions** and **[U] 26 Working with categorical data and factor variables**) from another age-in-years variable:

```
. generate agegrp=recode(age,24,40,50,65)
```

We now want to change the codes to 1, 2, 3, and 4:

```
. egen agegrp2 = group(agegrp)
```

◁

▷ Example 17: group( ) with missing values

We have two categorical variables, `race` and `sex`, which may be string or numeric. We want to use `ir` (see [R] **Epitab**) to create a Mantel–Haenszel weighted estimate of the incidence rate. `ir`, however, allows only one variable to be specified in its `by()` option. We type

```
. use https://www.stata-press.com/data/r19/egenxmpl6, clear
. egen racesex = group(race sex)
(2 missing values generated)
. ir deaths smokes pyears, by(racesex)
  (output omitted)
```

The new numeric variable, `racesex`, will be missing wherever `race` or `sex` is missing (meaning `.` for numeric variables and `""` for string variables), so missing values will be handled correctly. When we list some of the data, we see

```
. list race sex racesex in 1/7, sep(0)
```

	race	sex	racesex
1.	White	Female	1
2.	White	Male	2
3.	Black	Female	3
4.	Black	Male	4
5.	Black	Male	4
6.	.	Female	.
7.	Black	.	.

`group()` began by putting the data in the order of the grouping variables and then assigned the numeric codes. Observations 6 and 7 were assigned to `racesex` = `.` because, in one case, `race` was not known, and in the other, `sex` was not known. (These observations were not used by `ir`.)

If we wanted the unknown groups to be treated just as any other category, we could have typed

```
. egen rs2 = group(race sex), missing
. list race sex rs2 in 1/7, sep(0)
```

	race	sex	rs2
1.	White	Female	1
2.	White	Male	2
3.	Black	Female	3
4.	Black	Male	4
5.	Black	Male	4
6.	.	Female	6
7.	Black	.	5

The resulting variable from `group()` does not have value labels. Therefore, the values carry no indication of meaning. Interpretation requires comparison with the original *varlist*. To get value labels, we specify the option `label`.

```
. egen rs3 = group(race sex), missing label
. list race sex rs3 in 1/7, sep(0)
```

```
     +------------------------------+
     |  race      sex           rs3 |
     |------------------------------|
  1. | White   Female  White Female |
  2. | White     Male    White Male |
  3. | Black   Female  Black Female |
  4. | Black     Male    Black Male |
  5. | Black     Male    Black Male |
  6. |     .   Female      . Female |
  7. | Black        .       Black . |
     +------------------------------+
```

The numeric values of the generated variable `rs3` are the same as `rs2`, but `rs3` has a value label that indicates the categories of `race` and `sex` that define the groups. The value label created by `group()` uses the actual values of the categorical variables or their value labels, if they exist. In this case, the categorical variables `race` and `sex` are numeric variables with value labels, so their value labels were used to create the value label for `rs3`.

◁

String variables

Concatenation of string variables is provided in Stata. In context, Stata understands the addition symbol + as specifying concatenation or adding strings end to end. `"soft" + "ware"` produces `"software"`, and given string variables `s1` and `s2`, `s1 + s2` indicates their concatenation.

The complications that may arise in practice include wanting 1) to concatenate the string versions of numeric variables and 2) to concatenate variables, together with some separator such as a space or a comma. Given numeric variables `n1` and `n2`,

```
. generate newstr = s1 + string(n1) + string(n2) + s2
```

shows how numeric values may be converted to their string equivalents before concatenation, and

```
. generate newstr = s1 + " " + s2 + " " + s3
```

shows how spaces may be added between variables. Stata will automatically assign the most appropriate data type for the new string variables.

▷ Example 18: concat( )

`concat()` allows us to do everything in one line concisely.

```
. egen newstr = concat(s1 n1 n2 s2)
```

carries with it an implicit instruction to convert numeric values to their string equivalents, and the appropriate string data type is worked out within `concat()` by Stata's automatic promotion. Moreover,

```
. egen newstr = concat(s1 s2 s3), p(" ")
```

specifies that spaces be used as separators. (The default is to have no separation of concatenated strings.)

As an example of punctuation other than a space, consider

```
. egen fullname = concat(surname forename), p(", ")
```

Noninteger numerical values can cause difficulties, but

```
. egen newstr = concat(n1 n2), format(%9.3f) p(" ")
```

specifies the use of format `%9.3f`. This is equivalent to

```
. generate str1 newstr = ""
. replace newstr = string(n1,"%9.3f") + " " + string(n2,"%9.3f")
```

See [FN] **String functions** for more about `string()`.

◁

As a final flourish, the `decode` option instructs `concat()` to use value labels. With that option, the `maxlength()` option may also be used. For more details about `decode`, see [D] **encode**. Unlike the `decode` command, however, `concat()` uses `string(`*varname*`)`, not `""`, whenever values of *varname* are not associated with value labels, and the `format()` option, whenever specified, applies to this use of `string()`.

▷ Example 19: ends()

The `ends(`*strvar*`)` function is used for subdividing strings. The approach is to find specified separators by using the `strpos()` string function and then to extract what is desired, which either precedes or follows the separators, using the `substr()` string function.

By default, substrings are considered to be separated by individual spaces, so we will give definitions in those terms and then generalize.

The head of the string is whatever precedes the first space or is the whole of the string if no space occurs. This could also be called the first "word". The tail of the string is whatever follows the first space. This could be nothing or one or more words. The last word in the string is whatever follows the last space or is the whole of the string if no space occurs.

To clarify, let's look at some examples. The quotation marks here just mark the limits of each string and are not part of the strings.

	`head`	`tail`	`last`
`"frog"`	`"frog"`	`""`	`"frog"`
`"frog toad"`	`"frog"`	`"toad"`	`"toad"`
`"frog toad newt"`	`"frog"`	`"toad newt"`	`"newt"`
`"frog  toad newt"`	`"frog"`	`" toad newt"`	`"newt"`
`"frog toad  newt"`	`"frog"`	`"toad  newt"`	`"newt"`

The main subtlety is that these functions are literal, so the tail of `"frog  toad newt"`, in which two spaces follow `"frog"`, includes the second of those spaces, and is thus `" toad newt"`. Therefore, you may prefer to use the `trim` option to trim the result of any leading or trailing spaces, producing `"toad newt"` in this instance.

The `punct(`*pchars*`)` option may be used to specify separators other than spaces. The general definitions of the `head`, `tail`, and `last` options are therefore interpreted in terms of whatever separator has been specified; that is, they are relative to the first or last occurrence of the separator in the string value.

Thus, with `punct(,)` and the string `"Darwin, Charles Robert"`, the head is `"Darwin"`, and the tail and the last are both `" Charles Robert"`. Note again the leading space in this example, which may be trimmed with `trim`. The punctuation (here the comma, "`,`") is discarded, just as it is with one space.

pchars, the argument of `punct()`, will usually, but not always, be one character. If two or more characters are specified, these must occur together; for example, `punct(:;)` would mean that words are separated by a colon followed by a semicolon (that is, `:;`). It is not implied, in particular, that the colon and semicolon are alternatives. To do that, you would have to modify the programs presented here or resort to first principles by using `split`; see [D] **split**.

With personal names, the `head` or `last` option might be applied to extract surnames if strings were similar to `"Darwin, Charles Robert"` or `"Charles Robert Darwin"`, with the surname coming first or last. What then happens with surnames like `"von Neumann"` or `"de la Mare"`? `"von Neumann, John"` is no problem, if the comma is specified as a separator, but the `last` option is not intelligent enough to handle `"Walter de la Mare"` properly.

◁

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Many of the other `egen` functions were written by Nicholas J. Cox of the Department of Geography at Durham University, UK, and coeditor of the *Stata Journal* and author of *Speaking Stata Graphics*.

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Also see

[D] **collapse** — Make dataset of summary statistics

[D] **generate** — Create or change contents of variable

[U] 13.3 Functions

encode — Encode string into numeric and vice versa

Description

encode creates a new variable named *newvar* based on the string variable *varname*, creating, adding to, or just using (as necessary) the value label *newvar* or, if specified, *name*. *Do not* use encode if *varname* contains numbers that merely happen to be stored as strings; instead, use generate *newvar* = real(*varname*) or destring; see **[U] 24.2 Categorical string variables**, [FN] **String functions**, and [D] **destring**.

decode creates a new string variable named *newvar* based on the "encoded" numeric variable *varname* and its value label.

Quick start

Generate numeric newv1 from string v1, using the values of v1 to create a value label that is applied to newv1

```
encode v1, generate(newv1)
```

Same as above, but name the value label mylabel1

```
encode v1, generate(newv1) label(mylabel1)
```

Same as above, but refuse to encode v1 if values exist in v1 that are not present in preexisting value label mylabel1

```
encode v1, generate(newv1) label(mylabel1) noextend
```

Convert numeric v2 to string newv2 using the value label applied to v2 to generate values of newv2

```
decode v2, generate(newv2)
```

Menu

encode

Data > Create or change data > Other variable-transformation commands > Encode value labels from string variable

decode

Data > Create or change data > Other variable-transformation commands > Decode strings from labeled numeric variable

Syntax

String variable to numeric variable

`encode` *varname* [*if*] [*in*] , `generate(`*newvar*`)` [`label(`*name*`)` `noextend`]

Numeric variable to string variable

`decode` *varname* [*if*] [*in*] , `generate(`*newvar*`)` [`maxlength(#)`]

Options for encode

`generate(`*newvar*`)` is required and specifies the name of the variable to be created.

`label(`*name*`)` specifies the name of the value label to be created or used and added to if the named value label already exists. If `label()` is not specified, `encode` uses the same name for the label as it does for the new variable.

`noextend` specifies that *varname* not be encoded if there are values contained in *varname* that are not present in `label(`*name*`)`. By default, any values not present in `label(`*name*`)` will be added to that label.

Options for decode

`generate(`*newvar*`)` is required and specifies the name of the variable to be created.

`maxlength(#)` specifies how many bytes of the value label to retain; # must be between 1 and 32,000. The default is `maxlength(32000)`.

Remarks and examples

Remarks are presented under the following headings:

encode

`encode` is most useful in making string variables accessible to Stata's statistical routines, most of which can work only with numeric variables. `encode` is also useful in reducing the size of a dataset. If you are not familiar with value labels, read **[U] 12.6.3 Value labels**.

The maximum number of associations within each value label is 65,536. Each association in a value label maps a string of up to 32,000 bytes to a number. For plain ASCII text, the number of bytes is equal to the number of characters. If your string has other Unicode characters, the number of bytes is greater than the number of characters. See **[U] 12.4.2 Handling Unicode strings**. If your variable contains string values longer than 32,000 bytes, then only the first 32,000 bytes are retained and assigned as a value label to a number.

▷ Example 1

We have a dataset on high blood pressure, and among the variables is `sex`, a string variable containing either "male" or "female". We wish to run a regression of high blood pressure on race, sex, and age group. We type `regress hbp race sex age_grp` and get the message "no observations".

```
. use https://www.stata-press.com/data/r19/hbp2
. regress hbp sex race age_grp
no observations
r(2000);
```

Stata's statistical procedures cannot directly deal with string variables; as far as they are concerned, all observations on `sex` are missing. `encode` provides the solution:

```
. encode sex, gen(gender)
. regress hbp gender race age_grp

      Source |       SS           df       MS      Number of obs   =     1,121
-------------+----------------------------------   F(3, 1117)      =     15.15
       Model |  2.01013476         3  .67004492    Prob > F        =    0.0000
    Residual |  49.3886164     1,117  .044215413   R-squared       =    0.0391
-------------+----------------------------------   Adj R-squared   =    0.0365
       Total |  51.3987511     1,120  .045891742   Root MSE        =    .21027

------------------------------------------------------------------------------
         hbp | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
      gender |   .0394747   .0130022     3.04   0.002     .0139633    .0649861
        race |  -.0409453   .0113721    -3.60   0.000    -.0632584   -.0186322
     age_grp |   .0241484     .00624     3.87   0.000     .0119049    .0363919
       _cons |   -.016815   .0389167    -0.43   0.666     -.093173     .059543
------------------------------------------------------------------------------
```

`encode` looks at a string variable and makes an internal table of all the values it takes on, here "male" and "female". It then alphabetizes that list and assigns numeric codes to each entry. Thus 1 becomes "female" and 2 becomes "male". It creates a new `int` variable (`gender`) and substitutes a 1 where `sex` is "female", a 2 where `sex` is "male", and a *missing* (`.`) where `sex` is *null* (`""`). It creates a value label (also named `gender`) that records the mapping 1 ↔ `female` and 2 ↔ `male`. Finally, `encode` labels the values of the new variable with the value label.

◁

▷ Example 2

It is difficult to distinguish the result of `encode` from the original string variable. For instance, in our last two examples, we typed `encode sex, gen(gender)`. Let's compare the two variables:

```
. list sex gender in 1/4

     +-----------------+
     |    sex   gender |
     |-----------------|
  1. | female   female |
  2. |               . |
  3. |   male     male |
  4. |   male     male |
     +-----------------+
```

They look almost identical, although you should notice the missing value for `gender` in the second observation.

The difference does show, however, if we tell `list` to ignore the value labels and show how the data really appear:

```
. list sex gender in 1/4, nolabel

     +-----------------+
     |    sex   gender |
     |-----------------|
  1. | female        1 |
  2. |               . |
  3. |   male        2 |
  4. |   male        2 |
     +-----------------+
```

We could also ask to see the underlying value label:

```
. label list gender
gender:
           1 female
           2 male
```

`gender` really is a numeric variable, but because *all* Stata commands understand value labels, the variable displays as “male” and “female”, just as the underlying string variable `sex` would.

◁

▷ Example 3

We can drastically reduce the size of our dataset by encoding strings and then discarding the underlying string variable. We have a string variable, `sex`, that records each person’s sex as “male” and “female”. Because female has six characters, the variable is stored as a `str6`.

We can `encode` the `sex` variable and use `compress` to store the variable as a `byte`, which takes only 1 byte. Because our dataset contains 1,130 people, the string variable takes 6,780 bytes, but the encoded variable will take only 1,130 bytes.

```
. use https://www.stata-press.com/data/r19/hbp2, clear

. describe

Contains data from https://www.stata-press.com/data/r19/hbp2.dta
 Observations:         1,130
    Variables:             7                  3 Mar 2024 06:47
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
id              str10   %10s                  Record identification number
city            byte    %8.0g                 City
year            int     %8.0g                 Year
age_grp         byte    %8.0g      agefmt     Age group
race            byte    %8.0g      racefmt    Race
hbp             byte    %8.0g      yn         High blood pressure
sex             str6    %9s                   Sex
-------------------------------------------------------------------------------
Sorted by:

. encode sex, generate(gender)
```

```
. list sex gender in 1/5

     ┌─────────────────┐
     │    sex   gender │
     ├─────────────────┤
  1. │ female   female │
  2. │               . │
  3. │   male     male │
  4. │   male     male │
  5. │ female   female │
     └─────────────────┘

. drop sex

. rename gender sex

. compress
  variable sex was long now byte
  (3,390 bytes saved)

. describe

Contains data from https://www.stata-press.com/data/r19/hbp2.dta
 Observations:         1,130
    Variables:             7                  3 Mar 2024 06:47
────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
────────────────────────────────────────────────────────────────────────────────
id              str10   %10s                  Record identification number
city            byte    %8.0g                 City
year            int     %8.0g                 Year
age_grp         byte    %8.0g      agefmt     Age group
race            byte    %8.0g      racefmt    Race
hbp             byte    %8.0g      yn         High blood pressure
sex             byte    %8.0g      gender     Sex
────────────────────────────────────────────────────────────────────────────────
Sorted by:
     Note: Dataset has changed since last saved.
```

The size of our dataset has fallen from 24,860 bytes to 19,210 bytes.

◁

❑ Technical note

In the examples above, the value label did not exist before encode created it, because that is not required. If the value label does exist, encode uses your encoding as far as it can and adds new mappings for anything not found in your value label. For instance, if you wanted “female” to be encoded as 0 rather than 1 (possibly for use in linear regression), you could type

```
. label define gender 0 "female"

. encode sex, gen(gender)
```

You can also specify the name of the value label. If you do not, the value label is assumed to have the same name as the newly created variable. For instance,

```
. label define sexlbl 0 "female"

. encode sex, gen(gender) label(sexlbl)
```

❑

decode

decode is used to convert numeric variables with associated value labels into true string variables.

▷ Example 4

We have a numeric variable named female that records the values 0 and 1. female is associated with a value label named sexlbl that says that 0 means male and 1 means female:

```
. use https://www.stata-press.com/data/r19/hbp3, clear

. describe female

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
female          byte    %8.0g      sexlbl     Female

. label list sexlbl
sexlbl:
           0 Male
           1 Female
```

We see that female is stored as a byte. It is a numeric variable. Nevertheless, it has an associated value label describing what the numeric codes mean, so if we tabulate the variable, for instance, it appears to contain the strings “male” and “female”:

```
. tabulate female

     Female |      Freq.     Percent        Cum.
------------+-----------------------------------
       Male |        695       61.61       61.61
     Female |        433       38.39      100.00
------------+-----------------------------------
      Total |      1,128      100.00
```

We can create a real string variable from this numerically encoded variable by using decode:

```
. decode female, gen(sex)

. describe sex

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
sex             str6    %9s                   Female
```

We have a new variable called sex. It is a string, and Stata automatically created the shortest possible string. The word “female” has six characters, so our new variable is a str6. female and sex appear indistinguishable:

```
. list female sex in 1/4

     +-----------------+
     | female      sex |
     |-----------------|
  1. | Female   Female |
  2. |      .          |
  3. |   Male     Male |
  4. |   Male     Male |
     +-----------------+
```

But when we add `nolabel`, the difference is apparent:

```
. list female sex in 1/4, nolabel

     +-----------------+
     | female      sex |
     |-----------------|
  1. |      1   Female |
  2. |      .          |
  3. |      0     Male |
  4. |      0     Male |
     +-----------------+
```

◁

▷ Example 5

`decode` is most useful in instances when we wish to match-merge two datasets on a variable that has been encoded inconsistently.

For instance, we have two datasets on individual states in which one of the variables (`state`) takes on values such as "CA" and "NY". The state variable was originally a string, but along the way the variable was encoded into an integer with a corresponding value label in one or both datasets.

We wish to merge these two datasets, but either 1) one of the datasets has a string variable for state and the other an encoded variable or 2) although both are numeric, we are not certain that the codings are consistent. Perhaps "CA" has been coded 5 in one dataset and 6 in another.

Because `decode` will take an encoded variable and turn it back into a string, `decode` provides the solution:

```
use first                    (load the first dataset)
decode state, gen(st)        (make a string state variable)
drop state                   (discard the encoded variable)
sort st                      (sort on string)
save first, replace          (save the dataset)
use second                   (load the second dataset)
decode state, gen(st)        (make a string variable)
drop state                   (discard the encoded variable)
sort st                      (sort on string)
merge 1:1 st using first     (merge the data)
```

◁

Video example

How to convert categorical string variables to labeled numeric variables

References

Cox, N. J., and C. B. Schechter. 2018. Speaking Stata: Seven steps for vexatious string variables. *Stata Journal* 18: 981–994.

Schechter, C. B. 2011. Stata tip 99: Taking extra care with encode. *Stata Journal* 11: 321–322.

Also see

[D] **compress** — Compress data in memory

[D] **destring** — Convert string variables to numeric variables and vice versa

[D] **generate** — Create or change contents of variable

[U] **12.6.3 Value labels**

[U] **24.2 Categorical string variables**

erase — Erase a disk file

Description   Quick start   Syntax   Remarks and examples   Also see

Description

The `erase` command erases files stored on disk. `rm` is a synonym for `erase` for the convenience of Mac and Unix users.

Stata for Mac users: `erase` is permanent; the file is not moved to the Trash but is immediately removed from the disk.

Stata for Windows users: `erase` is permanent; the file is not moved to the Recycle Bin but is immediately removed from the disk.

Quick start

Delete `mylog.smcl` from current directory in Stata for Windows

```
erase mylog.smcl
```

Same as above for Mac and Unix

```
rm mylog.smcl
```

Delete `mydata.dta` from current directory in Stata for Windows

```
erase mydata.dta
```

Same as above for Mac and Unix

```
rm mydata.dta
```

Delete `mylog.smcl` from `C:\my dir\my folder` in Stata for Windows

```
erase "c:\my dir\my folder\mylog.smcl"
```

Same as above for Mac and Unix

```
rm "~/my dir/my folder/mylog.smcl"
```

Syntax

{ `erase` | `rm` } ["] *filename* ["]

Note: Double quotes must be used to enclose *filename* if the name contains spaces.

Remarks and examples

The only difference between Stata's `erase` (`rm`) command and the Windows command prompt `DEL` or Unix `rm`(1) command is that we may not specify groups of files. Stata requires that we erase files one at a time.

Mac users may prefer to discard files by dragging them to the Trash.

Windows users may prefer to discard files by dragging them to the Recycle Bin.

▷ Example 1

Stata provides seven operating system equivalent commands: cd, copy, dir, erase, mkdir, rmdir, and type, or, from the Unix perspective, cd, copy, ls, rm, mkdir, rmdir, and cat. These commands are provided for Mac users, too. Stata users can also issue any operating system command by using Stata's shell command, so you should never have to exit Stata to perform some housekeeping detail.

Suppose that we have the file mydata.dta stored on disk and we wish to permanently eliminate it:

```
. erase mydata
file mydata not found
r(601);

. erase mydata.dta

. _
```

Our first attempt, erase mydata, was unsuccessful. Although Stata ordinarily supplies the file extension for you, it does not do so when you type erase. You must be explicit. Our second attempt eliminated the file. Unix users could have typed rm mydata.dta if they preferred.

◁

Also see

[D] **cd** — Change directory

[D] **copy** — Copy file from disk or URL

[D] **dir** — Display filenames

[D] **mkdir** — Create directory

[D] **rmdir** — Remove directory

[D] **shell** — Temporarily invoke operating system

[D] **type** — Display contents of a file

[U] 11.6 Filenaming conventions

expand — Duplicate observations

Description | Quick start | Menu | Syntax
Option | Remarks and examples | References | Also see

Description

`expand` replaces each observation in the dataset with *n* copies of the observation, where *n* is equal to the required expression rounded to the nearest integer. If the expression is less than 1 or equal to *missing*, it is interpreted as if it were 1, and the observation is retained but not duplicated.

Quick start

Duplicate each observation 3 times, resulting in the original and 2 copies

```
expand 3
```

Duplicate each observation the number of times stored in `v`

```
expand v
```

Same as above, but flag duplicated observations using generated `newv`

```
expand v, generate(newv)
```

Same as above, but only duplicate observations where `catvar` equals 4

```
expand v if catvar==4, generate(newv)
```

Menu

Data > Create or change data > Other variable-transformation commands > Duplicate observations

Syntax

expand [=] *exp* [*if*] [*in*] [, generate(*newvar*)]

Option

generate(*newvar*) creates new variable *newvar* containing 0 if the observation originally appeared in the dataset and 1 if the observation is a duplicate. For instance, after an expand, you could revert to the original observations by typing keep if *newvar*==0.

Remarks and examples

▷ Example 1

expand is, admittedly, a strange command. It can, however, be useful in tricky programs or for reformatting data for survival analysis (see examples in [R] **Epitab**). Here is a silly use of expand:

```
. use https://www.stata-press.com/data/r19/expandxmpl
. list

     +--------+
     |  n   x |
     |--------|
  1. | -1   1 |
  2. |  0   2 |
  3. |  1   3 |
  4. |  2   4 |
  5. |  3   5 |
     +--------+

. expand n
(1 negative count ignored; observation not deleted)
(1 zero count ignored; observation not deleted)
(3 observations created)

. list

     +--------+
     |  n   x |
     |--------|
  1. | -1   1 |
  2. |  0   2 |
  3. |  1   3 |
  4. |  2   4 |
  5. |  3   5 |
     |--------|
  6. |  2   4 |
  7. |  3   5 |
  8. |  3   5 |
     +--------+
```

The new observations are added to the end of the dataset. expand informed us that it created 3 observations. The first 3 observations were not replicated because n was less than or equal to 1. n is 2 in the fourth observation, so expand created one replication of this observation, bringing the total number of observations of this type to 2. expand created two replications of observation 5 because n is 3.

Because there were 5 observations in the original dataset and because expand adds new observations onto the end of the dataset, we could now undo the expansion by typing drop in 6/l.

◁

References

Cox, N. J. 2013. Stata tip 114: Expand paired dates to pairs of dates. *Stata Journal* 13: 217–219.

———. 2014. Stata tip 119: Expanding datasets for graphical ends. *Stata Journal* 14: 230–235.

Huber, C. 2014. How to simulate multilevel/longitudinal data. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2014/07/18/how-to-simulate-multilevellongitudinal-data/.

Also see

[D] **contract** — Make dataset of frequencies and percentages

[D] **expandcl** — Duplicate clustered observations

[D] **fillin** — Rectangularize dataset

expandcl — Duplicate clustered observations

Description

`expandcl` duplicates clusters of observations and generates a new variable that identifies the clusters uniquely.

`expandcl` replaces each cluster in the dataset with n copies of the cluster, where n is equal to the required expression rounded to the nearest integer. The expression is required to be constant within cluster. If the expression is less than 1 or equal to *missing*, it is interpreted as if it were 1, and the cluster is retained but not duplicated.

Quick start

Duplicate each set of observations on clusters identified by `cvar` 3 times, and store new cluster identifier in `newcv`

```
expandcl 3, cluster(cvar) generate(newcv)
```

Duplicate each cluster of observations the number of times stored in `v`

```
expandcl v, cluster(cvar) generate(newcv)
```

Menu

Data > Create or change data > Other variable-transformation commands > Duplicate clustered observations

Syntax

`expandcl` [`=`]*exp* [*if*] [*in*] `,` `cluster(`*varlist*`)` `generate(`*newvar*`)`

Options

`cluster(`*varlist*`)` is required and specifies the variables that identify the clusters before expanding the data.

`generate(`*newvar*`)` is required and stores unique identifiers for the duplicated clusters in *newvar*. *newvar* will identify the clusters by using consecutive integers starting from 1.

Remarks and examples

▷ Example 1

We will show how `expandcl` works by using a small dataset with five clusters. In this dataset, `cl` identifies the clusters, `x` contains a unique value for each observation, and `n` identifies how many copies we want of each cluster.

```
. use https://www.stata-press.com/data/r19/expclxmpl

. list, sepby(cl)

     +--------------+
     | cl   x     n |
     |--------------|
  1. | 10   1    -1 |
  2. | 10   2    -1 |
     |--------------|
  3. | 20   3     0 |
  4. | 20   4     0 |
     |--------------|
  5. | 30   5     1 |
  6. | 30   6     1 |
     |--------------|
  7. | 40   7   2.7 |
  8. | 40   8   2.7 |
     |--------------|
  9. | 50   9     3 |
 10. | 50  10     3 |
     |--------------|
 11. | 60  11     . |
 12. | 60  12     . |
     +--------------+

. expandcl n, generate(newcl) cluster(cl)
(2 missing counts ignored; observations not deleted)
(2 noninteger counts rounded to integer)
(2 negative counts ignored; observations not deleted)
(2 zero counts ignored; observations not deleted)
(8 observations created)

. sort newcl cl x
```

```
. list, sepby(newcl)
```

	cl	x	n	newcl
1.	10	1	-1	1
2.	10	2	-1	1
3.	20	3	0	2
4.	20	4	0	2
5.	30	5	1	3
6.	30	6	1	3
7.	40	7	2.7	4
8.	40	8	2.7	4
9.	40	7	2.7	5
10.	40	8	2.7	5
11.	40	7	2.7	6
12.	40	8	2.7	6
13.	50	9	3	7
14.	50	10	3	7
15.	50	9	3	8
16.	50	10	3	8
17.	50	9	3	9
18.	50	10	3	9
19.	60	11	.	10
20.	60	12	.	10

The first three clusters were not replicated because `n` was less than or equal to 1. `n` is 2.7 in the fourth cluster, so `expandcl` created two replications (2.7 was rounded to 3) of this cluster, bringing the total number of clusters of this type to 3. `expandcl` created two replications of cluster 50 because `n` is 3. Finally, `expandcl` did not replicate the last cluster because `n` was missing.

◁

Also see

[D] **expand** — Duplicate observations

[R] **bsample** — Sampling with replacement

Description Remarks and examples Also see

Description

This entry provides a quick reference for determining which method to use for exporting Stata data from memory to other formats.

Remarks and examples

Remarks are presented under the following headings:

Summary of the different methods

export excel

- `export excel` creates Microsoft Excel worksheets in `.xls` and `.xlsx` files.
- Entire worksheets can be exported, or custom cell ranges can be overwritten.
- See [D] **import excel**.

export delimited

- `export delimited` creates comma-separated or tab-delimited files that many other programs can read.
- A custom delimiter may also be specified.
- The first line of the file can optionally contain the names of the variables.
- See [D] **import delimited**.

jdbc

- Java Database Connectivity (JDBC) is an application programming interface for the programming language Java. The `jdbc` command allows you to connect to, load data from, insert data into, and execute queries on a database using JDBC.
- See [D] **jdbc**.

odbc

- ODBC, an acronym for Open DataBase Connectivity, is a standard for exchanging data between programs. Stata supports the ODBC standard for exporting data via the `odbc` command and can write to any ODBC data source on your computer.

- See [D] **odbc**.

outfile

- `outfile` creates text-format datasets.
- The data can be written in space-separated or comma-separated format.
- Alternatively, the data can be written in fixed-column format.
- See [D] **outfile**.

export sasxport5 and export sasxport8

- `export sasxport5` saves SAS XPORT Version 5 Transport format files.
- `export sasxport5` can also write value-label information to a `formats.xpf` XPORT file.
- `export sasxport8` saves SAS XPORT Version 8 Transport format files.
- `export sasxport8` can also write value-label information to a SAS command (`.sas`) file.
- See [D] **import sasxport5** and [D] **import sasxport8**.

export spss

- `export spss` saves an IBM SPSS Statistics (`.sav`) file.
- See [D] **import spss**.

export dbase

- `export dbase` saves version IV dBase (`.dbf`) files.
- See [D] **import dbase**.

Also see

[D] **import** — Overview of importing data into Stata

[M-5] **_docx*()** — Generate Office Open XML (.docx) file

[M-5] **xl()** — Excel file I/O class

[RPT] **dyndoc** — Convert dynamic Markdown document to HTML or Word (.docx) document

[RPT] **putdocx intro** — Introduction to generating Office Open XML (.docx) files

[RPT] **putexcel** — Export results to an Excel file

[RPT] **putpdf intro** — Introduction to generating PDF files

filefilter — Convert ASCII or binary patterns in a file

Description | Quick start | Syntax | Options
Remarks and examples | Stored results | Reference | Also see

Description

`filefilter` reads an input file, searching for *oldpattern*. Whenever a matching pattern is found, it is replaced with *newpattern*. All resulting data, whether matching or nonmatching, are then written to the new file.

Because of the buffering design of `filefilter`, arbitrarily large files can be converted quickly. `filefilter` is also useful when traditional editors cannot edit a file, such as when unprintable ASCII characters are involved. In fact, converting end-of-line characters between Macintosh, Windows, and Unix is convenient with the EOL codes.

Unicode is not directly supported, but UTF-8 encoded files can be operated on by using byte-sequence methods in some cases.

Although it is not mandatory, you may want to use quotes to delimit a pattern, protecting the pattern from Stata's parsing routines. A pattern that contains blanks must be in quotes.

Quick start

Create `newfile.txt` from `oldfile.txt` by replacing all tabs with semicolons

```
filefilter oldfile.txt newfile.txt, from(\t) to(";")
```

Create `newfile.txt` from `oldfile.txt` by replacing all instances of "The" with "the"

```
filefilter oldfile.txt newfile.txt, from("The") to("the")
```

Syntax

`filefilter` *oldfile newfile* ,

{ `from(`*oldpattern*`)` `to(`*newpattern*`)` | `ascii2ebcdic` | `ebcdic2ascii` } [*options*]

where *oldpattern* and *newpattern* for ASCII characters are

"*string*" or *string*

string	:=	[*char*[*char*[*char*[...]]]]	
char	:=	*regchar* | *code*	
regchar	:=	ASCII 32–91, 93–127, or extended ASCII 128, 161–255; excludes '\'	
code	:=	`\BS`	backslash
		`\r`	carriage return
		`\n`	newline
		`\t`	tab
		`\M`	Classic Mac EOL, or \r
		`\W`	Windows EOL, or \r\n
		`\U`	Unix or Mac EOL, or \n
		`\LQ`	left single quote, ‘
		`\RQ`	right single quote, ’
		`\Q`	double quote, ”
		`\$`	dollar sign, $
		`\###d`	3-digit [0–9] decimal ASCII
		`\##h`	2-digit [0–9, A–F] hexadecimal ASCII

options	Description
* `from(`*oldpattern*`)`	find *oldpattern* to be replaced
* `to(`*newpattern*`)`	use *newpattern* to replace occurrences of `from()`
* `ascii2ebcdic`	convert file from ASCII to EBCDIC
* `ebcdic2ascii`	convert file from EBCDIC to ASCII
`replace`	replace *newfile* if it already exists

* Both `from(`*oldpattern*`)` and `to(`*newpattern*`)` are required, or `ascii2ebcdic` or `ebcdic2ascii` is required.

`collect` is allowed; see **[U] 11.1.10 Prefix commands**.

Options

`from(`*oldpattern*`)` specifies the pattern to be found and replaced. It is required unless `ascii2ebcdic` or `ebcdic2ascii` is specified.

`to(`*newpattern*`)` specifies the pattern used to replace occurrences of `from()`. It is required unless `ascii2ebcdic` or `ebcdic2ascii` is specified.

`ascii2ebcdic` specifies that characters in the file be converted from ASCII coding to EBCDIC coding. `from()`, `to()`, and `ebcdic2ascii` are not allowed with `ascii2ebcdic`.

`ebcdic2ascii` specifies that characters in the file be converted from EBCDIC coding to ASCII coding. `from()`, `to()`, and `ascii2ebcdic` are not allowed with `ebcdic2ascii`.

`replace` specifies that *newfile* be replaced if it already exists.

Remarks and examples

Convert Classic Mac-style EOL characters to Windows-style

```
. filefilter macfile.txt winfile.txt, from(\M) to(\W) replace
```

Convert left quote (‘) characters to the string “left quote”

```
. filefilter auto1.csv auto2.csv, from(\LQ) to("left quote")
```

Convert the character with hexidecimal code 60 to the string “left quote”

```
. filefilter auto1.csv auto2.csv, from(\60h) to("left quote")
```

Convert the character with decimal code 96 to the string “left quote”

```
. filefilter auto1.csv auto2.csv, from(\096d) to("left quote")
```

Convert strings beginning with hexidecimal code 6B followed by “Text” followed by decimal character 100 followed by “Text” to an empty string (remove them from the file)

```
. filefilter file1.txt file2.txt, from("\6BhText\100dText") to("")
```

Convert file from EBCDIC to ASCII encoding

```
. filefilter ebcdicfile.txt asciifile.txt, ebcdic2ascii
```

❑ Technical note

Unicode is not directly supported, but you can try to operate on a UTF-8 encoded Unicode file by working on the byte sequence representation of the UTF-8 encoded Unicode character. For example, the Unicode character `é`, the Latin small letter “e” with an acute accent (Unicode code point `\u00e9`), has the byte sequence representation (195,169). You can obtain the byte sequence by using `tobytes("é")`. Although you may use 195 and 169 in *regchar* and *code*, they will be treated as two separate bytes instead of one character `é` (195 followed by 169). In short, this goes beyond the original design of the command and is technically unsupported. If you try to use `filefilter` in this way, you might encounter problems.
❑

Stored results

`filefilter` stores the following in `r()`:

Scalars

`r(occurrences)`	number of *oldpattern* found
`r(bytes_from)`	# of bytes represented by *oldpattern*
`r(bytes_to)`	# of bytes represented by *newpattern*

Reference

Riley, A. R. 2008. Stata tip 60: Making fast and easy changes to files with filefilter. *Stata Journal* 8: 290–292.

Also see

[P] **file** — Read and write text and binary files

[D] **changeeol** — Convert end-of-line characters of text file

[D] **hexdump** — Display hexadecimal report on file

fillin — Rectangularize dataset

Description

`fillin` adds observations with missing data so that all interactions of *varlist* exist, thus making a complete rectangularization of *varlist*. `fillin` also adds the variable `_fillin` to the dataset. `_fillin` is 1 for observations created by using `fillin` and 0 for previously existing observations.

Quick start

Add observations so that all possible interactions of `v1` and `v2` exist and flag new observations with `_fillin` = 1

    fillin v1 v2

Same as above, but also include interactions with `v3`

    fillin v1 v2 v3

Menu

Data > Create or change data > Other variable-transformation commands > Rectangularize dataset

Syntax

`fillin` *varlist*

varlist may not contain `strL`s or alias variables.

Remarks and examples

▷ Example 1

We have data on something by sex, race, and age group. We suspect that some of the combinations of sex, race, and age do not exist, but if so, we want them to exist with whatever remaining variables there are in the dataset set to missing. For example, rather than having a missing observation for black females aged 20–24, we want to create an observation that contains missing values:

```
. use https://www.stata-press.com/data/r19/fillin1
. list

     +-------------------------------------------+
     |    sex    race   age_gr~p      x1     x2 |
     |-------------------------------------------|
  1. | female   white      20-24   20393   14.5 |
  2. |   male   white      25-29   32750   12.7 |
  3. | female   black      30-34   39399   14.2 |
     +-------------------------------------------+

. fillin sex race age_group
. list, sepby(sex)

     +-----------------------------------------------------+
     |    sex    race   age_gr~p      x1     x2    _fillin |
     |-----------------------------------------------------|
  1. | female   white      20-24   20393   14.5          0 |
  2. | female   white      25-29       .      .          1 |
  3. | female   white      30-34       .      .          1 |
  4. | female   black      20-24       .      .          1 |
  5. | female   black      25-29       .      .          1 |
  6. | female   black      30-34   39399   14.2          0 |
     |-----------------------------------------------------|
  7. |   male   white      20-24       .      .          1 |
  8. |   male   white      25-29   32750   12.7          0 |
  9. |   male   white      30-34       .      .          1 |
 10. |   male   black      20-24       .      .          1 |
 11. |   male   black      25-29       .      .          1 |
 12. |   male   black      30-34       .      .          1 |
     +-----------------------------------------------------+
```

◁

References

Baum, C. F. 2016. *An Introduction to Stata Programming*. 2nd ed. College Station, TX: Stata Press.

Cox, N. J. 2005. Stata tip 17: Filling in the gaps. *Stata Journal* 5: 135–136.

Also see

[D] **cross** — Form every pairwise combination of two datasets

[D] **expand** — Duplicate observations

[D] **frunalias** — Change storage type of alias variables

[D] **joinby** — Form all pairwise combinations within groups

[D] **save** — Save Stata dataset

Description Quick start Menu Syntax
Option Remarks and examples References Also see

Description

`format` *varlist* %*fmt* and `format` %*fmt varlist* are the same commands. They set the display format associated with the variables specified. The default formats are a function of the type of the variable:

`byte`	`%8.0g`
`int`	`%8.0g`
`long`	`%12.0g`
`float`	`%9.0g`
`double`	`%10.0g`
`str#`	`%#s`
`strL`	`%9s`

`set dp` sets the symbol that Stata uses to represent the decimal point. The default is `period`, meaning that one and a half is displayed as 1.5.

`format` [*varlist*] displays the current formats associated with the variables. `format` by itself lists all variables that have formats too long to be listed in their entirety by `describe`. `format` *varlist* lists the formats for the specified variables regardless of their length. `format *` lists the formats for all the variables.

Quick start

Show 10-digit `v1` as whole numbers with commas

`format v1 %15.0gc`

Same as above

`format %15.0gc v1`

Left-align string variable `v2` of type `str20`

`format v2 %-20s`

Show 3-digit `v3` with 1 digit after the decimal

`format v3 %4.1f`

Left-align `v4` and `v5`, and show with leading zeros if less than 4 digits in length

`format v4 v5 %-04.0f`

Show `v6` in Stata default date format like 19jun2014

`format v6 %td`

Same as above, but show `v6` in a date format like 06/14/2014

`format v6 %tdNN/DD/CCYY`

Menu

Data > Variables Manager

Syntax

Set formats

`format` *varlist* %*fmt*

`format` %*fmt* *varlist*

Set style of decimal point

`set dp` { `comma` | `period` } [, `permanently`]

Display long formats

`format` [*varlist*]

where %*fmt* can be a numerical, date, business calendar, or string format.

Numerical %*fmt*	Description	Example
right-justified		
`%#.#g`	general	`%9.0g`
`%#.#f`	fixed	`%9.2f`
`%#.#e`	exponential	`%10.7e`
`%21x`	hexadecimal	`%21x`
`%16H`	binary, hilo	`%16H`
`%16L`	binary, lohi	`%16L`
`%8H`	binary, hilo	`%8H`
`%8L`	binary, lohi	`%8L`
right-justified with commas		
`%#.#gc`	general	`%9.0gc`
`%#.#fc`	fixed	`%9.2fc`
right-justified with leading zeros		
`%0#.#f`	fixed	`%09.2f`
left-justified		
`%-#.#g`	general	`%-9.0g`
`%-#.#f`	fixed	`%-9.2f`
`%-#.#e`	exponential	`%-10.7e`
left-justified with commas		
`%-#.#gc`	general	`%-9.0gc`
`%-#.#fc`	fixed	`%-9.2fc`

You may substitute comma (`,`) for period (`.`) in any of the above formats to make comma the decimal point. In `%9,2fc`, 1000.03 is 1.000,03. Or you can `set dp comma`.

date %*fmt*	Description	Example
right-justified		
`%tc`	date/time	`%tc`
`%tC`	date/time	`%tC`
`%td`	date	`%td`
`%tw`	week	`%tw`
`%tm`	month	`%tm`
`%tq`	quarter	`%tq`
`%th`	half-year	`%th`
`%ty`	year	`%ty`
`%tg`	generic	`%tg`
left-justified		
`%-tc`	date/time	`%-tc`
`%-tC`	date/time	`%-tC`
`%-td`	date	`%-td`
etc.		

There are many variations allowed. See [D] **Datetime display formats**.

business calendar %*fmt*	Description	Example
`%tb`*calname* [:*datetime-specifiers*]	a business calendar defined in *calname*`.stbcal`	`%tbsimple`

See [D] **Datetime business calendars**.

string %*fmt*	Description	Example
right-justified		
`%#s`	string	`%15s`
left-justified		
`%-#s`	string	`%-20s`
centered		
`%~#s`	string	`%~12s`

The centered format is for use with `display` only.

Option

`permanently` specifies that, in addition to making the change right now, the `dp` setting be remembered and become the default setting when you invoke Stata.

Remarks and examples

Remarks are presented under the following headings:

Setting formats

See **[U] 12.5 Formats: Controlling how data are displayed** for an explanation of %*fmt*. To review: Stata's three numeric formats are denoted by a leading percent sign, %, followed by the string *w.d* (or *w,d* for European format), where *w* and *d* stand for two integers. The first integer, *w*, specifies the width of the format. The second integer, *d*, specifies the number of digits that are to follow the decimal point; *d* must be less than *w*. Finally, a character denoting the format type (`e`, `f`, or `g`) is appended. For example, `%9.2f` specifies the `f` format that is nine characters wide and has two digits following the decimal point. For `f` and `g`, a `c` may also be suffixed to indicate comma formats. Other "numeric" formats known collectively as the `%t` formats are used to display dates and times; see **[D] Datetime display formats**. String formats are denoted by %*w*`s`, where *w* indicates the width of the format.

▷ Example 1

We have census data by region and state on median age and population in 1980.

```
. use https://www.stata-press.com/data/r19/census10
(1980 Census data by state)

. describe

Contains data from https://www.stata-press.com/data/r19/census10.dta
 Observations:            50                  1980 Census data by state
    Variables:             4                  9 Apr 2024 08:05
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
state           str14   %14s                  State
region          int     %8.0g      cenreg     Census region
pop             long    %11.0g                Population
medage          float   %9.0g                 Median age
-------------------------------------------------------------------------------
Sorted by:
```

```
. list in 1/8
```

	state	region	pop	medage
1.	Alabama	South	3893888	29.3
2.	Alaska	West	401851	26.1
3.	Arizona	West	2718215	29.2
4.	Arkansas	South	2286435	30.6
5.	California	West	23667902	29.9
6.	Colorado	West	2889964	28.6
7.	Connecticut	NE	3107576	32
8.	Delaware	South	594338	29.8

The `state` variable has a display format of `%14s`. To left-align the state data, we type

```
. format state %-14s
. list in 1/8
```

	state	region	pop	medage
1.	Alabama	South	3893888	29.3
2.	Alaska	West	401851	26.1
3.	Arizona	West	2718215	29.2
4.	Arkansas	South	2286435	30.6
5.	California	West	23667902	29.9
6.	Colorado	West	2889964	28.6
7.	Connecticut	NE	3107576	32
8.	Delaware	South	594338	29.8

Although it seems like `region` is a string variable, it is really a numeric variable with an attached value label. You do the same thing to left-align a numeric variable as you do a string variable: insert a negative sign.

```
. format region %-8.0g
. list in 1/8
```

	state	region	pop	medage
1.	Alabama	South	3893888	29.3
2.	Alaska	West	401851	26.1
3.	Arizona	West	2718215	29.2
4.	Arkansas	South	2286435	30.6
5.	California	West	23667902	29.9
6.	Colorado	West	2889964	28.6
7.	Connecticut	NE	3107576	32
8.	Delaware	South	594338	29.8

The pop variable would probably be easier to read if we inserted commas by appending a 'c':

```
. format pop %11.0gc

. list in 1/8

     +---------------------------------------------+
     | state         region          pop   medage  |
     |---------------------------------------------|
  1. | Alabama       South     3,893,888     29.3  |
  2. | Alaska        West        401,851     26.1  |
  3. | Arizona       West      2,718,215     29.2  |
  4. | Arkansas      South     2,286,435     30.6  |
  5. | California    West       23667902     29.9  |
     |---------------------------------------------|
  6. | Colorado      West      2,889,964     28.6  |
  7. | Connecticut   NE        3,107,576       32  |
  8. | Delaware      South       594,338     29.8  |
     +---------------------------------------------+
```

Look at the value of pop for observation 5. There are no commas. This number was too large for Stata to insert commas and still respect the current width of 11. Let's try again:

```
. format pop %12.0gc

. list in 1/8

     +----------------------------------------------+
     | state         region           pop   medage  |
     |----------------------------------------------|
  1. | Alabama       South      3,893,888     29.3  |
  2. | Alaska        West         401,851     26.1  |
  3. | Arizona       West       2,718,215     29.2  |
  4. | Arkansas      South      2,286,435     30.6  |
  5. | California    West      23,667,902     29.9  |
     |----------------------------------------------|
  6. | Colorado      West       2,889,964     28.6  |
  7. | Connecticut   NE         3,107,576       32  |
  8. | Delaware      South        594,338     29.8  |
     +----------------------------------------------+
```

Finally, medage would look better if the decimal points were vertically aligned.

```
. format medage %8.1f

. list in 1/8

     +----------------------------------------------+
     | state         region           pop   medage  |
     |----------------------------------------------|
  1. | Alabama       South      3,893,888     29.3  |
  2. | Alaska        West         401,851     26.1  |
  3. | Arizona       West       2,718,215     29.2  |
  4. | Arkansas      South      2,286,435     30.6  |
  5. | California    West      23,667,902     29.9  |
     |----------------------------------------------|
  6. | Colorado      West       2,889,964     28.6  |
  7. | Connecticut   NE         3,107,576     32.0  |
  8. | Delaware      South        594,338     29.8  |
     +----------------------------------------------+
```

Display formats are permanently attached to variables by the `format` command. If we `save` the data, the next time we `use` it, `state` will still be formatted as `%-14s`, `region` will still be formatted as `%-8.0g`, etc.

◁

▷ Example 2

Suppose that we have an employee identification variable, `empid`, and that we want to retain the leading zeros when we list our data. `format` has a leading-zero option that allows this.

```
. use https://www.stata-press.com/data/r19/fmtxmpl, clear
. describe empid
Variable      Storage   Display    Value
    name         type    format    label      Variable label
─────────────────────────────────────────────────────────────────────────────
empid           float    %9.0g
. list empid in 83/87

      ┌───────┐
      │ empid │
      ├───────┤
 83.  │    98 │
 84.  │    99 │
 85.  │   100 │
 86.  │   101 │
 87.  │   102 │
      └───────┘

. format empid %05.0f
. list empid in 83/87

      ┌───────┐
      │ empid │
      ├───────┤
 83.  │ 00098 │
 84.  │ 00099 │
 85.  │ 00100 │
 86.  │ 00101 │
 87.  │ 00102 │
      └───────┘
```

◁

❑ Technical note

The syntax of the `format` command allows *varlist* and not just one variable name. Thus you can attach the `%9.2f` format to the variables `myvar`, `thisvar`, and `thatvar` by typing

```
. format myvar thisvar thatvar %9.2f
```

❑

▷ Example 3

We have employee data that includes `hiredate` and `login` and `logout` times. `hiredate` is stored as a `float`, but we were careful to store `login` and `logout` as `double`s. We need to attach a date format to these three variables.

```
. use https://www.stata-press.com/data/r19/fmtxmpl2, clear
. format hiredate login logout
  Variable name  Display format
  ─────────────────────────────
  hiredate       %9.0g
  login          %10.0g
  logout         %10.0g
  ─────────────────────────────
```

```
. format login logout %tcDDmonCCYY_HH:MM:SS.ss

. list login logout in 1/5

     +-------------------------------------------------+
     |                login                    logout |
     |-------------------------------------------------|
  1. | 08nov2006 08:16:42.30   08nov2006 05:32:23.53 |
  2. | 08nov2006 08:07:20.53   08nov2006 05:57:13.40 |
  3. | 08nov2006 08:10:29.48   08nov2006 06:17:07.51 |
  4. | 08nov2006 08:30:02.19   08nov2006 05:42:23.17 |
  5. | 08nov2006 08:29:43.25   08nov2006 05:29:39.48 |
     +-------------------------------------------------+

. format hiredate %td

. list hiredate in 1/5

     +-----------+
     |  hiredate |
     |-----------|
  1. | 24jan1986 |
  2. | 10mar1994 |
  3. | 29sep2006 |
  4. | 14apr2006 |
  5. | 03dec1999 |
     +-----------+
```

We remember that the project manager requested that hire dates be presented in the same form as they were previously.

```
. format hiredate %tdDD/NN/CCYY

. list hiredate in 1/5

     +------------+
     |   hiredate |
     |------------|
  1. | 24/01/1986 |
  2. | 10/03/1994 |
  3. | 29/09/2006 |
  4. | 14/04/2006 |
  5. | 03/12/1999 |
     +------------+
```

◁

Setting European formats

Do you prefer that one and one half be written as 1,5 and that one thousand one and a half be written as 1.001,5? Stata will present numbers in that format if, when you set the format, you specify ',' rather than '.' as follows:

```
. use https://www.stata-press.com/data/r19/census10, clear
(1980 Census data by state)

. format pop %12,0gc

. format medage %9,2f
```

```
. list in 1/8
```

	state	region	pop	medage
1.	Alabama	South	3.893.888	29,30
2.	Alaska	West	401.851	26,10
3.	Arizona	West	2.718.215	29,20
4.	Arkansas	South	2.286.435	30,60
5.	California	West	23.667.902	29,90
6.	Colorado	West	2.889.964	28,60
7.	Connecticut	NE	3.107.576	32,00
8.	Delaware	South	594.338	29,80

You can also leave the formats just as they were and instead type `set dp comma`. That tells Stata to interpret all formats as if you had typed the comma instead of the period:

```
. format pop %12.0gc                (put the formats back as they were)
. format medage %9.2f
. set dp comma                      (tell Stata to use European format)
. list in 1/8
(same output appears as above)
```

`set dp comma` affects all Stata output, so if you run a regression, display summary statistics, or make a table, commas will be used instead of periods in the output:

```
. tabulate region [fw=pop]
```

Census region	Freq.	Percent	Cum.
NE	49135283	21,75	21,75
N Cntrl	58865670	26,06	47,81
South	74734029	33,08	80,89
West	43172490	19,11	100,00
Total	225907472	100,00	

You can return to using periods by typing

```
. set dp period
```

Setting a variable's display format to European affects how the variable's values are displayed by `list` and in a few other places. Setting `dp` to `comma` affects every bit of Stata.

Also, `set dp comma` affects only how Stata displays output, not how it gets input. When you need to type one and a half, you must type `1.5` regardless of context.

❑ Technical note

`set dp comma` makes drastic changes inside Stata, and we mention this because some older, user-written programs may not be able to deal with those changes. If you are using an older, user-written program, you might `set dp comma` only to find that the program does not work and instead presents some sort of syntax error.

If, using any program, you get an unanticipated error, try setting `dp` back to `period`.

Even with `set dp comma`, you might still see some output with the decimal symbol shown as a period rather than a comma. There are two places in Stata where Stata ignores `set dp comma` because the features are generally used to produce what will be treated as input, and `set dp comma` does not affect how Stata inputs numbers. First,

```
local x = sqrt(2)
```

stores the string "`1.414213562373095`" in `x` and not "`1,414213562373095`", so if some program were to display `` `x' `` as a string in the output, the period would be displayed. Most programs, however, would use `` `x' `` in subsequent calculations or, at the least, when the time came to display what was in `` `x' ``, would display it as a number. They would code

```
display ... `x' ...
```

and not

```
display ... "`x'" ...
```

so the output would be

```
... 1,4142135 ...
```

The other place where Stata ignores `set dp comma` is the `string()` function. If you type

```
. generate res = string(numvar)
```

new variable `res` will contain the string representation of numeric variable `numvar`, with the decimal symbol being a period, even if you have previously `set dp comma`. Of course, if you explicitly ask that `string()` use European format,

```
. generate res = string(numvar,"%9,0g")
```

then `string()` honors your request; `string()` merely ignores the global `set dp comma`.

❏

Details of formats

The %f format

In `%`*w*`.`*d*`f`, *w* is the total output width, including sign and decimal point, and *d* is the number of digits to appear to the right of the decimal point. The result is right-justified.

The number 5.139 in `%12.2f` format displays as

```
----+----1--
        5.14
```

When $d = 0$, the decimal point is not displayed. The number 5.14 in `%12.0f` format displays as

```
----+----1--
           5
```

`%-`*w*`.`*d*`f` works the same way, except that the output is left-justified in the field. The number 5.139 in `%-12.2f` displays as

```
----+----1--
5.14
```

The %fc format

`%`w`.`d`fc` works like `%`w`.`d`f` except that commas are inserted to make larger numbers more readable. w records the total width of the result, including commas.

The number 5.139 in `%12.2fc` format displays as

```
----+----1--
        5.14
```

The number 5203.139 in `%12.2fc` format displays as

```
----+----1--
    5,203.14
```

As with `%f`, if $d = 0$, the decimal point is not displayed. The number 5203.139 in `%12.0fc` format displays as

```
----+----1--
       5,203
```

As with `%f`, a minus sign may be inserted to left justify the output. The number 5203.139 in `%-12.0fc` format displays as

```
----+----1--
5,203
```

The %g format

In `%`w`.`d`g`, w is the overall width, and d is usually specified as 0, which leaves up to the format the number of digits to be displayed to the right of the decimal point. If $d \neq 0$ is specified, then not more than d digits will be displayed. As with `%f`, a minus sign may be inserted to left-justify results.

`%g` differs from `%f` in that 1) it decides how many digits to display to the right of the decimal point, and 2) it will switch to a `%e` format if the number is too large or too small.

The number 5.139 in `%12.0g` format displays as

```
----+----1--
       5.139
```

The number 5231371222.139 in `%12.0g` format displays as

```
----+----1--
  5231371222
```

The number 52313712223.139 displays as

```
----+----1--
 5.23137e+10
```

The number 0.0000029394 displays as

```
----+----1--
 2.93940e-06
```

The %gc format

`%`w`.`d`gc` is `%`w`.`d`g` with commas. It works in the same way as the `%g` and `%fc` formats.

The %e format

`%`w`.`d`e` displays numeric values in exponential format. w records the width of the format. d records the number of digits to be shown after the decimal place. w should be greater than or equal to d+7 or, if 3-digit exponents are expected, d+8.

The number 5.139 in `%12.4e` format is

```
----+----1--
  5.1390e+00
```

The number 5.139×10^{220} is

```
----+----1--
 5.1390e+220
```

The %21x format

The `%21x` format is for those, typically programmers, who wish to analyze routines for numerical roundoff error. There is no better way to look at numbers than how the computer actually records them.

The number 5.139 in `%21x` format is

```
----+----1----+----2-
+1.48e5604189375X+002
```

The number 5.125 is

```
----+----1----+----2-
+1.4800000000000X+002
```

Reported is a signed, base-16 number with base-16 point, the letter `X`, and a signed, 3-digit base-16 integer. Call the two numbers f and e. The interpretation is $f \times 2^e$.

The %16H and %16L formats

The `%16H` and `%16L` formats show the value in the IEEE floating point, double-precision form. `%16H` shows the value in most-significant-byte-first (hilo) form. `%16L` shows the number in least-significant-byte-first (lohi) form.

The number 5.139 in `%16H` is

```
----+----1----+-
40148e5604189375
```

The number 5.139 in `%16L` is

```
----+----1----+-
75931804568e1440
```

The format is sometimes used by programmers who are simultaneously studying a hexadecimal dump of a binary file.

The %8H and %8L formats

`%8H` and `%8L` are similar to `%16H` and `%16L` but show the number in IEEE single-precision form.

The number 5.139 in `%8H` is

```
----+---
40a472b0
```

The number 5.139 in %8L is

```
----+---
b072a440
```

The %t format

The %t format displays numerical variables as dates and times. See [D] **Datetime display formats**.

The %s format

The %*w*s format displays a string in a right-justified field of width *w*. %-*w*s displays the string left-justified.

"Mary Smith" in %16s format is

```
----+----1----+-
      Mary Smith
```

"Mary Smith" in %-16s format is

```
----+----1----+-
Mary Smith
```

Also, in some contexts, particularly display (see [P] **display**), %~*w*s is allowed, which centers the string. "Mary Smith" in %~16s format is

```
----+----1----+-
   Mary Smith
```

Other effects of formats

You have data on the age of employees, and you type summarize age to obtain the mean and standard deviation. By default, Stata uses its default g format to provide as much precision as possible.

```
. use https://www.stata-press.com/data/r19/fmtxmpl, clear
. summarize age
```

Variable	Obs	Mean	Std. dev.	Min	Max
age	204	30.18627	10.38067	18	66

If you attach a %9.2f format to the variable and specify the format option, Stata uses that specification to format the results:

```
. format age %9.2f
. summarize age, format
```

Variable	Obs	Mean	Std. dev.	Min	Max
age	204	30.19	10.38	18.00	66.00

Displaying current formats

format *varlist* is not often used to display the formats associated with variables because using describe (see [D] **describe**) is easier and provides more information. The exceptions are date variables. Unless you use the default %tc, %tC, … formats (and most people do), the format specifier itself can become very long, such as

```
. format admittime %tcDDmonCCYY_HH:MM:SS.sss
```

Such formats are too long for describe to display, so it gives up. In such cases, you can use format to display the format:

```
. format admittime

variable name   display format
──────────────────────────────────────────
admittime       %tcDDmonCCYY_HH:MM:SS.sss
──────────────────────────────────────────
```

Type format * to see the formats for all the variables.

Video example

How to change the display format of a variable

References

Cox, N. J. 2011. Speaking Stata: MMXI and all that: Handling Roman numerals within Stata. *Stata Journal* 11: 126–142.

Gould, W. W. 2011a. How to read the %21x format. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2011/02/02/how-to-read-the-percent-21x-format/.

———. 2011b. How to read the %21x format, part 2. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2011/02/10/how-to-read-the-percent-21x-format-part-2/.

Linhart, J. M. 2008. Mata Matters: Overflow, underflow and the IEEE floating-point format. *Stata Journal* 8: 255–268.

Also see

[D] **Datetime business calendars** — Business calendars

[D] **Datetime display formats** — Display formats for dates and times

[D] **list** — List values of variables

[D] **varmanage** — Manage variable labels, formats, and other properties

[P] **display** — Display strings and values of scalar expressions

[U] 12.5 Formats: Controlling how data are displayed

[U] 12.6 Dataset, variable, and value labels

Description

fralias add defines variable aliases, names that reference variables in a linked frame. An alias defined by fralias add is a variable that behaves like a copy of a variable from a linked frame, which you could obtain from frget. Unlike a copy, however, an alias uses very little memory, and you cannot modify its observations. Almost all of Stata's statistical and data-management commands allow you to specify an alias just as you would specify the name of a variable in the current frame.

fralias describe produces a summary of the alias variables in the current frame.

See [D] **frames intro** if you do not know what a frame is.

Quick start

Define aliases for variables v1, v2, and v3 from another frame linked by lnk

```
fralias add v1 v2 v3, from(lnk)
```

Define aliases newv4 and newv5 for variables v4 and v5 linked via lnk

```
fralias add newv4=v4 newv5=v5, from(lnk)
```

Define aliases for all variables in linkage lnk, prefixing them with l_

```
fralias add *, from(lnk) prefix(l_)
```

Define aliases for all variables via linkage lnk, excluding those matching pattern ind*

```
fralias add *, from(lnk) exclude(ind*)
```

Report on all the alias variables in the current frame

```
fralias describe
```

Report on the alias variables starting with l_

```
fralias describe l_*
```

Syntax

Add alias variables

`fralias add` *varlist* , `from(`*linkname*`)` [*rename_options*] (1)

`fralias add` $newalias_1$ = $varname_1$
[$newalias_2$ = $varname_2$ [...]] , `from(`*linkname*`)` (2)

Describe alias variables

`fralias describe` [*varlist*]

linkname is the name of a *linkvar* in the current frame that was created by `frlink`; see [D] **frlink**.

rename_options	Description
`prefix(`*string*`)`	prefix new alias names with *string*
`suffix(`*string*`)`	suffix new alias names with *string*
`exclude(`*varlist*`)`	exclude specified variables

`collect` is allowed; see [U] **11.1.10 Prefix commands**.

Syntax 1 defines aliases for the variable names specified by *varlist* from the frame linked by *linkname*.

Syntax 2 defines alias $newalias_1$ in the current frame to be a reference to $varname_1$ from the frame linked by *linkname*. Similarly, alias $newalias_2$ is a reference to $varname_2$ and so on.

Options

`from(`*linkname*`)` specifies the identity of the linked frame from which variables are aliased. Linkages to frames are created by the `frlink` command. Linkages are usually named for the frame to which they link. Linkage `counties` links to frame `counties`, and so you specify `from(counties)`. If linkage `c` links to frame `counties`, you specify `from(c)`. `from()` is required.

`prefix(`*string*`)` specifies a string to be prefixed to the names of the new aliases created in the current frame. Say that you type

```
. fralias add inc*, from(counties)
```

to define aliases for variables `income` and `income_family`. If variable `income` already exists in the current frame, the command would issue an error message to that effect and alias neither variable. To alias the two variables, you could type

```
. fralias add inc*, from(counties) prefix(c_)
```

Then the new aliases would be named `c_income` and `c_income_family`.

`suffix(`*string*`)` works like `prefix(`*string*`)`, the difference being that the string is suffixed rather than prefixed to the alias names. Both options may be specified if you wish.

`exclude(`*varlist*`)` specifies variables that are not to be aliased. An example of the option is

```
. fralias add *, from(counties) exclude(emp*)
```

All variables except variables starting with `emp` would get an alias. More correctly, all variables except `emp*`, `_*`, and the match variables would be aliased because `fralias add` always omits the underscore and match variables. See the explanation below.

Remarks and examples

Remarks are presented under the following headings:

Overview

You have data on people and data on counties. You loaded the datasets and created a linkage named `uscounties` by typing

```
. use people
. frame create uscounties
. frame uscounties: use uscounties
. frlink m:1 countyid, frame(uscounties)
```

See example 1 in [D] **frlink** for details.

Among the variables in `uscounties.dta` is `median_income`. Instead of copying the variable into the current frame, you could define an alias for the variable by typing either of the following:

```
. fralias add median_income, from(uscounties)
. fralias add medinc = median_income, from(uscounties)
```

The first command defines an alias named `median_income` in the current frame. The second names it `medinc`.

Everything you need to know about fralias add

Here is everything you need to know in outline form:

1. What it means to alias a linked variable
2. `fralias add` can define aliases one at a time
3. `fralias add` allows variable names to be abbreviated
4. `fralias add` can define groups of aliases
5. `fralias add` works with all the variables specified, or none of them
6. `fralias add` ignores repeated variables
7. How to define aliases for all the variables 1: `fralias add *`
8. How to define aliases for all the variables 2: `fralias add *, prefix()`

We make two assumptions in what follows:

A1. The current frame contains data on people. A frame named `uscounties` contains data on counties. That is, we assume

```
. use people
. frame create uscounties
. frame uscounties: use uscounties
```

A2. The frames are linked on the match variable `countyid`, which appears in both datasets. The linkage between the frames is named `uscounties`, the same name as the frame being linked. That is, we assume

```
. frlink m:1 countyid, frame(uscounties)
```

1. What it means to alias a linked variable

   When you type

   ```
   . fralias add median_income, from(uscounties)
   ```

   `fralias add` defines an alias named `median_income` in the current frame that references variable `median_income` from frame `uscounties`. This allows you to use `median_income` as if it were a variable in the current frame. It is like a copy of the original variable, but it uses much less memory, and you cannot modify its observations.

2. `fralias add` can define aliases one at a time

   To define alias `median_income` of variable `median_income` from linked frame `uscounties`, type

   ```
   . fralias add median_income, from(uscounties)
   ```

   To instead define alias `medinc` of variable `median_income` from the same linked frame, type

   ```
   . fralias add medinc=median_income, from(uscounties)
   ```

3. `fralias add` allows variable names to be abbreviated

   `fralias add` allows abbreviations if you have not `set varabbrev off`. If `median_income` is the only variable beginning with `median` in the linked frame, you can type

   ```
   . fralias add median, from(uscounties)
   ```

   The new alias will be named `median_income`.

   When using `fralias add`'s *newvar*=*varname* syntax, you can abbreviate the variable being copied that appears to the right of the equals sign:

   ```
   . fralias add medinc=median, from(uscounties)
   ```

4. `fralias add` can define groups of aliases

   `fralias add` allows you to specify a *varlist*. Even though you type `fralias add` in the current frame, the *varlist* is interpreted in the linked frame. You can type

   ```
   . fralias add emp*, from(uscounties)
   . fralias add emp* median_income, from(uscounties)
   . fralias add emp* median, from(uscounties)
   . fralias add emp* m*, from(uscounties)
   . fralias add *, from(uscounties)
   ```

   When you specify a *varlist*, `fralias add` automatically omits the match variable or variables and any variables starting with an underscore (_). First, we will tell you why, and then, we will tell you a workaround.

We start with a match variable. The match variable in our example is match variable `countyid`. The variable has the same name in both frames. Pretend for a moment that `fralias add` did not exclude match variables. Then, if you tried to alias `countyid`, that would be an error because `fralias add` will not overwrite an existing variable with a new alias. That seems reasonable until you realize that it would also mean that `fralias add` would issue an error if you typed

```
. fralias add c*, from(uscounties)
```

or even if you typed

```
. fralias add *, from(uscounties)
```

`fralias add` would issue errors because `c*` and `*` would include `countyid`, which, being the match variable, already exists in the current frame. `fralias add` automatically omits match variables so that you can type `fralias add c*` and `fralias add *` and get aliases for all the other variables.

`fralias add` omits `_*` variables because they tend to be Stata system variables that are valid only in the dataset in which they appear. You do not want them.

What if you need to get one of these variables? Use the *newvar*=*varname* syntax. Type, for instance,

```
. fralias add _myvar=_myvar, frame(uscounties)
```

Automatic omission is not applied to this syntax.

5. `fralias add` works with all the variables specified, or none of them

   `fralias add` will not replace existing variables with aliases. If just one variable in the specified list already exists in the current frame, `fralias add` issues an error.

```
. fralias add emp* m*, from(uscounties)
variable mvalues already exists
r(110);
```

   If you want all the `m*` variables except `mvalues`, use the `exclude()` option:

```
. fralias add emp* m*, from(uscounties) exclude(mvalues)
```

   If you also want `mvalues` to have alias `mvals` in the current frame, type

```
. fralias add mvals=mvalues, from(uscounties)
```

6. `fralias add` ignores repeated variables

   It is not an error to type

```
. fralias add employment employment, from(uscounties)
```

   We specified `employment` twice, but `fralias add` ignores that and defines the alias once. This is convenient because variables can be inadvertently repeated, as in

```
. fralias add m* employment-larea, from(uscounties)
```

   Although you cannot see it, variable `mds` is repeated in the example. `m*` contains `mds`, and so does `employment-larea` because `mds` is among the variables stored between them.

   When variables are repeated using the *newvar*=*varname* syntax, `fralias add` does not ignore repetition. It defines an alias for each variable that you specify:

```
. fralias add medinc=income inc=income, from(uscounties)
```

7. How to define aliases for all the variables 1: `fralias add *`

   To define an alias for all the variables, try typing

   ```
   . fralias add *, from(uscounties)
   ```

   This sometimes works. Other times it does not because some of the variables in `uscounties` already exist in the current frame. When it does not work, `fralias add` lists the variable names that exist in both frames and, even better, stores them in `r(dups)`. Thus, if you are willing to exclude those variables, you can type

   ```
   . fralias add *, from(uscounties) exclude(`r(dups)')
   ```

8. How to define aliases for all the variables 2: `fralias add *, prefix()`

   Another way to define aliases for all the variables in a linked frame is to type

   ```
   . fralias add *, from(uscounties) prefix(c_)
   ```

   This defines aliases for all the variables in the linked frame, using their original names but prefixed with `c_`. The variable `mvalues` in the linked frame, for instance, is aliased to `c_mvalues`.

   Another advantage of this approach is how easily you can drop the aliases from the data should you desire to do so. Type

   ```
   . drop c_*
   ```

   You can choose your own prefix. If you prefer suffixing them, type

   ```
   . fralias add *, from(uscounties) suffix(_c)
   ```

   This names the aliases `mvalues1_c`, `mvalues2_c`, etc. These names are more like the originals, at least if you use tab completion for typing them. Type the first characters of the original name, and press *Tab*. And if you wish, you can later drop the suffixed variables just as easily as prefixed ones. Type

   ```
   . drop *_c
   ```

Where are alias variables not allowed

The following commands change the values in variables they operate on, so by their very nature, they cannot work with alias variables: `cross`, `dyngen`, `fillin`, the `icd` suite of commands, `recode`, `reshape`, `stack`, `xpose`, the `mi` suite of commands, and `snapspan`.

The error message they produce, when they detect alias variables, will mention using `frunalias` to work around this restriction.

```
. xpose, clear
alias variables not allowed
    Alias variables detected: var1 and var2.
    You could use command frunalias to recast these variables to avoid this
    error message.
r(109);
```

Breaking alias variables

We can break the linkages that alias variables depend on. In the following, we cover the various ways this can happen.

We use the datasets and linkage described in *Example 1: A typical m:1 linkage* of [D] **frlink** for our setup. Recall that `persons.dta` contains data on people and `txcounty.dta` contains data on Texas counties, and we link the two using variable `countyid`.

```
. use https://www.stata-press.com/data/r19/persons
. frame create txcounty
. frame txcounty: webuse txcounty
(Median income in Texas counties)
. frlink m:1 countyid, frame(txcounty)
(all observations in frame default matched)
```

Let's create an alias for each variable in the linked frame.

```
. fralias add *, from(txcounty)
(variable not aliased from linked frame: countyid)
(1 variable aliased from linked frame)
```

`fralias add` informed us that it added 1 alias variable.

For alias variables, `describe` will try to report the storage type of the linked variable. If the link is broken, then `describe` will report `unknown` for the storage type. In either case, `describe` will note when it detects alias variables. The note indicates that alias variables have a clickable type.

```
. describe

Contains data from https://www.stata-press.com/data/r19/persons.dta
 Observations:            20
    Variables:             5                    16 Apr 2024 13:36
                                                (_dta has notes)
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
personid        byte    %9.0g                 Person ID
countyid        byte    %9.0g                 County ID
income          float   %9.0g                 Household income
txcounty        byte    %10.0g
median_income   float   %9.0g                 Household median income
--------------------------------------------------------------------------------
Sorted by:
     Note: Alias variables have clickable types.
     Note: Dataset has changed since last saved.
```

Clicking on the storage type link (*`float`*) in Stata will run the `fralias describe` command on the associated variable.

```
. fralias describe median_income

-----------------------------------------------------------
Alias           Type    Target          Link       Frame
-----------------------------------------------------------
median_income   float   median_income   txcounty   txcounty
-----------------------------------------------------------
```

Rename or drop the linked variable

Let's break the link in our alias variable by renaming the linked variable `median_income` to `medinc`. `describe` now reports *unknown* for the storage type of our alias variable.

```
. frame txcounty: rename median_income medinc

. describe

Contains data from https://www.stata-press.com/data/r19/persons.dta
 Observations:            20
    Variables:             5                  16 Apr 2024 13:36
                                              (_dta has notes)
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
personid        byte    %9.0g                 Person ID
countyid        byte    %9.0g                 County ID
income          float   %9.0g                 Household income
txcounty        byte    %10.0g
median_income   unknown %9.0g                 Household median income
--------------------------------------------------------------------------------
Sorted by:
     Note: Alias variables have clickable types.
     Note: Dataset has changed since last saved.
```

Clicking on the link (*unknown*) shows the same information as before, except the target type is `(unknown)`.

```
. fralias describe median_income

---------------------------------------------------------------
Alias            Type         Target          Link       Frame
---------------------------------------------------------------
median_income    (unknown)    median_income   txcounty   txcounty
---------------------------------------------------------------
```

If we try to use this broken alias variable in a calculation, Stata will exit with an informative error message.

```
. summarize median_income
variable median_income not found in frame txcounty
    You created alias variable median_income using the fralias command. When
    you did that, you specified median_income as the target variable and
    txcounty as the link variable for frame txcounty. The target variable
    median_income no longer exists in frame txcounty. Without it, the alias
    variable median_income is broken. If you renamed the target variable in
    frame txcounty, rename it back to median_income.
r(111);
```

We did rename `median_income`, so let's rename back to the original and try `summarize` again.

```
. frame txcounty: rename medinc median_income

. summarize median_income

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
median_inc~e |         20     56182.1     12207.6      43788      72785
```

Rename or drop the linkage variable

Renaming or dropping a linkage variable will break all the alias variables that depend on it. A linkage variable is the variable created by `frlink`. In our example, this is the variable named `txcounty`. If we rename `txcounty` to `txcnty`, `describe` reports *unknown* for the storage type of our alias variable.

```
. rename txcounty txcnty
. describe

Contains data from https://www.stata-press.com/data/r19/persons.dta
 Observations:            20
    Variables:             5                  16 Apr 2024 13:36
                                              (_dta has notes)
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
personid        byte    %9.0g                 Person ID
countyid        byte    %9.0g                 County ID
income          float   %9.0g                 Household income
txcnty          byte    %10.0g
median_income   unknown %9.0g                 Household median income
-------------------------------------------------------------------------------
Sorted by:
     Note: Alias variables have clickable types.
     Note: Dataset has changed since last saved.
```

Now, if we try to use this broken alias variable in a calculation, Stata will exit with another informative error message.

```
. summarize median_income
variable txcounty not found
    You created alias variable median_income using the fralias command. When
    you did that, you specified txcounty as the link variable. The link
    variable txcounty no longer exists. Without it, the alias variable
    median_income is broken. If you renamed the link variable, rename it back
    to txcounty.
r(111);

. rename txcnty txcounty
```

Here, we simply renamed the linkage variable back to the original.

Rename or drop a matching variable

Renaming or dropping the variables used to link the frames will break alias variables that depend on that link. In our example, variable `countyid` is used to link our frames. After we rename `countyid` to `cnty` in frame `txcounty`, `describe` reports *unknown* for the storage type of our alias variable.

```
. frame txcounty: rename countyid cnty
. describe

Contains data from https://www.stata-press.com/data/r19/persons.dta
 Observations:            20
    Variables:             5                  16 Apr 2024 13:36
                                              (_dta has notes)
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
personid        byte    %9.0g                 Person ID
countyid        byte    %9.0g                 County ID
income          float   %9.0g                 Household income
txcounty        byte    %10.0g
median_income   unknown %9.0g                 Household median income
-------------------------------------------------------------------------------
Sorted by:
     Note: Alias variables have clickable types.
     Note: Dataset has changed since last saved.
```

Now, if we try to use this broken alias variable in a calculation, Stata will exit with a different informative error message.

```
. summarize median_income
variable countyid not found in frame txcounty
    You created the link variable txcounty using the frlink command. When you
    did that, you specified variable countyid as the link variable, or as one
    of them. That variable no longer exists in frame txcounty. Without it,
    the frames can no longer be linked. If you renamed the variable in the
    frame, rename it back to countyid.
r(111);

. frame txcounty: rename cnty countyid
```

Renaming `cnty` back to `countyid` in frame `txcounty` resolves this problem.

Rename or drop the linked frame

Renaming or dropping a linked frame will break alias variables linked to that frame. Let's rename frame `txcounty` to `county`. As before, `describe` now reports *unknown* for the storage type of our alias variable.

```
. frame rename txcounty county

. describe

Contains data from https://www.stata-press.com/data/r19/persons.dta
 Observations:            20
    Variables:             5                  16 Apr 2024 13:36
                                              (_dta has notes)
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
personid        byte    %9.0g                 Person ID
countyid        byte    %9.0g                 County ID
income          float   %9.0g                 Household income
txcounty        byte    %10.0g
median_income   unknown %9.0g                 Household median income
--------------------------------------------------------------------------------
Sorted by:
     Note: Alias variables have clickable types.
     Note: Dataset has changed since last saved.
```

Now, if we try to use this broken alias variable in a calculation, Stata will exit with another informative error message.

```
. summarize median_income
frame txcounty not found
    You created the link variable txcounty using the frlink command with
    txcounty specified in option frame(). That frame no longer exists.
    Without it, the frames can no longer be linked. If you renamed the frame,
    rename it back to txcounty.
r(111);

. frame rename county txcounty
```

Renaming the frame back to `txcounty` again resolves this issue.

Change sort order in the linked frame

Changing the sort order in the linked frame will break alias variables linked to that frame. Let's sort frame `txcounty` on `median_income`. As evidence that the link is broken, `describe` reports *unknown* for the storage type of our alias variable.

```
. frame txcounty: sort median_income

. describe

Contains data from https://www.stata-press.com/data/r19/persons.dta
 Observations:            20
    Variables:             5                  16 Apr 2024 13:36
                                              (_dta has notes)
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
personid        byte    %9.0g                 Person ID
countyid        byte    %9.0g                 County ID
income          float   %9.0g                 Household income
txcounty        byte    %10.0g
median_income   unknown %9.0g                 Household median income
--------------------------------------------------------------------------------
Sorted by:
     Note: Alias variables have clickable types.
     Note: Dataset has changed since last saved.
```

Now, if we try to use this broken alias variable in a calculation, Stata will exit with another informative error message.

```
. summarize median_income
data in frame txcounty not sorted
    Type frlink describe txcounty. frlink describe will sort the data in the
    frame, thus correcting the problem, and it will verify that the link
    variable is otherwise still valid. If it is not, frlink describe will
    tell you how to fix the problem.
r(5);

. quietly frlink describe txcounty
```

Using `frlink describe` restores the original sort order.

Stored results

`fralias add` stores the following in `r()`:

Scalars	
`r(k)`	number of aliases created
Macros	
`r(newlist)`	new aliases in the current frame
`r(srclist)`	variables aliased from linked frame
`r(excluded)`	variables not aliased from linked frame
`r(dups)`	variables already present in the current frame
`r(notfound)`	variables not found in the linked frame

`r(dups)` is present only if `fralias add` exits with an error message because a prospective new alias name already exists in the current frame.

`r(notfound)` is present only for syntax 2 when `fralias add` exits with an error message because a *varname* is not found in the linked frame.

`fralias describe` stores the following in `r()`:

Macros	
`r(varlist)`	alias variables in the current frame

Also see

[D] **frlink** — Link frames

[D] **frget** — Copy variables from linked frame

[D] **frunalias** — Change storage type of alias variables

[D] **frames intro** — Introduction to frames

[D] **merge** — Merge datasets

[M-5] **st_addalias()** — Add alias variable to current Stata dataset

[M-5] **st_isalias()** — Properties of alias variable

Description Remarks and examples References Also see

Description

Frames, also known as data frames, allow you to simultaneously store multiple datasets in memory. The datasets in memory are stored in frames, and Stata allows multiple frames. You can switch between them and even link data in them to data in other frames. How this works is presented below.

Remarks and examples

Remarks are presented under the following headings:

What frames can do for you

Frames let you have multiple datasets in memory simultaneously. Here are a few ways you can use them.

Use frames to multitask

You can create a new frame, load another dataset into it, perform some task, switch back, and discard the frame.

You are working. The phone rings. Something has to be handled right now.

```
. frame create interruption          // you create new frame ...
. frame change interruption          // and switch to it

. use another_dataset               // you load a dataset
.                                    // you do what needs doing

. frame change default               // you switch back
. frame drop interruption            // you delete the new frame
```

You are back to work just as if you had never been interrupted.

Use frames to perform tasks integral to your work

You need to calculate a value from the data and add it to the data. This is troublesome because making the calculation requires modifying the data, the same data that need to be unmodified and have the result added to them.

You have loaded `yourdata.dta` into memory and have already made some updates to it. You have not yet saved those changes. You set about calculating the troublesome value.

```
. frame copy default subtask          // create & copy current data to new frame
. frame change subtask                // switch to the new frame

. sort weight foreign                 // begin result calculation
. omitted steps
. keep if mark1 | mark2               // drop observations!
. omitted steps
. regress dmpg dw if mod(_n,2)        // calculate troublesome value

. frame change default                // switch back to previous frame
. gen dwc = cond(foreign,_b[dw],0)    // save result in yourdata.dta
. frame drop subtask                  // drop new frame
```

You could have used `preserve` and `restore` to perform this task. Using frames, however, is usually more convenient, if for no other reason than you can switch back and forth between them. You cannot do that with a preserved dataset and the modified copy in memory.

If you look carefully at the code above, you will notice that the troublesome value we needed to calculate and store was `_b[dw]`. `_b[dw]` was calculated from data in frame `subtask` and stored in Stata for subsequent use no matter which frame is current.

It is dataset values that are stored in frames. Programmatic values such as `_b[]`, `r()`, `e()`, and `s()` are stored in Stata and available across frames.

Use frames to work with separate datasets simultaneously

When we say working with datasets simultaneously, we mean datasets that are linked. Linked datasets are an alternative to merged datasets.

You have two datasets. `persons.dta` contains data on people. `uscounties.dta` contains data on counties. You want to analyze the people in `persons.dta` and the counties in which they live. There are issues in combining the two datasets:

1. Some of the people in `persons.dta` live in the same county.
2. There are counties in `uscounties.dta` that are irrelevant to your analysis because nobody in `persons.dta` lives in them.

3. You are not certain that `uscounties.dta` is complete. There might be some people in `persons.dta` that live in counties not recorded in `uscounties.dta`.
4. And beyond that, only some of the variables in `uscounties.dta` are needed for your analysis.

The frames solution to all of these problems is to link the two datasets. You start by loading `persons.dta` into one frame and `uscounties.dta` into another:

```
. use persons
. frame create uscounties
. frame uscounties: use uscounties
```

To link the datasets in the two frames, you type

```
. frlink m:1 countyid, frame(uscounties)
```

This matches the observations in `persons.dta` to those in `uscounties.dta` based on equal values of variable `countyid`. The data are not merged, they are linked. No variables from `uscounties.dta` are copied to `persons.dta`, but how the variables would be copied has been worked out.

You copy variables to the person data as you need them, one at a time, or in groups, using the `frget` command:

```
. frget med_income nschools, from(uscounties)
```

You can perform the desired analysis using `persons.dta`, the dataset in the current frame:

```
. regress income med_income nschools educ age
```

Use frames to record statistics gathered from simulations

Simulations involve repeating a task—performing a simulation—each step of which produces statistics that are somehow recorded. After that, you analyze the recorded statistics.

The frames solution to the simulation problem is to collect the statistics in another frame. We will name that frame `results`. You start by creating a new frame and the variables in it to record the statistics, such as `b1coverage` and `b2coverage`:

```
                  new frame's
                   name
                     \
. frame create results b1coverage b2coverage

                                    /
                           new variables in it
```

The new frame contains zero observations at this point.

You will next write a do-file to create the values to be stored after each iteration. At the end of each iteration, the do-file will contain the line

```
                frame's name
                  \
. frame post results (exp1) (exp2)

                            /
                        values for
                 b1coverage and b2coverage
```

`frame post` adds an observation to the data in `results`. exp_1 and exp_2 are expressions.

When the do-file finishes, the completed set of results will be found in frame `results`. You will want to save them:

```
. frame results: save filename
```

You will then switch to the frame and begin your analysis of the statistics:

```
. frame change results
. summarize
```

Frames make Stata (preserve/restore) faster

Many programs written in Stata use the commands `preserve` and `restore` to temporarily save and later restore the contents of the data in memory. Programs that use `preserve` and `restore` now run faster if you are using Stata/MP. They run faster because Stata preserves data by copying them to hidden frames. Those hidden frames are stored in memory. Copying data to frames stored in memory takes a lot less time than copying data to disk.

More correctly, `preserve` copies data to hidden frames unless memory is in short supply. If it is, `preserve` resorts to storing them on disk. That is temporary because later, as datasets are restored, memory will again become available and `preserve` will return to preserving them in hidden frames.

This is all automatic, but you may want to reset the value of `max_preservemem`, which controls this behavior. When the amount stored in hidden frames would exceed `max_preservemem`, Stata preserves subsequent datasets on disk. Out of the box, `max_preservemem` is set to 1 gigabyte. Perhaps you or someone else has already changed that. To find out the current value of `max_preservemem`, type

```
. query memory
```

If you want to change `max_preservemem` to 2 gigabytes for the duration of the session, type

```
. set max_preservemem 2g
```

You can set the value up or down. You could set it to `4g` or `50m`. You could even set it to `0`, and then all datasets would be preserved to disk.

If you want to set `max_preservemem` to 2 gigabytes permanently, for this session and future Stata sessions, type

```
. set max_preservemem 2g, permanently
```

Other uses will occur to you that we should have listed

Frames make doing lots of tasks more convenient, and you will find your own uses for them. Frames make code faster too. Manipulating objects stored in memory takes less computer time than manipulating disk files.

Learning frames

Here is a tutorial on using frames. In the tutorial, we will sometimes show you a syntax diagram. For example, we might show you

`frame copy` *framename newframename*

When we show syntax diagrams in the tutorial, they are not always the full syntax diagrams. `frame copy`, for instance, also allows a `replace` option, and we might not only not show it in the syntax diagram but also not even mention it. You can click on the command to see the full syntax.

The current frame

Everything hinges on the *current frame*. Stata commands use the data in the current frame. When you load a dataset,

```
. sysuse auto
(1978 automobile data)
```

you are loading it into the current frame. Which frame is that? Type `frame` to discover its identity:

```
. frame
  (current frame is default)
```

You can type `frame` or type `pwf`, which is a synonym for `frame`. The letters stand for "print working frame". We will type `frame` in this tutorial, but you may prefer to type `pwf` because it is shorter. Other `frame` commands also have shorter synonyms. We will mention them as we go along.

We just discovered that the current frame is named `default`. When Stata is launched, that is what it names the frame it creates for you. You cannot change that, but `default` is just a name, and you can rename frames if you wish. You can create other frames too. You can create up to 100 of them.

To rename a frame, use the `frame rename` command:

`frame rename` *oldname newname*

To rename the frame `default` to `genesis`, type

```
. frame rename default genesis
. frame
  (current frame is genesis)
```

Frames can be renamed whether Stata created them or you did. They can be renamed whether they have data in them or they are empty. Renaming `default` will not break anything subsequently. Stata commands operate on the current frame, whatever its name.

Creating new frames

Create new frames using the `frame create` command:

`frame create` *newframename*

We will show you an example in a minute. First, however, if you are going to create a frame with a new name, you need to know how to find out the names of the frames that currently exist. You do that using the `frames dir` command:

`frames dir`

We recall that we renamed our default frame, but we cannot recall the name that we used. So what frames are in memory?

```
. frames dir
  genesis  74 x 12; 1978 automobile data
```

There is one frame in memory, named `genesis`. It contains a dataset that is 74 × 12, meaning 74 observations and 12 variables. The dataset has a dataset label "1978 automobile data", but if it did not, the dataset's name, `auto.dta`, would have appeared in its place in `frames dir`'s output, unless the data had never been saved to disk. In that case, nothing would have appeared where "1978 automobile data" appeared.

Now let's create a new frame named `second`:

```
. frame create second

. frame dir
  genesis   74 x 12; 1978 automobile data
  second    0 x 0
```

There are now two frames in memory. The new frame is 0 × 0. It is empty.

By the way, `frame create` has a shorter synonym, `mkf`. The letters stand for "make frame". We could have typed `mkf second` to make the new frame.

Type frame or frames, it does not matter

You probably did not notice, but we have used `frames dir` twice so far, but we typed it differently the second time. We typed

```
. frames dir
. frame dir
```

Stata does not care whether you type `frame` or `frames`. This indifference applies to all the `frames`/`frame` commands.

Switching frames

`frame change` (synonym: `cwf` for "change working frame") switches the identity of the current frame:

`frame change` *framename*

We could make `second` the current frame and switch back to `genesis` again:

```
. frames change second

. count
  0

. cwf genesis

. count
  74
```

We used Stata's `count` command to demonstrate that the current frame really switched. `count` without arguments displays the number of observations.

Copying frames

There are two commands for copying frames:

`frame copy` *framename newframename*

`frame put` *varlist* `, into(`*newframename*`)`

`frame put` *if* `, into(`*newframename*`)` `frame copy` copies the entire dataset.

`frame put` copies subsets of the dataset.

In either case, the commands create the frame being copied to.

Dropping frames

To drop existing frames, type

`frame drop` *framename* [*framename* [...]]

The current frame cannot be dropped.

Resetting frames

Resetting frames means the following:

1. Drop all the data in all the frames, even if the data have not been saved since they were last saved.
2. Drop (delete) all the frames.
3. Create a new frame named `default`, and make it the current frame.

Each of the following commands resets frames:

`frames reset`

`clear frames`

`clear all`

`frames reset` and `clear frames` are synonyms.

`clear all` resets the frames and does more. It returns Stata to as close to just-after-launch status as possible.

Frame prefix command

The `frame` prefix command is perhaps the most convenient of the `frame` commands. Its syntax command is

`frame` *framename*`:` *stata_command*

The `frame` prefix command 1) changes the current frame to the frame specified, 2) executes *stata_command*, and 3) changes the current frame back to what it was.

For instance, say the current frame is `default` and we have a second frame named `second`. We type

```
. frame second: sysuse census, clear
```

The result would be that frame `second` would contain `census.dta` and the current frame would still be `default`, just as if we had typed

```
. frame change second
. sysuse census, clear
. frame change default
```

Frame prefix has a second feature too. Imagine that in doing the above, we omitted the `clear` option when we use the data. Consider what would have happened if we set about typing the three commands but the data in `second` had changed since they were last saved:

```
. frame change second
. sysuse census
no; dataset in memory has changed since last saved
r(4);
```

What is the current frame? It is `second`, of course, because we changed to it. Instead of using the two previous commands, we could have used the `frame` prefix approach. (The current frame is `default`.)

```
. frame second: sysuse census
no; dataset in memory has changed since last saved
r(4);
```

Even though an error occurred, the current frame is still `default`! To recover from the error, we do not have to change back to the original frame. The `frame` prefix command did that for us.

`frame` prefix has another syntax when you have more than one command to be executed:

```
frame framename {
        stata_command
        stata_command
        .
        .
}
```

This syntax is especially useful in programs.

Linking frames

When we say linking, we mean linking as shown in the earlier example when we had separate datasets on people and counties and combined them in a merged-data kind of way. Linking can do a lot more than we showed you.

In [D] **frlink**, we show you how to create a nested linkage to link students (one dataset) to the schools they attend (a second dataset) and to the counties (a third dataset) in which their schools are located. We show you an example of linking a generational dataset with itself, so that adult children are linked to their parents and grandparents, a total of six simultaneous linkages!

Linkages are created by using the `frlink` command. Its simplest syntaxes are

`frlink m:1` *varlist*`, frame(`*framename*`)`

`frlink 1:1` *varlist*`, frame(`*framename*`)`

These syntaxes create an `m:1` or `1:1` link between the current frame and *framename* based on observations having equal values of *varlist*.

Once a link is created, you can use the `frget` command to copy the appropriate values of variables from *framename* to the current frame. Its syntaxes are

`frget` *varlist*`, from(`*linkagename*`)`

`frget` *newvar* `=` *varname*`, from(`*linkagename*`)`

Alternatively, you can use the `fralias add` command to add an alias to variables from *framename*. The alias variables can be used in the current frame similarly to copies created with `frget`, but alias variables require less memory. The syntaxes of `fralias add` are fralias add *varlist* , from(*linkagename*)

fralias add *newvar* = *varname* , from(*linkagename*)

You can use the `frval()` function in expressions to access appropriate observations of variables in the linked data. Its syntax is

... frval(*linkagename*,*varname*) ...

Ignore the _frval() function

While we are on the subject of the `frval()` function, we should warn you. Also available in [FN] **Programming functions** is `_frval()`. Ignore it. `frval()` is better. `_frval()` is for use by programmers.

Posting new observations to frames

We used posting to perform simulations in an example earlier. That is one use of it. More generally, posting solves problems that require transferring data or values from one frame to a new observation in another.

First, you prepare the other frame to receive the data. `frame create`, which we already discussed, has a syntax for doing this. We showed you its first syntax, which is

frame create *newframename*

The second syntax is

frame create *newframename* *newvarlist*

This syntax creates the new frame and creates in it a zero-observation dataset of the new variables specified. *newvarlist* really is a new varlist, and that means that you can specify variables types and variable names. You could type

```
. frame create results strL(rngstate) double(b1coverage b2coverage)
```

Alternatively, you can use `frame create`'s first syntax to create the frame, use `frame change` to switch to it, and create the zero-observation dataset yourself. Then, you can switch back to what was the current frame.

`frame post` adds observations to the second frame. Its syntax is

frame post *framename* (*exp*) (*exp*) ... (*exp*)

The expressions are in the same order as the variables in the second frame.

Saving, modifying, loading, and describing a set of frames

You may want to save several frames for later use. We provide commands for saving a set of frames in a Stata frameset (`.dtas`) file and loading saved frames back in memory.

`frames save` allows you to save a set of frames in a `.dtas` file. The command provides an option to automatically save frames that are linked through `frlink`.

`frames modify` allows you to modify a Stata frameset (`.dtas`) file by adding or dropping frames. You can also replace the contents of an existing frame in the frameset.

`frames use` allows you to load in memory frames that have been previously saved with `frames save`.

`frames describe` produces a summary of frames in memory or in a file.

Programming with frames

Below we discuss writing Stata programs that deal with multiple frames.

If you are not interested in writing such programs, stop reading.

What follows is not a tutorial. What follows are numbered lists detailing everything you need to know to write programs that use more than the current frame. That program could implement a command that does something with frames specified by users. Or it could do something that, as far as users are concerned, uses only the current frame and hidden from them is that your program uses frames to accomplish certain internal tasks.

We also want to emphasize there still exists a place for programs written in Stata that do not use frames at all. Perhaps most programs are like that.

Ado-programming with frames

1. `tempnames`.

   Frames with names created by `tempname` are automatically dropped (deleted) when the program generating the temporary name ends.

   If the program you write is to create a new frame for the user, give the frame a `tempname` in your program, and, at the end, use `frame rename` to change its name. This way, if an error occurs, the frame the program may have been in the midst of creating will be dropped automatically.

2. Current frame.

   Stata provides the name of the current frame in `creturn` result `c(frame)`. You can obtain the name of the current frame by coding

   ```
   local curframe = c(frame)
   ```

   Programs that use frames invariably change frames during their execution. Programs need to ensure the appropriate frame is the current one at the time the program exits. This includes when the program is successful and when it exits with error.

   The successful case is easy enough to handle. At the point your program exits, set the current frame appropriately. In general, the current frame should be the same as the current frame was when the program started.

   Error cases can be more difficult. Who knows when the user will press break or when the bug buried in your code will bite? The code could be doing literally anything. Even so, your program needs to ensure that the current frame is set appropriately. There is a style of programming that does this.

   Case 1: You are writing new command `foo`. `foo` uses frames but in all cases is to leave the current frame the same as it was initially. The code reads as follows:

   ```
   program foo
      version ...
           local curframe = c(frame)
           frame `curframe' {
                foo_cmd `0'
           }
   end
   ```

Write foo_cmd as you usually would. As you write foo_cmd, you can ignore the current-frame problem. You can use frame change freely in foo_cmd and its subroutines. No matter what happens, error or success, the program will end with the current frame unchanged.

Case 2: You are writing new command foo. If foo is successful, the new frame will change. The code reads as follows:

```
program foo
   version ...
       local curframe = c(frame)
       frame `curframe' {
            foo_cmd `0'
       }
 frame change `s(frame)'
end
```

Write foo_cmd as you usually would. If execution is successful, however, foo_cmd must sreturn in s(frame) the name of the frame that is to be the current frame. As with case 1, you can use frame change freely in foo_cmd and all of its subroutines.

3. preserve and restore.

   For end users, using frames is sometimes a better alternative to using preserve and restore. Programmers should not, however, interpret that as preserve and restore are out of date and not to be used in frame programming. preserve and restore in programming have the same valid use they have always had.

   Before frames existed in Stata, a single program could have at most one active preserve in it. Active means not canceled by restore or restore, not. A program could preserve, later restore or restore, not, and then preserve again. It would be odd but allowed.

   Nowadays, a single program can have up to one active preserve for each frame. If a program deals with frames `one' and `two' and it is necessary, it can preserve both of them. preserve preserves the current frame. To preserve frames `one' and `two', code,

```
frame `one': preserve
frame `two': preserve
```

   When frames are automatically restored at the end of the program, both frames will be restored.

   If you wish to restore frame `one' early and cancel its automatic restoration when the program ends, code

```
frame `one': restore
```

   If you instead wish to restore frame `one' now and still have it restored when the program ends, code

```
frame `one': restore, preserve
```

   If you instead wish simply to cancel the restoration of frame `one' when the program ends, code

```
frame `one': restore, not
```

   In all three cases, frame `two' will still be restored when the program ends.

   Any uncanceled automatic restorations when the program ends will re-create any frames that have been dropped (deleted). Automatic restoration does not change the identity of the current frame.

Mata programming with frames

1. st_frame*() functions.

   Mata provides a suite of frame-related functions. They can change frames, create frames, drop frames, etc.

2. st_data(), st_sdata(), _st_data(), and _st_sdata() functions.

   Calls to st_data() and its associated functions return the data from the current frame. If you want data from other frames, change to the other frame first using st_framecurrent().

3. st_view() and st_sview() functions.

   Views are views onto the frame that was current at the time the view was created by st_view() or st_sview(), and they remain that after creation even when the identity of the current frame changes. If X is a view onto frame default, it remains a view onto frame default even if the current frame changes.

   Views are how data can be copied between frames. Create a view onto the data in one frame. Create another view onto the data in the other. Use one view to update the other.

References

Gopal, K. 2023. From datasets to framesets and alias variables: Data management advances in Stata. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2023/09/12/from-datasets-to-framesets-and-alias-variables-data-management-advances-in-stata/.

Huber, C. 2019. Fun with frames. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2019/09/06/fun-with-frames/.

Also see

[D] **frames** — Data frames

[D] **frget** — Copy variables from linked frame

[D] **frlink** — Link frames

[FN] **Programming functions**

[M-5] **st_frame*()** — Data frame manipulation

Description Menu Syntax Also see

Description

This entry provides a quick reference to each of the individual commands and functions related to data frames.

If you are new to data frames in Stata, please start by reading [D] **frames intro**.

Data frames are discussed in detail in [D] **frames intro**.

There is also a set of Mata functions to work with frames. See [M-5] **st_frame*( )**.

Menu

Data > Frames Manager

Syntax

`frame` and `frames` are synonyms. Below, we will use one or the other depending on which one is more natural given the context.

Display name of current (working) frame

`frame pwf` (see [D] **frame pwf**)

`frame`

`pwf`

Display names of all frames in memory

`frames dir` (see [D] **frames dir**)

Create new, empty frame

`frame create` *newframename* (see [D] **frame create**)

Create new frame with specified variables for use with `frame post`

`frame create` *newframename newvarlist* (see [P] **frame post**)

Change identity of current (working) frame

`frame change` *framename* (see [D] **frame change**)

`cwf` *framename*

Execute command on data in specified frame

`frame` *framename*`:` *stata_command* (see [D] **frame prefix**)

`frame` *framename* `{`
  commands to execute in context of framename
`}`

Make a copy of a frame

`frame copy` *frame_from frame_to* [`, replace`] (see [D] **frame copy**)

Copy subset of variables or observations to a new frame

`frame put` (see [D] **frame put**)

Add new observation to frame

`frame post` *framename* `(`*exp*`) (`*exp*`) ... (`*exp*`)` (see [P] **frame post**)

Drop (eliminate) frames that are not the current frame

`frame drop` *framename* [*framename* [...]] (see [D] **frame drop**)

Rename existing frame (which can be the current frame)

`frame rename` *oldframename newframename* (see [D] **frame rename**)

Reestablish initial state of having a single, empty frame named `default`

`frames reset` (see [D] **frames reset**)

Link frames

`frlink` (see [D] **frlink**)

Get variables from linked frame

`frget` (see [D] **frget**)

Add aliases to variables from linked frame

`fralias add` (see [D] **fralias**)

Describe alias variables in current frame

`fralias describe` (see [D] **fralias**)

Recast alias variables into copies in the current frame

`frunalias` (see [D] **frunalias**)

Functions to access variables in another frame

`frval(`*linkvar*`,` *varname*`)` (see `frval()`)

`_frval(`*framename*`, varname,` *i*`)`

Saving, modifying, loading, and describing a set of frames

`frames save`	(see [D] **frames save**)
`frames modify`	(see [D] **frames modify**)
`frames use`	(see [D] **frames use**)
`frames describe`	(see [D] **frames describe**)

Also see

[D] **frames intro** — Introduction to frames

[M-5] **st_frame*()** — Data frame manipulation

frame change — Change identity of current (working) frame

Description   Menu   Syntax   Remarks and examples   Also see

Description

frame change makes the named frame current. This means that any commands you issue after frame change will run on the data in that frame.

cwf (change working frame) is a synonym for frame change.

Menu

Data > Frames Manager

Syntax

frame change *framename*

cwf *framename*

Remarks and examples

frame change makes the named frame current, or active. After you change to a frame, any commands you execute work with the data in that frame.

Another way to work with the data in another frame is the frame prefix command. See [D] **frame prefix**.

▷ Example 1

Let's assume we have several frames in memory, including our current frame named default. We see this by typing frames dir:

```
. frames dir
  cars     74 x 12; 1978 automobile data
  default  50 x 13; 1980 Census data by state
  work     28534 x 21; National Longitudinal Survey of Young Women, 14-24
             years old in 1968
```

Our next project uses the 1978 automobile data in the cars frame. To change to this frame, we type

```
. frame change cars
```

We can now work with the data in this frame. For instance, we can describe the data by typing

```
. describe

Contains data from https://www.stata-press.com/data/r19/auto.dta
 Observations:            74                  1978 automobile data
    Variables:            12                  13 Apr 2024 17:45
                                              (_dta has notes)
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
make            str18   %-18s                 Make and model
price           int     %8.0gc                Price
mpg             int     %8.0g                 Mileage (mpg)
rep78           int     %8.0g                 Repair record 1978
headroom        float   %6.1f                 Headroom (in.)
trunk           int     %8.0g                 Trunk space (cu. ft.)
weight          int     %8.0gc                Weight (lbs.)
length          int     %8.0g                 Length (in.)
turn            int     %8.0g                 Turn circle (ft.)
displacement    int     %8.0g                 Displacement (cu. in.)
gear_ratio      float   %6.2f                 Gear ratio
foreign         byte    %8.0g      origin     Car origin
--------------------------------------------------------------------------------
Sorted by: foreign
```

At any time, we can change back to the default frame by typing

```
. frame change default
```

◁

Also see

[D] **frames intro** — Introduction to frames

[D] **frame prefix** — The frame prefix command

frame copy — Make a copy of a frame

Description | Quick start | Menu | Syntax
Option | Remarks and examples | Also see

Description

`frame copy` copies an existing frame to a frame with a new name or to an existing frame, replacing its contents. All data and metadata from *frame_from* are copied.

Quick start

Copy the `default` frame to a frame named `fr1`

    frame copy default fr1

Copy frame `fr1` to existing frame `fr2`, replacing the data

    frame copy fr1 fr2, replace

Menu

Data > Frames Manager

Syntax

`frame copy` *frame_from* *frame_to* [`, replace`]

Option

`replace` specifies that *frame_to* be replaced if it already exists.

Remarks and examples

frame_from must be an existing frame. It may be the current frame. *frame_to* may be the name of a new frame or an existing frame. If it is an existing frame, `replace` must be specified.

In a programming context within a do-file or an ado-file, if you obtain a temporary name and copy a frame to that name, the frame will automatically be removed upon conclusion of the do-file or program.

▷ Example 1

Let's assume we have a frame named `default` in memory. We want to copy this frame to a new frame named `counties`. To do this, we type

```
. frame copy default counties
```

Later, we decide that we need to copy a frame named uscounties to our existing frame named counties, replacing it

```
. frame copy uscounties counties, replace
```

◁

When programming, we might want to copy a frame to a temporary name. To copy a frame named counties to a temporary name, we could type the following:

```
. tempname newframe
. frame copy counties `newframe'
```

Also see

[D] **frames intro** — Introduction to frames

[D] **frame put** — Copy selected variables or observations to a new frame

[D] **frame rename** — Rename existing frame

frame create — Create a new frame

Description Menu Syntax Remarks and examples Also see

Description

`frame create` creates a new, empty frame.

`mkf` (make frame) is a synonym for `frame create`.

`frame create` with a *newvarlist* creates a new frame with the specified variables. This syntax is most often used in combination with `frame post` for posting results in a new frame, see [P] **frame post**.

Menu

Data > Frames Manager

Syntax

Create new, empty frame

`frame create` *newframename*

`mkf` *newframename*

Create new frame with specified variables

`frame create` *newframename newvarlist* (see [P] **frame post**)

Remarks and examples

`frame create` creates a new, empty frame. After creation, you might use `frame change` to switch to that frame, or you might use the `frame` prefix with `use` or `import` to load data for analysis in that frame.

▷ Example 1

To create a new frame named `cars`, type

```
. frame create cars
```

We can now load our 1978 automobile data into new the new frame:

```
. frame cars: use https://www.stata-press.com/data/r19/auto.dta
```

Here we loaded data from the web. More often, we will load data from our computer. If `auto.dta` was saved in our current working directory, we could have typed

```
. frame cars: use auto.dta
```

◁

Also see

[D] **frames intro** — Introduction to frames

[D] **frames** — Data frames

[P] **frame post** — Post results to dataset in another frame

Description Menu Syntax Remarks and examples Also see

Description

`frame drop` eliminates from memory the specified frames, including any data that are in those frames.

Menu

Data > Frames Manager

Syntax

`frame drop` *framename* [*framename* [...]]

Remarks and examples

`frame drop` eliminates, or removes from memory, the specified frames. Any data in the frames are dropped when the frames are dropped. The current frame cannot be dropped.

To eliminate all frames from memory, including the current frame, use `frames reset`. See [D] **frames reset**.

`frame drop` supports wildcards `*` and `?` in *framename*: `*` matches zero or more characters, and `?` matches exactly one character.

▷ Example 1

To drop a frame named `cars`, type

```
. frame drop cars
```

◁

▷ Example 2

To drop all frames with name starting with `auto`, type

```
. frame drop auto*
```

◁

▷ Example 3

To drop all frames with name starting with `f` followed by exactly three characters, type

```
. frame drop f???
```

◁

Also see

[D] **frames intro** — Introduction to frames

[D] **frames** — Data frames

[D] **frames reset** — Drop all frames from memory

frame prefix — The frame prefix command

Description   Quick start   Syntax   Remarks and examples   Also see

Description

The `frame` prefix allows you to execute one or more Stata commands in another frame, leaving the current frame unchanged.

Quick start

Describe the data in frame `fr1`

```
frame fr1: describe
```

Execute a series of commands in frame `fr2`

```
frame fr2 {
  use mydata
  summarize
  codebook
}
```

Syntax

`frame` *framename*`:` *stata_command*

`frame` *framename* `{`
    commands to execute in context of framename
`}`

Remarks and examples

Remarks are presented under the following headings:

Example of interactive use
Example of use in programs

Example of interactive use

You have data in two frames. In your current frame you have data containing detailed information on sales for your company across four regions. A colleague just sent you an email with a summary dataset named `sales.dta`, which is supposed to contain the total sales for each region. You want to make sure the summary dataset was created from the same base sales information as the detailed dataset.

In your current dataset, you know from `summarize` that the total sales for the South region were \$532,399 and the total cost of the goods sold was \$330,499. You check that the dataset you just received matches these totals:

```
. frame create summary
. frame summary: use sales
. frame summary: list if region=="South"
```

The `frame` prefix command allowed you to load a dataset in frame `summary` and run a command on that data without affecting anything in your current frame.

Example of use in programs

The `frame` prefix can be used for one-liners, such as above, or it can be used to execute a whole series of commands on the data in another frame. The nice thing in either case is that no matter what happens when those commands are executed, whether they complete successfully or exit with error, the current frame will come back to what it was before you called the `frame` prefix command. In programs, this means that you do not have to hold on to the current frame name and change back to it after working in another frame.

You are writing a program that takes a subset of the current data, performs some manipulations on that subset, and then graphs the result. The required manipulations would damage the original dataset. One way to do this would be to

1. create a temporary frame:

```
tempname tmpframe
```

2. put a subset of data into it:

```
frame put if ..., into(`tmpframe')
```

3. perform the needed manipulations and graph the result:

```
frame `tmpframe' {
        some commands which manipulate the data
        graph twoway ...
}
```

At the end of this block of code, any commands that appear next will work against the original frame, not `` `tmpframe' ``. You could add a line to drop `` `tmpframe' ``, but there is no need. Because it has a temporary name, the frame and the data in it will automatically be dropped when your program or do-file completes.

An alternative workflow for the above would be to first `preserve` your data, then manipulate them in place and obtain your graph. You could then `restore` the original data. Whether you should use the `frame` prefix approach or the `preserve` and `restore` approach is up to you. The `frame` approach is often faster, but if your dataset in memory is extremely large, you may not want to make another entire copy of it in memory, even temporarily, and thus, the second approach may be better in such a case.

Also see

[D] **frames intro** — Introduction to frames

[D] **frames** — Data frames

frame put — Copy selected variables or observations to a new frame

Description Quick start Menu Syntax Remarks and examples Also see

Description

`frame put` copies a subset of variables or observations from the current frame to the specified frame. It works much like Stata's `keep` command (see [D] **drop**), except that the data in the current frame are left unchanged, while the selected variables or observations are copied to a new frame.

Quick start

Put variables `v1`, `v2`, and `v3` from the current frame into new frame `fr1`

```
frame put v1 v2 v3, into(fr1)
```

Put all variables whose name begins with `v` into new frame `fr2`

```
frame put v*, into(fr2)
```

Put all observations where `v1` is not missing into new frame `fr3`

```
frame put if !missing(v1), into(fr3)
```

Put the first observation from each cluster identified by `cvar` into new frame `fr4`

```
by cvar: frame put if _n==1, into(fr4)
```

Menu

Data > Frames Manager

Syntax

Copy selected variables from the current frame to a new frame

`frame put` *varlist* `, into(`*newframename*`)`

Copy observations that satisfy specified condition from the current frame to a new frame

`frame put` [*varlist*] *if* `, into(`*newframename*`)`

Copy a range of observations from the current frame to a new frame

`frame put` [*varlist*] *in* [*if*] `, into(`*newframename*`)`

`by` is allowed with the second syntax of `frame put`; see [D] **by**.

Remarks and examples

There are three main workflows for operating on a subset of data you already have in memory. One is to make use of Stata's `if` and `in` qualifiers with your commands to restrict the observations to be used. Another is to use `preserve` to make a temporary copy of the data in memory, then use `keep` and `drop` to make a subset of those data for analysis, and then to use `restore` to bring the original data back. Finally, you can leave the data in memory unchanged and use `frame put` to place a subset of the data in another frame for analysis. That frame can then be dropped, saved, or left in memory for further analysis.

`frame put` copies all variable and value labels, characteristics, and notes for any variables copied to the new frame.

▷ Example 1

To demonstrate `frame put`, we start with data from the 1980 US Census.

```
. use https://www.stata-press.com/data/r19/census
(1980 Census data by state)

. describe

Contains data from https://www.stata-press.com/data/r19/census.dta
 Observations:            50                  1980 Census data by state
    Variables:            13                  6 Apr 2024 15:43
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
state           str14   %-14s                 State
state2          str2    %-2s                  Two-letter state abbreviation
region          int     %-8.0g     cenreg     Census region
pop             long    %12.0gc               Population
poplt5          long    %12.0gc               Pop, < 5 year
pop5_17         long    %12.0gc               Pop, 5 to 17 years
pop18p          long    %12.0gc               Pop, 18 and older
pop65p          long    %12.0gc               Pop, 65 and older
popurban        long    %12.0gc               Urban population
medage          float   %9.2f                 Median age
death           long    %12.0gc               Number of deaths
marriage        long    %12.0gc               Number of marriages
divorce         long    %12.0gc               Number of divorces
--------------------------------------------------------------------------------
Sorted by:
```

We put data from several variables for all states with a population greater than 5,000,000 into new frame pop5.

```
. frame put state region pop* medage death if pop > 5000000, into(pop5)
. frame pop5: describe

Contains data
 Observations:            14                  1980 Census data by state
    Variables:            10
────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
────────────────────────────────────────────────────────────────────────────────
state           str14   %-14s                 State
region          int     %-8.0g     cenreg     Census region
pop             long    %12.0gc               Population
poplt5          long    %12.0gc               Pop, < 5 year
pop5_17         long    %12.0gc               Pop, 5 to 17 years
pop18p          long    %12.0gc               Pop, 18 and older
pop65p          long    %12.0gc               Pop, 65 and older
popurban        long    %12.0gc               Urban population
medage          float   %9.2f                 Median age
death           long    %12.0gc               Number of deaths
────────────────────────────────────────────────────────────────────────────────
Sorted by:
     Note: Dataset has changed since last saved.
```

◁

Also see

[D] **frames intro** — Introduction to frames

[D] **frames** — Data frames

[D] **drop** — Drop variables or observations

[D] **frame copy** — Make a copy of a frame

[P] **frame post** — Post results to dataset in another frame

frame pwf — Display name of current (working) frame

Description

`frame pwf` displays the name of the current frame, also known as the working frame. `frame` by itself and `pwf` (print working frame) by itself are synonyms for `frame pwf`.

Menu

Data > Frames Manager

Syntax

`frame pwf`

`frame`

`pwf`

`collect` is allowed with `frame pwf`; see **[U] 11.1.10 Prefix commands**.

Remarks and examples

You can type any of `frame pwf`, `frame`, or `pwf` to see what the current (working) frame is.

```
. sysuse auto
(1978 automobile data)

. frame pwf
  (current frame is default)

. frame create cars

. frame change cars

. pwf
  (current frame is cars)
```

Stored results

`frame pwf` stores the following in `r()`:

Macros
    `r(currentframe)`   name of current (working) frame

Also see

[D] **frames intro** — Introduction to frames

[D] **frames** — Data frames

frame rename — Rename existing frame

Description

`frame rename` changes the name of an existing frame. You can even rename the current frame.

Menu

Data > Frames Manager

Syntax

`frame rename` *oldframename newframename*

Remarks and examples

oldframename must be an existing frame. It may be the current frame. *newframename* must not be an existing frame.

▷ Example 1

Let's assume we have several frames in memory, including a frame named `default`. We see this by typing `frames dir`:

```
. frames dir
  cars     74 x 12; 1978 automobile data
  default  50 x 13; 1980 Census data by state
  work     28534 x 21; National Longitudinal Survey of Young Women, 14-24
             years old in 1968
```

We want to rename the `default` frame to a new frame named `census`:

```
. frame rename default census
```

We also want to rename the existing frame `cars` to `automobiles`:

```
. frame rename cars automobiles
```

We can then check the changes with `frames dir`:

```
. frames dir
  automobiles  74 x 12; 1978 automobile data
  census       50 x 13; 1980 Census data by state
  work         28534 x 21; National Longitudinal Survey of Young Women, 14-24
                 years old in 1968
```

◁

Also see

[D] **frames intro** — Introduction to frames

[D] **frames** — Data frames

[D] **frame copy** — Make a copy of a frame

frames describe — Describe frames in memory or in a file

Description

`frames describe` produces a summary of frames in memory or in a Stata frameset (`.dtas`) file.

Quick start

Describe all frames in memory

    frames describe

Describe frames in file `myframeset.dtas`

    frames describe using myframeset

Describe variable `var1` in frames `A` and `B` in memory

    frames describe var1, frames(A B)

Menu

Data > Frames Manager

Syntax

Describe frames in memory

frames describe [*varlist*] [, *memory_options*]

Describe frames in a file

frames describe [*varlist*] using *filename* [, *file_options*]

If *filename* is specified without an extension, .dtas is assumed. If *filename* contains embedded spaces or other special characters, enclose it in double quotes.

memory_options	Description
frames(*framelist*)	list of frames to describe
simple	display only variable names
short	display only general information
fullnames	do not abbreviate variable names
numbers	display variable number along with name

file_options	Description
frames(*framelist*)	list of frames to describe
simple	display only variable names
short	display only general information

Options

Options are presented under the following headings:

Options to describe frames in memory

frames(*framelist*) specifies the list of frames to describe.

simple displays only the variable names in a compact format. simple may not be combined with other options, except for frames().

short suppresses the specific information for each variable. Only the general information (number of observations, number of variables, and sort order) is displayed.

fullnames specifies that frames describe display the full names of the variables. The default is to present an abbreviation when the variable name is longer than 15 characters. fullnames may not be specified with numbers.

numbers specifies that frames describe present the variable number with the variable name. If numbers is specified, variable names are abbreviated when the name is longer than eight characters. numbers may not be specified with fullnames.

Options to describe frames in a file

`frames(`*framelist*`)` specifies the list of frames to describe.

`simple` displays only the variable names in a compact format. `simple` may not be combined with other options, except for `frames()`.

`short` suppresses the specific information for each variable. Only the general information (number of observations, number of variables, and sort order) is displayed.

Remarks and examples

`frames describe`, with no operands, describes the frames in memory in alphabetical order.

`frames describe` with the `using` modifier describes frames on disk in the order they were specified in *framelist* when saved with `frames save, frames(`*framelist*`)`. This ordering is reflected in stored result `r(frames)` after `frames describe using`.

▷ Example 1: Describe frames in memory

After loading multiple datasets in memory with data frames, you can use `frames describe` to get a summary of the data in each frame. To demonstrate, below we create one frame with demographic information from the 1980 census (`census.dta`) and another with housing data (`hsng.dta`) from the same census.

```
. clear frames

. sysuse census
(1980 Census data by state)

. frame rename default census

. frame create housing

. frame change housing

. use https://www.stata-press.com/data/r19/hsng
(1980 Census housing data)
```

By simply typing `frames describe`, we get detailed information about the data in each frame, such as the number of observations and details about all the variables:

```
. frames describe
─────────────────────────────────────────────────────────────────────────────────
Frame: census

Contains data from C:\Program Files\Stata19\ado\base\c\census.dta
 Observations:            50                  1980 Census data by state
    Variables:            13                  6 Apr 2024 15:43
─────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
─────────────────────────────────────────────────────────────────────────────────
state           str14   %-14s                 State
state2          str2    %-2s                  Two-letter state abbreviation
region          int     %-8.0g     cenreg     Census region
pop             long    %12.0gc               Population
poplt5          long    %12.0gc               Pop, < 5 year
pop5_17         long    %12.0gc               Pop, 5 to 17 years
pop18p          long    %12.0gc               Pop, 18 and older
pop65p          long    %12.0gc               Pop, 65 and older
popurban        long    %12.0gc               Urban population
medage          float   %9.2f                 Median age
death           long    %12.0gc               Number of deaths
marriage        long    %12.0gc               Number of marriages
divorce         long    %12.0gc               Number of divorces
─────────────────────────────────────────────────────────────────────────────────
Sorted by:
─────────────────────────────────────────────────────────────────────────────────

─────────────────────────────────────────────────────────────────────────────────
Frame: housing

Contains data from https://www.stata-press.com/data/r19/hsng.dta
 Observations:            50                  1980 Census housing data
    Variables:            12                  3 Feb 2024 16:22
─────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
─────────────────────────────────────────────────────────────────────────────────
state           str14   %14s                  State
division        int     %8.0g      division   Census division
region          int     %8.0g      region     Census region
pop             long    %10.0g                Population in 1980
popgrow         float   %6.1f                 Pop. growth 1970-80
popden          int     %6.1f                 Pop/sq. mile
pcturban        float   %8.1f                 Percent urban
faminc          long    %8.2f                 Median family inc., 1979
hsng            long    %10.0g                Hsng units 1980
hsnggrow        float   %8.1f                 % housing growth
hsngval         long    %9.2f                 Median hsng value
rent            long    %6.2f                 Median gross rent
─────────────────────────────────────────────────────────────────────────────────
Sorted by: state
─────────────────────────────────────────────────────────────────────────────────
```

In the `census` data frame, we have information for each state about the median age and the numbers of children and teens, adults, and senior citizens. In the `housing` data frame, we have information about the housing units, median family income, and median housing value.

`frames describe` describes the frames in memory in alphabetical order. Therefore, we first get a summary of the `census` frame and then a summary of the `housing` frame.

If we are interested only in certain variables, we can list them. Below, we describe the variables `state` and `region`, as well as all variables whose names begin with pop, for all frames in memory:

```
. frames describe state region pop*

----------------------------------------------------------------------------
Frame: census
Variable      Storage   Display    Value
    name         type    format    label      Variable label
----------------------------------------------------------------------------
state           str14   %-14s                 State
region          int     %-8.0g     cenreg     Census region
pop             long    %12.0gc               Population
poplt5          long    %12.0gc               Pop, < 5 year
pop5_17         long    %12.0gc               Pop, 5 to 17 years
pop18p          long    %12.0gc               Pop, 18 and older
pop65p          long    %12.0gc               Pop, 65 and older
popurban        long    %12.0gc               Urban population
----------------------------------------------------------------------------

----------------------------------------------------------------------------
Frame: housing
Variable      Storage   Display    Value
    name         type    format    label      Variable label
----------------------------------------------------------------------------
state           str14   %14s                  State
region          int     %8.0g      region     Census region
pop             long    %10.0g                Population in 1980
popgrow         float   %6.1f                 Pop. growth 1970-80
popden          int     %6.1f                 Pop/sq. mile
----------------------------------------------------------------------------
```

Furthermore, if we are interested only in describing the data for certain frames, we can list the names with the `frames()` option. Below, we are interested in the population variables in the `housing` frame:

```
. frames describe pop*, frames(housing)

----------------------------------------------------------------------------
Frame: housing
Variable      Storage   Display    Value
    name         type    format    label      Variable label
----------------------------------------------------------------------------
pop             long    %10.0g                Population in 1980
popgrow         float   %6.1f                 Pop. growth 1970-80
popden          int     %6.1f                 Pop/sq. mile
----------------------------------------------------------------------------
```

We can also skip the variable information altogether with the `short` option:

```
. frames describe, frames(housing) short

----------------------------------------------------------------------------
Frame: housing
Contains data from https://www.stata-press.com/data/r19/hsng.dta
 Observations:            50                  1980 Census housing data
    Variables:            12                  3 Feb 2024 16:22
Sorted by: state
----------------------------------------------------------------------------
```

◁

▷ Example 2: Describe frames in a file

In example 1, we created two frames with different information from the 1980 census. Let's save these frames into a file called `censuses.dtas`:

```
. frames save censuses, frames(housing census) replace
(file censuses.dtas not found)
file censuses.dtas saved
```

Now suppose that we are working in a new Stata session and we wish to describe the frames from the `censuses.dtas` file:

```
. clear all

. frames describe using censuses
--------------------------------------------------------------------------------
Frame: housing

Contains data                                   1980 Census housing data
 Observations:            50                    28 Mar 2025 19:42
    Variables:            12
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
state           str14   %14s                  State
division        int     %8.0g      division   Census division
region          int     %8.0g      region     Census region
pop             long    %10.0g                Population in 1980
popgrow         float   %6.1f                 Pop. growth 1970-80
popden          int     %6.1f                 Pop/sq. mile
pcturban        float   %8.1f                 Percent urban
faminc          long    %8.2f                 Median family inc., 1979
hsng            long    %10.0g                Hsng units 1980
hsnggrow        float   %8.1f                 % housing growth
hsngval         long    %9.2f                 Median hsng value
rent            long    %6.2f                 Median gross rent
--------------------------------------------------------------------------------
Sorted by: state
--------------------------------------------------------------------------------
```

```
---------------------------------------------------------------------------------
Frame: census
Contains data                                        1980 Census data by state
 Observations:            50                         28 Mar 2025 19:42
    Variables:            13
---------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
---------------------------------------------------------------------------------
state           str14   %-14s                 State
state2          str2    %-2s                  Two-letter state abbreviation
region          int     %-8.0g     cenreg     Census region
pop             long    %12.0gc               Population
poplt5          long    %12.0gc               Pop, < 5 year
pop5_17         long    %12.0gc               Pop, 5 to 17 years
pop18p          long    %12.0gc               Pop, 18 and older
pop65p          long    %12.0gc               Pop, 65 and older
popurban        long    %12.0gc               Urban population
medage          float   %9.2f                 Median age
death           long    %12.0gc               Number of deaths
marriage        long    %12.0gc               Number of marriages
divorce         long    %12.0gc               Number of divorces
---------------------------------------------------------------------------------
Sorted by:
---------------------------------------------------------------------------------
```

Note that when we describe frames from a file, the first frame listed in the `frames save` command will be the first one described. Therefore, we now see the `housing` frame described first.

You can issue the `return list` command after `frames describe using` to see the order in which the frames were saved.

◁

Stored results

`frames describe` stores the following in `r()`:

Scalars

`r(complevel)`	compression level (with option `using` only)

Macros

`r(frames)`	list of frames described
`r(first)`	first frame in `r(frames)` (with option `using` only)
`r(N)`	number of observations in each frame
`r(k)`	number of variables in each frame
`r(width)`	width of frames
`r(changed)`	1 or 0 for each frame in memory: 1 means the data in the frame have changed since last save; 0 means they have not changed

Also see

[D] **frames save** — Save a set of frames on disk

[D] **frames use** — Load a set of frames from disk

[D] **frames** — Data frames

[D] **describe** — Describe data in memory or in a file

frames dir — Display names of all frames in memory

Description Menu Syntax Remarks and examples Stored results Also see

Description

`frames dir` lists all frames in memory, along with the dimensions of the data, the label of the data in each (if any), and an indicator of whether the data in the frame have changed since last saved.

Menu

Data > Frames Manager

Syntax

`frames dir`

`collect` is allowed; see **[U] 11.1.10 Prefix commands**.

Remarks and examples

`frames dir` shows you at a glance information about all frames in memory.

The first column shows an asterisk if the data in a given frame have changed since they were last saved. If you try to exit Stata and there are unsaved data in one or more frames, you will receive an error warning you. You can type `frames dir` to see frames with unsaved data.

The third column shows the number of observations and variables along with the data label, if any, for each frame. If there is not a data label, the dataset filename, if there is one, will be displayed.

▷ Example 1

We have been working with data in multiple frames. We now want to see all the frames currently in memory. To do this, we type

```
. frames dir
* afewcars  74 x 3; Subset of auto.dta
  default   74 x 12; 1978 automobile data
* work      3142 x 10; National Longitudinal Survey of Young Women, 14-24
              years old in 1968

Note: Frames marked with * contain unsaved data.
```

We are reminded of the names and contents of the three frames in memory. We also see that the data in frames `afewcars` and `work` have changed, but those changes have not been saved.

◁

Stored results

`frames dir` stores the following in `r()`:

Macros

`r(frames)`	names of frames in memory
`r(changed)`	`1` or `0` for each frame in memory: `1` means the data in the frame have changed since last save; `0` means they have not changed

Also see

[D] **frames intro** — Introduction to frames

[D] **frames** — Data frames

[D] **save** — Save Stata dataset

frames modify — Modify a set of frames on disk

Description | Quick start | Menu | Syntax | Options
Remarks and examples | Stored results | Also see

Description

`frames modify` modifies a frameset (`.dtas`) file by adding frames, dropping frames, or replacing the content of existing frames in the file.

Quick start

Add frames `A`, `B`, and `C` to file `myframeset.dtas`

    frames modify using myframeset, add(A B C)

Drop frames `A` and `B` from file `myframeset.dtas`

    frames modify using myframeset, drop(A B)

Menu

Data > Frames Manager

Syntax

Add frames to a frameset on disk

`frames modify using` *filename* `, add(`*framelist* [`, replace`]`)` [*options*]

Drop frames from a frameset on disk

`frames modify using` *filename* `, drop(`*framelist*`)`

If *filename* is specified without an extension, `.dtas` is assumed. If *filename* contains embedded spaces or other special characters, enclose it in double quotes.

options	Description
`nolabel`	omit value labels from the added frames
`orphans`	save value labels in added frames, even if they are not attached to a variable
`emptyok`	add specified frames even if they have zero observations and zero variables

Options

`add(`*framelist*[`, replace`]`)` specifies the frames in memory to be added to the frameset. *framelist* is a list of frame names separated by a space. To add all frames in memory to the frameset, specify `add(_all)`. Either `add()` or `drop()`, but not both, must be specified.

`replace` permits `frames modify` to overwrite frames that already exist in the frameset.

`drop(`*framelist*`)` specifies the frames to be dropped from the frameset. *framelist* is a list of frame names separated by a space. Either `drop()` or `add()`, but not both, must be specified.

`nolabel` specifies that value labels be omitted when adding frames to the frameset.

`orphans` specifies that all value labels be saved with the frames to be added, including those not attached to any variable.

`emptyok` specifies that frames be added to the frameset even if they contain zero observations and zero variables.

Remarks and examples

`frames modify` allows you to conveniently modify a frameset (`.dtas`) file. You can add a list of frames to the frameset, or drop a list of frames from the frameset, without loading the entire frameset into memory.

`frames modify` is useful when you have already saved a set of frames with `frames save` but wish to modify its contents. However, `frames modify` has the potential to break linkages, if they exist, between frames in the frameset. Adding a frame that does not previously exist in the frameset will not affect any existing links in the frameset. However, if a frame in the frameset was saved with links to other frames, the linkages will be dropped if you replace the frame without reestablishing the link. If you are not sure about existing linkages, you should load the frameset with `frames use` and examine linkages before using `frames modify`.

▷ Example 1: Modify an existing frame in the frameset

In `frames save`, we saved frames `census` and `housing` in `myframeset.dtas`. Below, we re-create that file:

```
. frame create census

. frame change census

. sysuse census
(1980 Census data by state)

. frame create housing

. frame change housing

. webuse hsng
(1980 Census housing data)

. frlink 1:1 state, frame(census)
(all observations in frame housing matched)

. frames save myframeset, frames(housing) linked
file myframeset.dtas saved
```

Suppose that we wish to modify the contents of the housing frame. This is the current frame. Below, we drop two variables that we are not interested in, and then we replace the contents of the housing frame in myframeset.dtas.

```
. drop popden popgrow
. frames modify using myframeset, add(housing, replace)
frame housing replaced
file myframeset.dtas saved
```

frames modify reports that the housing frame was replaced and that the frameset file myframeset.dtas has been saved.

◁

Stored results

frames modify stores the following in r():

Scalars

r(complevel)	compression level
r(compsize)	size, in bytes, of compressed file
r(compratio)	compression ratio, defined as the ratio of compressed size to uncompressed size

Macros

r(fn)	pathname of modified frameset file
r(frames)	list of frames in the modified frameset
r(added)	list of frames added, if add() specified
r(replaced)	list of frames replaced
r(dropped)	list of frames dropped, if drop() specified

Also see

[D] **frames save** — Save a set of frames on disk

[D] **frames use** — Load a set of frames from disk

[D] **frames** — Data frames

frames reset — Drop all frames from memory

Description Menu Syntax Remarks and examples Also see

Description

`frames reset` eliminates from memory all frames, including any data in them. It restores Stata to its initial state of having a single, empty frame named `default`. `clear frames` is a synonym for `frames reset`.

Menu

Data > Frames Manager

Syntax

```
frames reset

clear frames
```

Remarks and examples

`frames reset` eliminates, or removes from memory, all frames. It then creates a single, empty frame named `default`. This is the same as Stata's initial state when it first starts.

To drop frames, use `frame drop`. See [D] **frame drop**.

To drop results, programs, matrices, etc. in addition to frames, use the `clear` command. See [D] **clear**.

▷ Example 1

We have numerous frames in memory:

```
. frames dir
  cars     74 x 12; 1978 automobile data
  default  50 x 13; 1980 Census data by state
  work     28534 x 21; National Longitudinal Survey of Young Women, 14-24
             years of age in 1968
 (output omitted)
```

We want to drop all the frames. We do this by typing

```
. frames reset
```

We now have the empty frame named `default`.

```
. frames dir
  default  0 x 0
```

◁

Also see

[D] **frames intro** — Introduction to frames

[D] **frames** — Data frames

[D] **frame drop** — Drop frames from memory

[D] **clear** — Clear memory

frames save — Save a set of frames on disk

Description | Quick start | Menu | Syntax | Options
Remarks and examples | Stored results | Also see

Description

`frames save` saves a set of frames as a Stata frameset (`.dtas`) file.

Quick start

Save frames `A`, `B`, and `C` in file `myframeset.dtas`

    frames save myframeset, frames(A B C)

Save, in file `myframeset.dtas`, frames `A` and `B` as well as all frames linked, through `frlink`, to `A` and `B`

    frames save myframeset, frames(A B) linked

Menu

Data > Frames Manager

Syntax

`frames save` *filename* `,` `frames(`*framelist*`)` [*options*]

If *filename* is specified without an extension, `.dtas` is assumed. If *filename* contains embedded spaces or other special characters, enclose it in double quotes.

options	Description
* `frames(`*framelist*`)`	specify frames to be saved
`replace`	overwrite existing `.dtas` file
`linked`	save frames linked to those in *framelist*
`relaxed`	ignore missing linked frames
`complevel(#)`	specify compression level; default is `complevel(1)`
`nolabel`	omit value labels from the saved frames
`orphans`	save all value labels, even if they are not attached to a variable
`emptyok`	save specified frames even if they have zero observations and zero variables
`all`	save `e(sample)` with the frames in which it exists; programmer's option

*`frames(`*framelist*`)` is required.

`all` does not appear in the dialog box.

Options

`frames(`*framelist*`)` specifies the frames to be saved. *framelist* is a list of frame names separated by a space. To save all frames in memory, specify `frames(_all)`. `frames()` is required.

`replace` permits `frames save` to overwrite *filename* if it already exists.

`linked` specifies that all frames linked to those in *framelist* are also saved. Linkages are established by the `frlink` command. Note that if frame `A` is linked to frame `B` through `frlink`, and frame `B` is similarly linked to frame `C`, then saving frame `A` with the `linked` option will also save frames `B` and `C`, as well as other frames linked to `B` and `C`, and so forth.

`relaxed` is allowed only with the `linked` option. `relaxed` specifies that an error message not be issued if a linked frame does not exist.

`complevel(#)` specifies the compression level to be used. # may be any integer from 0 to 9; the default is `complevel(1)`. `complevel(0)` means no compression; a larger # means more compression. The compression level can also be set with `set dtascomplevel`; type `help set dtascomplevel` to learn more. `complevel()` overrides the `dtascomplevel` setting.

`nolabel` specifies that value labels from the saved frames are omitted.

`orphans` specifies that all value labels be saved, including those not attached to any variable.

`emptyok` specifies that the frames be saved even if they contain zero observations and zero variables.

The following option is available with `frames save` but is not shown in the dialog box:

`all` specifies that `e(sample)` be saved with the frames in which it exists. `all` is a programmer's option.

Remarks and examples

Data frames allow you to work with multiple datasets in memory and to access variables across those datasets. `frames save` allows you to save the data from multiple frames into a single file; the resulting file is referred to as a Stata frameset and uses the `.dtas` extension. You can simply specify the list of frames you want to save or specify that the listed frames and those linked to them be saved.

▷ Example 1: Save multiple frames

Suppose that we have two frames in memory and we want to save data from both in a single file. To demonstrate, we first create a frame named `census` and load a dataset with population data by state:

```
. clear all
. frame create census
. frame change census
. sysuse census
(1980 Census data by state)
```

Next we create a frame named `housing` in which we load housing data by state:

```
. frame create housing
. frame change housing
. webuse hsng
(1980 Census housing data)
```

Now we save both frames, census and housing, into a file called myframeset.dtas:

```
. frames save myframeset, frames(census housing) replace
(file myframeset.dtas not found)
file myframeset.dtas saved
```

Whenever we wish to load the data frames from myframeset.dtas, we can use frames use.

◁

▷ Example 2: Save linked frames

One advantage of working with data frames is that you can access values from one frame in another by linking the two frames. Furthermore, when you save data from a frame, you may wish to save data from the frames it is linked to, which we demonstrate below.

Continuing with our frames from example 1, we can use frame pwf to check which frame is the working frame:

```
. frame pwf
  (current frame is housing)
```

Our current frame is housing. We now use frlink to link frame census to frame housing, matching observations on values of state:

```
. frlink 1:1 state, frame(census)
(all observations in frame housing matched)
```

The message indicates that all observations in frame housing matched those in frame census. We can use frames describe to get a summary of the data in each frame:

```
. frames describe
--------------------------------------------------------------------------------

Frame: census

Contains data from C:\Program Files\Stata19\ado\base\c\census.dta
 Observations:            50                  1980 Census data by state
    Variables:            13                  28 Mar 2025 19:42
--------------------------------------------------------------------------------

Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------

state           str14   %-14s                 State
state2          str2    %-2s                  Two-letter state abbreviation
region          int     %-8.0g     cenreg     Census region
pop             long    %12.0gc               Population
poplt5          long    %12.0gc               Pop, < 5 year
pop5_17         long    %12.0gc               Pop, 5 to 17 years
pop18p          long    %12.0gc               Pop, 18 and older
pop65p          long    %12.0gc               Pop, 65 and older
popurban        long    %12.0gc               Urban population
medage          float   %9.2f                 Median age
death           long    %12.0gc               Number of deaths
marriage        long    %12.0gc               Number of marriages
divorce         long    %12.0gc               Number of divorces
--------------------------------------------------------------------------------

Sorted by: state
--------------------------------------------------------------------------------
```

```
--------------------------------------------------------------------------------
Frame: default

Contains data
 Observations:             0
    Variables:             0
Sorted by:
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
Frame: housing

Contains data from https://www.stata-press.com/data/r19/hsng.dta
 Observations:            50                    1980 Census housing data
    Variables:            13                    28 Mar 2025 19:42
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
state           str14   %14s                  State
division        int     %8.0g      division   Census division
region          int     %8.0g      region     Census region
pop             long    %10.0g                Population in 1980
popgrow         float   %6.1f                 Pop. growth 1970-80
popden          int     %6.1f                 Pop/sq. mile
pcturban        float   %8.1f                 Percent urban
faminc          long    %8.2f                 Median family inc., 1979
hsng            long    %10.0g                Hsng units 1980
hsnggrow        float   %8.1f                 % housing growth
hsngval         long    %9.2f                 Median hsng value
rent            long    %6.2f                 Median gross rent
census          byte    %10.0g
--------------------------------------------------------------------------------
Sorted by: state
     Note: Dataset has changed since last saved.
--------------------------------------------------------------------------------
```

We can see that frame `housing` has a variable named `census`; this is the variable that `frlink` created to store the information needed to link the frames. We can also see that the `default` frame is empty because we have not loaded a dataset into that frame.

We can now save frame `housing` and all frames linked to it by typing the following:

```
. frames save myframeset, frames(housing) linked replace
file myframeset.dtas saved
```

This saves frame `housing`, as well as frame `census`, because it is linked to frame `housing`. The `replace` option replaces file `myframeset.dtas` if it already exists.

We now drop frame `census` using `frame drop`:

```
. frame drop census
```

Note that if we try to save frame `housing` and the frames linked to it, we get an error message:

```
. frames save myframeset, frames(housing) linked replace
linked frame does not exist
    Frame census is linked from frame housing, but frame census does not
    exist. Use option relaxed if you wish to ignore this error and proceed
    anyway.
r(111);
```

Stata is attempting to save frame census because it is linked to frame housing, but it does not exist. To save the frames we specified, and any existing frames linked to them, we can use the relaxed option to ignore any linked frame that does not exist:

```
. frames save datasets, frames(housing) linked replace relaxed
(file datasets.dtas not found)
file datasets.dtas saved
```

We no longer get an error message, but because frame census does not exist, only frame housing gets saved.

◁

Stored results

frames save stores the following in r():

Scalars

r(complevel)	compression level
r(compsize)	size, in bytes, of compressed file
r(compratio)	compression ratio, defined as the ratio of compressed size to uncompressed size

Macros

r(fn)	pathname of saved frameset file
r(frames)	list of frames saved, listed in the same order as in option frames(); if frames(_all) is used, then the working frame is listed first, followed by the remaining frames in alphabetical order
r(first)	first frame in r(frames)

Also see

[D] **frames describe** — Describe frames in memory or in a file

[D] **frames modify** — Modify a set of frames on disk

[D] **frames use** — Load a set of frames from disk

[D] **frames** — Data frames

[D] **save** — Save Stata dataset

frames use — Load a set of frames from disk

Description | Quick start | Menu | Syntax | Options
Remarks and examples | Stored results | Also see

Description

`frames use` loads into memory a set of frames from a Stata frameset (`.dtas`) file previously saved by `frames save`.

Quick start

Load all frames in file `myframeset.dtas`

    frames use myframeset

Load frames `A` and `B` in file `myframeset.dtas`

    frames use myframeset, frames(A B)

Menu

Data > Frames Manager

Syntax

`frames use` *filename* [, *options*]

If *filename* is specified without an extension, `.dtas` is assumed. If *filename* contains embedded spaces or other special characters, it has to be enclosed in double quotes.

options	Description
`frames(`*framelist*`)`	specify frames to be used
`clear`	clear all frames in memory and replace them with the frames from disk
`replace`	overwrite existing frames in memory with frames of the same name from *filename*

Options

`frames(`*framelist*`)` specifies the frames to be loaded into memory. *framelist* is a list of frame names separated by a space. If `frames()` is not specified, all frames are loaded. The `frames()` option does not change the current working frame; to change the working frame after `frames use`, use `frame change`.

`clear` clears all frames in memory and replaces them with frames from disk. The new working frame will be the first frame that was specified in the `frames(`*framelist*`)` option with `frames save`.

If both `clear` and `frames(`*framelist*`)` are specified with `frames use`, the new working frame will be the first one listed in *framelist*.

`replace` replaces frames in memory with frames from *filename* if the frame names are the same. This option does not drop from memory existing frames with different names.

Remarks and examples

`frames use` is used to load a frameset previously saved with `frames save`. A frameset is a single file with data from multiple frames. By loading a frameset with `frames use`, you can resume the work you were doing with the frames saved with `frames save`.

`frames use` will load all the data frames stored in the `.dtas` file, unless you specify a list with the `frames()` option. Additionally, when no other options are specified, the frames will be loaded into memory, but the current working frame will not be changed, even if it is empty. When `frames use` is specified with both the `frames()` and `clear` options, the new working frame will be the first frame listed in the `frames()` option. When `frames use` is specified with the `clear` option but without the `frames()` option, the new working frame will be the first frame that was specified in the `frames()` option with `frames save`. Note that the first frame of a `.dtas` file is stored in `r(first)` after the frameset is described with `frames describe using`.

▷ Example 1

To demonstrate how to load a frameset, we first need to create a frameset. Below, we create frames `census` and `housing` with data from the 1980 census. We then use `frames save` to store both of these frames in a file named `myframeset.dtas`.

```
. clear frames
. sysuse census
(1980 Census data by state)
. frame rename default census
. frame create housing
. frame change housing
. webuse hsng
(1980 Census housing data)
. frames save myframeset, frames(census housing) replace
(file myframeset.dtas not found)
file myframeset.dtas saved
```

Suppose that at a later time we would like to load the frames in `myframeset.dtas`. We first clear any data and frames and then use `frames use`.

```
. clear all

. frames use myframeset
  census    50 x 13; 1980 Census data by state
  housing   50 x 12; 1980 Census housing data
```

We see in the output above that both frames were loaded into memory. If there is no dataset in memory, `frames use` loads the frames from the `.dtas` file, but the `default` frame remains the current working frame, as shown below:

```
. pwf
  (current frame is default)
```

The output from `pwf` shows that the current frame is `default`. `frames describe` below lists the frames in alphabetical order and shows that the `default` frame (labeled `Frame: default`) is empty:

```
. frames describe
--------------------------------------------------------------------------------
Frame: census

Contains data
 Observations:            50                  1980 Census data by state
    Variables:            13                  28 Mar 2025 19:42
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
state           str14   %-14s                 State
state2          str2    %-2s                  Two-letter state abbreviation
region          int     %-8.0g     cenreg     Census region
pop             long    %12.0gc               Population
poplt5          long    %12.0gc               Pop, < 5 year
pop5_17         long    %12.0gc               Pop, 5 to 17 years
pop18p          long    %12.0gc               Pop, 18 and older
pop65p          long    %12.0gc               Pop, 65 and older
popurban        long    %12.0gc               Urban population
medage          float   %9.2f                 Median age
death           long    %12.0gc               Number of deaths
marriage        long    %12.0gc               Number of marriages
divorce         long    %12.0gc               Number of divorces
--------------------------------------------------------------------------------
Sorted by:
--------------------------------------------------------------------------------

--------------------------------------------------------------------------------
Frame: default

Contains data
 Observations:             0
    Variables:             0
Sorted by:
--------------------------------------------------------------------------------
```

```
Frame: housing

Contains data
 Observations:            50                  1980 Census housing data
    Variables:            12                  28 Mar 2025 19:42

Variable      Storage   Display    Value
    name         type    format    label      Variable label

state         str14     %14s                  State
division      int       %8.0g      division   Census division
region        int       %8.0g      region     Census region
pop           long      %10.0g                Population in 1980
popgrow       float     %6.1f                 Pop. growth 1970-80
popden        int       %6.1f                 Pop/sq. mile
pcturban      float     %8.1f                 Percent urban
faminc        long      %8.2f                 Median family inc., 1979
hsng          long      %10.0g                Hsng units 1980
hsnggrow      float     %8.1f                 % housing growth
hsngval       long      %9.2f                 Median hsng value
rent          long      %6.2f                 Median gross rent

Sorted by: state
```

If there are frames in memory, frames `census` and `housing` in `myframeset.dtas` will be loaded into memory, in addition to the frames already in memory. If there is already a frame in memory with the same name as the frame you are loading, `frames use` issues an error message. For example, below we rename the `default` frame to `census` and then run our `frames use` command once more:

```
. clear frames

. sysuse census, clear
(1980 Census data by state)

. frame rename default census

. frames use myframeset.dtas
frames in memory are in conflict with frames on disk
    Frame census is already in memory.  Specify option clear to clear all
    frames or option replace to replace only the frames in conflict.
r(4);
```

To successfully load the frames from `myframeset.dtas`, we can either use the `clear` option to clear all frames from memory,

```
. frames use myframeset, clear
```

or use the `replace` option to replace the frames in conflict:

```
. frames use myframeset, replace
```

◁

Stored results

`frames use` stores the following in `r()`:

Macros

`r(fn)`	pathname of frameset
`r(frames)`	list of frames loaded

Also see

[D] **frames describe** — Describe frames in memory or in a file

[D] **frames modify** — Modify a set of frames on disk

[D] **frames save** — Save a set of frames on disk

[D] **frames** — Data frames

[D] **sysuse** — Use shipped dataset

[D] **use** — Load Stata dataset

[D] **webuse** — Use dataset from Stata website

frget — Copy variables from linked frame

Description | Quick start | Syntax | Options
Remarks and examples | Stored results | Also see

Description

`frget` copies variables and their associated metadata from the data in the linked frame to the data in the current frame. Copy means copying the relevant observations from the linked frame to the appropriate observations in the current frame. If you would like to refer to a variable in another frame without copying that variable into the current frame, see [D] **fralias**.

See [D] **frames intro** if you do not know what a frame is.

Quick start

Obtain variables `v1`, `v2`, and `v3` from another frame linked to by linkage `lnk`

```
frget v1 v2 v3, from(lnk)
```

Obtain variables `v4` and `v5` via linkage `lnk`, naming them `newv4` and `newv5` in the current frame

```
frget newv4=v4 newv5=v5, from(lnk)
```

Obtain all variables via linkage `lnk`, prefixing them with `l_`

```
frget *, from(lnk) prefix(l_)
```

Obtain all variables via linkage `lnk`, excluding those matching pattern `ind*`

```
frget *, from(lnk) exclude(ind*)
```

Syntax

`frget` *varlist* `,` `from(`*linkname*`)` [*rename_options*]   (1)

`frget` $newvar_1$ = $varname_1$ [$newvar_2$ = $varname_2$ [...]], `from(`*linkname*`)`   (2)

linkname is the name of a *linkvar* in the current frame that was created by `frlink`; see [D] **frlink**.

rename_options	Description
`prefix(`*string*`)`	prefix new variable names with *string*
`suffix(`*string*`)`	suffix new variable names with *string*
`exclude(`*varlist*`)`	exclude specified variables

`collect` is allowed; see [U] **11.1.10 Prefix commands**.

Syntax 1 copies the variable names specified by *varlist* from the frame linked by *linkname* to the current frame.

Syntax 2 copies $varname_1$ from the frame linked by *linkname* to $newvar_1$ in the current frame. Similarly, $varname_2$ is copied to $newvar_2$ and so on.

Copy means copy and clone. Display formats, variable labels, value labels, notes, and characteristics are also copied.

Options

`from(`*linkname*`)` specifies the identity of the linked frame from which variables are copied. Linkages to frames are created by the `frlink` command. Linkages are usually named for the frame to which they link. Linkage `counties` links to frame `counties`, and so you specify `from(counties)`. If linkage `c` links to frame `counties`, you specify `from(c)`. `from()` is required.

`prefix(`*string*`)` specifies a string to be prefixed to the names of the new variables created in the current frame. Say that you type

```
. frget inc*, from(counties)
```

to request that variables `income` and `income_family` be copied to the current frame. If variable `income` already exists in the current frame, the command would issue an error message to that effect and copy neither variable. To copy the two variables, you could type

```
. frget inc*, from(counties) prefix(c_)
```

Then the variables would be copied to variables named `c_income` and `c_income_family`.

`suffix(`*string*`)` works like `prefix(`*string*`)`, the difference being that the string is suffixed rather than prefixed to the variable names. Both options may be specified if you wish.

`exclude(`*varlist*`)` specifies variables that are not to be copied. An example of the option is

```
frget *, from(counties) exclude(emp*)
```

All variables except variables starting with `emp` would be copied.

More correctly, all variables except `emp*`, `_*`, and the match variables would be copied because `frget` always omits the underscore and match variables. See the explanation below.

Remarks and examples

Remarks are presented under the following headings:

Overview

You have data on people and data on counties. You loaded the datasets and created a linkage named `uscounties` by typing

```
. use people
. frame create uscounties
. frame uscounties: use uscounties
. frlink m:1 countyid, frame(uscounties)
```

See example 1 in [D] **frlink** for details.

Among the variables in `uscounties.dta` is `median_income`. You could copy the variable to the person data in the current frame by typing either of the following:

```
. frget median_income, from(uscounties)
. frget medinc = median_income, from(uscounties)
```

The first command names the copy `median_income` in the current frame. The second names it `medinc`.

Everything you need to know about frget

Here is everything you need to know in outline form:

1. What it means to copy a linked variable
2. frget can copy variables one at a time
3. frget allows variable names to be abbreviated
4. frget can bring over groups of variables
5. frget copies all the variables specified, or none of them
6. frget ignores repeated variables
7. How to get all the variables 1: frget *
8. How to get all the variables 2: frget *, prefix()
9. How to create new variables
10. frget copies and clones variables

We make two assumptions in what follows:

A1. The current frame contains data on people. A frame named uscounties contains data on counties. That is, we assume

```
. use people
. frame create uscounties
. frame uscounties: use uscounties
```

A2. The frames are linked on the match variable countyid, which appears in both datasets. The linkage between the frames is named uscounties, the same name as the frame being linked. That is, we assume

```
. frlink m:1 countyid, frame(uscounties)
```

1. What it means to copy a linked variable

   When you type

   ```
   . frget median_income, from(uscounties)
   ```

   frget copies variable median_income from frame uscounties to the current frame. Well, we say it copies the variable, but the process is more complicated than that. frget copies the relevant observations of median_income from frame uscounties to the appropriate observations in the current frame. In the process, frget duplicates some observations and ignores others.

   If the person in observation 1 lives in county 401, then the median income recorded for county 401 in the uscounties frame is copied to observation 1 in the current frame.

   If the people in observations 2, 33, and 65 in the current frame reside in county 207, then the median income recorded for county 207 is duplicated in observations 2, 33, and 65 of the current frame.

   If the person in observation 3 lives in county 599 and there is no county 599 in the uscounties frame, then missing value . or "" is stored in observation 3.

   A copy of a variable from a linked frame is a copy of the relevant observations of the variable to the appropriate observations in the current frame when relevant observations exist.

2. frget can copy variables one at a time

   To copy variable median_income from frame uscounties to the current frame, type

   ```
   . frget median_income, from(uscounties)
   ```

To instead copy `median_income` to a new variable named `medinc` in the current frame, type

```
. frget medinc=median_income, from(uscounties)
```

3. `frget` allows variable names to be abbreviated

   `frget` allows abbreviations if you have not `set varabbrev off`. If `median_income` is the only variable beginning with `median` in the linked frame, you can type

   ```
   . frget median, from(uscounties)
   ```

   Variable `median_income` will be copied, and the new variable in the current frame will be named `median_income`.

   When using `frget`'s *newvar=varname* syntax, you can abbreviate the variable being copied that appears to the right of the equals sign:

   ```
   . frget medinc=median, from(uscounties)
   ```

4. `frget` can bring over groups of variables

   `frget` allows you to specify a *varlist*. Even though you type `frget` in the current frame, the *varlist* is interpreted in the linked frame. You can type

   ```
   . frget emp*, from(uscounties)
   . frget emp* median_income, from(uscounties)
   . frget emp* median, from(uscounties)
   . frget emp* m*, from(uscounties)
   . frget *, from(uscounties)
   ```

   When you specify a *varlist*, `frget` automatically omits the match variable or variables and any variables starting with an underscore (`_`). First, we will tell you why, and then, we will tell you a workaround.

   We start with a match variable. The match variable(s) in our example is match variable `countyid`. The variable has the same name in both frames. Pretend for a moment that `frget` did not exclude match variables. Then, if you tried to copy `countyid`, that would be an error because `frget` will not overwrite existing variables. That seems reasonable until you realize that it would also mean that `frget` would issue an error if you typed

   ```
   . frget c*, from(uscounties)
   ```

   or even if you typed

   ```
   . frget *, from(uscounties)
   ```

   `frget` would issue errors because `c*` and `*` would include `countyid`, which, being the match variable, already exists in the current frame. `frget` automatically omits match variables so that you can type `frget c*` and `frget *` and get all the other variables.

   `frget` omits `_*` variables because they tend to be Stata system variables that are valid only in the dataset in which they appear. You do not want them.

   What if you need to get one of these variables? Use the *newvar=varname* syntax. Type, for instance,

   ```
   . frget _myvar=_myvar, frame(uscounties)
   ```

   Automatic omission is not applied to this syntax.

5. `frget` copies all the variables specified, or none of them

   `frget` will not overwrite existing variables. If just one variable in the specified list already exists in the current frame, `frget` copies none of the variables. It issues an error.

```
. frget emp* m*, from(uscounties)
variable mvalues already exists
r(110);
```

   If you want all the `m*` variables except `mvalues`, use the `exclude()` option:

```
. frget emp* m*, from(uscounties) exclude(mvalues)
```

   If you also want `mvalues` copied to `mvals` in the current frame, type

```
. frget mvals=mvalues, from(uscounties)
```

6. `frget` ignores repeated variables

   It is not an error to type

```
. frget employment employment, from(uscounties)
```

   We specified `employment` twice, but `frget` ignores that and copies the variable once. This is convenient because variables can be inadvertently repeated, as in

```
. frget m* employment-larea, from(uscounties)
```

   Although you cannot see it, variable `mds` is repeated in the example. `m*` contains `mds`, and so does `employment-larea` because `mds` is among the variables stored between them.

   When variables are repeated using the *newvar*=*varname* syntax, `frget` does not ignore repetition. It copies the variables you specify to each of the new variables that you specify:

```
. frget medinc=income inc=income, from(uscounties)
```

7. How to get all the variables 1: `frget *`

   To get all the variables, try typing

```
. frget *, from(uscounties)
```

   This sometimes works. Other times it does not because some of the variables in `uscounties` already exist in the current frame. When it does not work, `frget` lists the variable names that exist in both frames and, even better, stores them in `r(dups)`. Thus, if you are willing to exclude those variables, you can type

```
. frget *, from(uscounties) exclude(`r(dups)')
```

8. How to get all the variables 2: `frget *, prefix()`

   Another way to get all the variables is to type

```
. frget *, from(uscounties) prefix(c_)
```

   This brings in all the variables under their original names but prefixed with `c_`. The variable `mvalues` in the linked frame, for instance, is copied to `c_mvalues`.

   Another advantage of this approach is how easily you can drop the copies from the data should you desire to do so. Type

```
. drop c_*
```

You can choose your own prefix. If you prefer suffixing them, type

```
. frget *, from(uscounties) suffix(_c)
```

This names the copies `mvalues_c`, etc. These names are more like the originals, at least if you use tab completion for typing them. Type the first characters of the original name and press tab. And if you wish, you can later drop the suffixed variables just as easily as prefixed ones. Type

```
. drop *_c
```

9. How to create new variables

   Assume that the `uscounties` frame contains variables `total_income` and `population`. You need `avg_income` in the current frame.

   One solution would be

```
. frget total_income population, from(uscounties)
. generate avg_income = total_income/population
```

   Another solution would be to use the `frval()` function to make the calculation directly:

```
. generate avg_income =
> frval(uscounties, total_income)/frval(uscounties, population)
```

   Here, however, is perhaps the best solution:

```
. frame uscounties: generate avg_income = total_income/population
. frget avg_income, from(uscounties)
```

   It is not often that one has the opportunity to save computer time and memory. The gist of this approach is to create county-level variables in the `uscounties` frame and then use `frget` to get the ones you need.

10. `frget` copies and clones variables

    When `frget` copies variables, it also copies their display formats, variable labels, value labels, notes, and characteristics.

    The new variables are not just copies. They are clones.

Stored results

`frget` stores the following in `r()`:

Scalars

`r(k)`	number of variables copied from linked frame

Macros

`r(newlist)`	new variables in the current frame
`r(srclist)`	variables copied from linked frame
`r(excluded)`	variables not copied from linked frame
`r(dups)`	variables already present in the current frame
`r(notfound)`	variables not found in the linked frame

`r(dups)` is present only if `frget` exits with an error message because a prospective new variable name already exists in the current frame.

`r(notfound)` is present only for syntax 2 when `frget` exits with an error message because a *varname* is not found in the linked frame.

Also see

[D] **frlink** — Link frames

[D] **fralias** — Alias variables from linked frames

[D] **frames intro** — Introduction to frames

[D] **merge** — Merge datasets

Description

frlink creates and helps manage links between datasets in different frames. A link allows the variables in one frame to be accessed by another. See [D] **frames intro** if you do not know what a frame is.

Quick start

Create 1-to-1 linkage to frame fr2 and match on variable matchvar

```
frlink 1:1 matchvar, frame(fr2)
```

Create many-to-1 linkage to frame fr3, matching variables v1 and v2 in the current frame to variables x1 and x2 in frame fr3, naming the linkage lnk

```
frlink m:1 v1 v2, frame(fr3 x1 x2) generate(lnk)
```

List names of linkages in current frame

```
frlink dir
```

Show details for linkage lnk

```
frlink describe lnk
```

Attempt to re-create linkage lnk after data have changed

```
frlink rebuild lnk
```

Eliminate linkage lnk

```
drop lnk
```

Syntax

Create linkage between current frame and another

frlink { 1:1 | m:1 } *varlist*$_1$, frame(*frame*$_2$ [*varlist*$_2$]) [generate(*linkvar*$_1$)]

List names of existing linkages

frlink dir

List details about existing linkage, and verify it is still valid

frlink describe *linkvar*$_2$

Re-create existing linkage when data have changed or frames are renamed

frlink rebuild *linkvar*$_2$ [, frame(*frame*$_3$)]

Drop existing linkage (dropping the variable eliminates the linkage)

drop *linkvar*$_2$

1:1 and m:1 indicate how observations are to be matched.

varlist$_1$ contains the match variables in the current frame, which we will call frame 1.

linkvar$_1$ is the name to be given to the new variable that frlink creates. The variable is added to the dataset in frame 1. The variable contains all the information needed to link the frames.

You specify the name for *linkvar*$_1$ using the generate(*linkvar*$_1$) option, or you let frlink name it for you. If frlink() chooses the name, the variable is given the same name as *frame*$_2$.

linkvar$_2$ is the name of an existing link variable.

collect is allowed with frlink dir and frlink rebuild; see **[U] 11.1.10 Prefix commands**.

Options

Options are presented under the following headings:

Options for frlink 1:1 and frlink m:1
Options for frlink rebuild

Options for frlink 1:1 and frlink m:1

frame(*frame*$_2$ [*varlist*$_2$]) specifies the name of the frame, *frame*$_2$, to which a linkage is created and optionally the names of variables in *varlist*$_2$ on which to match. If *varlist*$_2$ is not specified, the match variables are assumed to have the same names in both frames. frame() is required.

To create a link to a frame named counties, you can type

```
. frlink m:1 countyid, frame(counties)
```

This example omits specification of *varlist*$_2$, and it works when the match variable `countyid` has the same name in both frames. If the variable were named `cntycode`, however, in the other frame, you type

```
. frlink m:1 countyid, frame(counties cntycode)
```

The rule for matching observations is thus that `countyid` in the current frame equals `cntycode` in the other frame.

You can specify multiple match variables when necessary. For example, you want to match on county names in US data. County names repeat across the states, so you match on the combined county and state names by typing

```
. frlink m:1 countyname statename, frame(counties)
```

If the match variables had different names in frame `counties`, such as `county` and `state`, you type

```
. frlink m:1 countyname statename, frame(counties county state)
```

`generate(`*linkvar*$_1$`)` specifies the name of the new variable that will contain all the information needed to link the frames. This variable is added to the dataset in frame 1. This option is rarely used.

If this option is not specified, the link variable will then be named the same as the frame name specified in the `frame()` option.

Options for frlink rebuild

`frame(`*frame*$_3$`)` specifies a frame name that differs from the existing linkage. *frame*$_3$ is the new name of a frame linked by *linkvar*$_2$.

For instance, yesterday, you created a linkage named `george` to the data in the frame named `george` by typing

```
. frlink m:1 countyname statename, frame(george)
```

Today, you loaded the linked data into a frame named `counties`. To rebuild the linkage so that linkage `george` links to the data in frame `counties`, type

```
. frlink rebuild george, frame(counties)
```

If you also wish to rename the linkage to be `counties`, type

```
. rename george counties
```

Then you would have a linkage named `counties` to the data in the frame named `counties`.

Remarks and examples

Remarks are presented under the following headings:

Overview of the frlink command

frlink 1:1 and frlink m:1 create linkages between the current frame and another frame you specify. This adds a new variable to the current frame, known as the link variable. You can use the frget command to copy variables from the linked frame to the current frame and use the frval() function to use the other frame's variables in expressions. You can use the fralias add command to define aliases of variables from the linked frame in the current frame. An alias is a reference to a variable in another frame, similar to a copy, but uses very little memory. You cannot modify the observations in a alias variable.

Linkages are said to be named, but the name is in fact the name of the link variable that frlink creates.

frlink dir lists the names of existing linkages.

frlink describe *linkvar* displays details about the specified linkage. It also checks the validity of the link variable and, if there are problems, tells you how to fix it.

frlink rebuild *linkvar* re-creates the specified *linkvar*. If *linkvar* is invalid, frlink rebuild will fix it.

Type drop linkvar to delete linkages.

Everything you need to know about linkages

Here is everything you need to know in outline form:

What follows will turn you into an expert.

1. A linkage connects one frame to another. Here are the advantages.

   Create a linkage and you can access the variables in another frame using the frval() function and the commands frget and fralias add.

1.1 The `frval()` function. You can type

```
. generate rel_income = income / frval(counties, median_income)
```

`frval(counties, median_income)` returns the value of the `median_income` variable in frame `counties`. If the current frame contained data on people and the county frame contained data on counties (linked to with link variable `counties` in the current frame), the above would produce person income divided by the median income of the county in which he or she resides. See `frval()` in [FN] **Programming functions**.

1.2 The `frget` command. You can type

```
(1) . frget median_income, from(counties)
(2) . frget medinc = median_income, from(counties)
(3) . frget median_income pop, from(counties)
(4) . frget median_income pop attr*, from(counties)
(5) . frget median_income pop attr*, from(counties) prefix(c_)
```

and more ...

(1) copies `median_income` from frame `counties` into the data in the current frame.

(2) does the same but names the variable `medinc`.

(3) copies two variables.

(4) copies lots of variables.

(5) copies lots of variables and renames them to start with `c_`.

This is only a smattering of what `frget` can do. See [D] **frget**.

1.3 The `fralias add` command. You can type

```
(1) . fralias add median_income, from(counties)
(2) . fralias add medinc = median_income, from(counties)
(3) . fralias add median_income pop, from(counties)
(4) . fralias add median_income pop attr*, from(counties)
(5) . fralias add median_income pop attr*, from(counties) prefix(c_)
```

and more ...

(1) alias `median_income` from frame `counties` so that you can use its observations in the current frame.

(2) does the same but names the alias variable `medinc`.

(3) aliases two variables.

(4) aliases lots of variables.

(5) aliases lots of variables and renames them to start with `c_`.

This is only a smattering of what `fralias add` can do. See [D] **fralias**.

2. The `frlink` command creates linkages.

`frlink` creates a linkage from the current frame to the frame you specify.

```
. frlink ..., frame(counties)
```

3. Linkages are named.

   The command

   ```
   . frlink ..., frame(counties)
   ```

   creates a linkage named `counties` to the frame named `counties`.

   You can specify option `generate()` to give the linkage a different name. To create a linkage named `c` to the frame `counties`, type

   ```
   . frlink ..., frame(counties) generate(c)
   ```

4. A linkage is a variable added to the data.

   The entire physical manifestation of a linkage is the addition of a single variable to the dataset in the current frame. Typing

   ```
   . frlink ..., frame(counties)
   ```

   adds new variable `counties` to the dataset in the current frame.

   ```
   . frlink ..., frame(counties) generate(c)
   ```

   adds new variable `c` to the dataset in the current frame.

   The added variable is known as the "link variable", or *linkvar*.

5. Drop the link variable, remove the link.

   Because linkages are just a variable, if you drop the variable, you remove the link.

   ```
   . drop counties
   . drop c
   ```

6. Do not modify the contents of the link variable.

   If you modify the link variable's contents, you invalidate the linkage. If you are lucky, the next time you use the `frget` or `fralias add` command or the `frval()` function, they will detect the problem and issue an error. If not, they will simply produce incorrect results.

   ```
   . replace counties = ...            // Do not do this
   . replace c = ...                   // Do not do this
   ```

   If you accidentally modify the link variable's contents, use `frlink rebuild` to repair it.

   ```
   . frlink rebuild counties
   . frlink rebuild c
   ```

7. Linkages are formed based on equality of match variables.

   To construct a link to frame `counties`, type

   ```
   . frlink ..., frame(counties)
   ```

   The complete command would have the dots filled in. Part of what needs to appear in place of the dots are the match variables. A more complete version of the command is

   ```
   . frlink ... countyid, frame(counties)
   ```

   We specified one match variable, `countyid`.

   Linkages are formed by matching observations in the current frame to observations in the other frame when their match variables are equal.

In the example, the match variables are countyid in the current frame and countyid in the county frame. Observations are matched when the countyid variables are equal.

Let's unravel that. The data in the current frame are on people. countyid in the current frame records the county in which each person resides.

Meanwhile, the data in the county frame contains information on counties, such as a county's median income. Variable countyid in this frame records the county each observation describes.

Observations in the two frames are matched when the county in which a person resides equals the county being described. Once we have formed the linkage by typing

```
. frlink ... countyid, frame(counties)
```

if we then type

```
. generate rel_income = income / frval(counties, median_income)
```

we obtain the ratio of each person's income to the median income in the county in which he or she resides.

8. You can specify more than one match variable.

   We just considered the case of one match variable—countyid—in each of the frames:

   ```
   . frlink ... countyid, frame(counties)
   ```

   Let's imagine that instead of containing countyid, the datasets contain countyname. Substituting countyname for countyid might be insufficient to form the desired linkage:

   ```
   . frlink ... countyname, frame(counties)
   ```

   County names in the United States are repeated across states. Monroe County, for instance, exists in Florida, Mississippi, Texas, and other states. To link the frames, we need to match on both county and state names:

   ```
   . frlink ... countyname statename, frame(counties)
   ```

   Because county and state names, taken together, uniquely identify the locations, the order in which we specify them is irrelevant:

   ```
   . frlink ... statename countyname, frame(counties)
   ```

9. Match variables can be named differently in the two frames.

   When we type

   ```
   . frlink ... countyname statename, frame(counties)
   ```

   we are stating the variables countyname and statename appear in both frames. If the names are different in the two frames, specify the names used in the current frame following the frlink command, and specify the names used in the other frame in the frame() option, after the frame's name:

   ```
   . frlink ... countyname statename, frame(counties cnty usstate)
   ```

   countyname and statename are the variable names used in the current frame. The variables corresponding to them in frame counties are named cnty and usstate.

10. Match type: One-to-one or many-to-one matching.

    Consider the linkage created by

    ```
    . frlink ... countyid, frame(counties)
    ```

    The current frame contains data on persons, and the other frame—counties—contains data on counties.

    All that is needed to turn the above into a complete command is to replace the dots with a match type, which can be 1:1 or m:1. In this case, the match type should be m:1, and the full command is

    ```
    . frlink m:1 countyid, frame(counties)
    ```

    m:1 stands for many-to-one matching. m:1 means that is okay if more than one observation in the current frame matches the same observation in the other frame. We specify m:1 because it is possible that multiple people in the current frame reside in the same county. If five people live in county 207, all five will match to the observation in frame counties that describes county 207.

    The alternative 1:1 means that at most one observation in the current frame can match an observation in the other frame. Specifying 1:1 would be appropriate for matching person data in the current frame with more data on him or her in the other frame. If persons were to be matched on personid and if the other frame were named person2, we type

    ```
    . frlink 1:1 personid, frame(person2)
    ```

    Matched would be persons in the current frame who also appeared in the second frame.

    If you think about it, 1:1 is a special case of m:1. 1:1 means at most one observation matches. m:1 means one or more observations match. This means that, if

    ```
    . frlink 1:1 personid, frame(morepersons)
    ```

    forms the linkage you want, so will

    ```
    . frlink m:1 personid, frame(morepersons)
    ```

    So why specify 1:1? We specify 1:1 so that frlink can issue an error message if the result is not 1:1. When matching people's data to more data on the same people, if two people in the first frame matched the same observation in the second, that means

    P1. there is an error in the first dataset: the same person appears more than once in it; or

    P2. there is an error in variable personid in the first dataset: the personid variable contains the wrong value; or

    P3. we are not thinking clearly and should have specified m:1 instead of 1:1.

    You specify 1:1 so that the software can flag situations where the reality is different from your expectations. Then you fix your data or your thinking.

11. Linking can result in unmatched observations.

    Imagine that you have successfully executed

    ```
    . frlink m:1 countyid, frame(counties)
    ```

The result will be that each observation in the current frame will be matched or unmatched. Observations in the current frame are matched when the values of countyid are found in frame counties. The remaining observations, if any, are unmatched. Unmatched observations are not an error; they are a characteristic and perhaps a shortcoming of your datasets.

frlink tells you how many unmatched observations there are when you create the linkage.

Function frval() will subsequently return missing values for the unmatched observations. If you type

```
. generate relative_income = income/frval(linkvar, median_income)
```

variable relative_income would be missing (.) for the unmatched observations, the same as if unmatched observations were matched but contained median_income==..

frget and alias variables created by fralias add behave similarly. frget sets the unmatched observations equal to missing in the copied variable. Alias variables return missing values for unmatched observations.

```
. frget median_income, from(counties)
. fralias add median_income, from(counties) prefix(a_)
```

In addition, the link variable in the current frame contains missing values for the unmatched observations. This is useful. How many observations in the current frame are unmatched? If you do not remember, type

```
. count if counties==.
```

You can look at the data for the unmatched observations.

```
. browse if counties==.
```

You can analyze the unmatched data.

```
. summarize if counties==.
```

If observations will be useful to you only when they are matched with county data, you can keep just the matched data by typing

```
. keep if counties!=.
```

12. Linkages are directional.

    We say that we link the current frame to another frame, but it's really the other way around. Data flow to the current frame from the other frame. If you have created the linkage

    ```
    . frlink m:1 countyid, frame(counties)
    ```

    then you can access data in frame counties from the current frame, but you cannot access data in the current frame from frame counties.

13. How to create nested linkages.

    Consider separate frames containing data on students, the schools they attend, and the counties in which the schools are located. Here is the setup:

    > Current frame: students.dta containing variables for each student's ID, the ID of the schools he or she attends, and student characteristics.
    >
    > Frame schools: schools.dta containing each school's ID, the ID of the counties in which the schools are located, and school characteristics.

Frame `counties`: `us_counties.dta` containing each county's ID and county characteristics.

Here is how you load the datasets into the frames:

```
. frame create schools
. frame create counties
. use students
. frame schools: use schools
. frame counties: use us_counties
```

Here is how you link the frames:

```
. frlink m:1 schoolid, frame(schools)
. frget countyid, from(schools)
. frlink m:1 countyid, frame(counties)
```

The first command links students with the schools they attend.

The second command copies variable `countyid` from frame `schools` to the current frame.

The third command links students with the counties in which their schools are located.

The command that copied `countyid` into the current frame was necessary so that the students in the current frame could be linked to the county frame.

Said generically, if you have data in frames A, B, and C, you link frame A to B and link frame A to C to access all the data from A.

Said negatively, linkages are not transitive. Linking frame A to B and B to C is not sufficient to allow frame A to access all the data.

14. Saving and using linked frames.

You have created students-linked-to-county data:

```
. use students
. frame create counties
. frame counties: use us_counties
. frlink m:1 countyid, frame(counties)
```

To save the datasets so that you can use them later, you need only type

```
. save students, replace
```

It is necessary to save `students.dta` because it has a new variable in it, namely, the linkage variable `counties`. It is not necessary to save `us_counties.dta` because it has not changed.

That said, you might still wish to save both files:

```
. save students, replace
. frame counties: save us_counties, replace
```

The data in frame `counties` were not changed, but the sort order of the data changed. Linking sorts the linked-to frame on its match variables. We recommend you save both datasets.

To later load the data, you type

```
. use students
. frame create counties
. frame counties: use us_counties
```

You might want to put these lines in a do-file. You could call it `usestudents.do`. Then, whenever you wanted to load the data, all you need to do is type

```
. do usestudents
```

15. Do's and don'ts.

We start with the don'ts. There are only three:

Do not modify the contents of the link variable,

... but if you do, use `frlink rebuild` to fix it.

Do not rename the match variables in either frame,

... but if you do, drop the link variable, and use `frlink m:1` or `1:1` to link the frames again.

Do not drop the match variables from either frame,

... and if you do, we cannot help you.

Everything else is a *do*, but they come in two flavors. The first is *do* without qualifications. The second is also a *do*, but do it only if you follow it by typing `frlink rebuild`.

Here are the *do's* without qualifications:

Do drop the link variable. That's how you eliminate the link.

Do rename the link variable.

Do drop observations in the current frame.

Do add new variables in either frame.

Do modify or rename variables in either frame, with the exception of the link and the match variables.

And here are the *do's* with qualification, which is always the same: Type `frlink rebuild` afterward.

Do rebuild after adding observations in either or both frames.

Do rebuild after dropping observations in the linked frame.

Do rebuild after modifying the contents of the match variables in either or both frames.

And remember a rule that always applies:

It is always safe to type `frlink rebuild`.

If there is no problem, it will do nothing.

If there is a problem, it will fix it unless it cannot,

... then it explains why and do nothing to your data.

You are now an expert on linked frames.

Example 1: A typical m:1 linkage

File `persons.dta` contains data on people. Among its variables is `countyid`, containing the county code where each person resides.

File `txcounty.dta` contains data on Texas counties. Among its variables is `countyid`, the county code for the county that each observation describes.

Here is how we load and link the datasets:

```
. use https://www.stata-press.com/data/r19/persons
. frame create txcounty
. frame txcounty: use https://www.stata-press.com/data/r19/txcounty
(Median income in Texas counties)
. frlink m:1 countyid, frame(txcounty)
(all observations in frame default matched)
```

Linkages are for situations where you want to analyze the data in the current frame using variables from both frames.

Below, we create new variable `relative_income` in the current frame equal to `income` (in the current frame) divided by `median_income` (from the county frame):

```
. generate relative_income = income / frval(txcounty, median_income)
. summarize relative_income
```

Variable	Obs	Mean	Std. dev.	Min	Max
relative_i~e	20	.5501545	.1090887	.352133	.7038001

If we wanted to use `median_income` from the county frame in a linear regression, we would use the `frget` command to add `median_income` to the current frame's data:

```
. frget median_income, from(txcounty)
. regress income ... median_income ...
```

We will not do that because `persons.dta` contains fictional values and is not worth the bother. But realize what would be possible if these datasets were real and contained more variables:

Get a variable:

```
frget median_income, from(txcounty)
```

Get a variable, but change its name:

```
frget medinc = median_income, from(txcounty)
```

Get a lot of variables:

```
frget median* nbus-pop, from(txcounty)
```

Get a lot of variables, but change their names to begin with `c_`:

```
frget median* nbus-pop, prefix(c_) from(txcounty)
```

See [D] **frget**.

A more memory-efficient option is to use `fralias add` to create aliases instead of copies. See [D] **fralias**.

How link variables work

`frlink` performs two actions when it creates a link:

1. It adds the link variable to the dataset in the current frame.
2. It sorts the dataset in the other frame by its match variables.

In the example above, this means that

1. frlink adds variable txcounty to the data in the current frame.
2. frlink sorts the data in frame txcounty by countyid. (It literally executes frame txcounty: sort countyid.)

Look at variable txcounty in the first observations of persons.dta in the current frame:

```
. list in 1/5
```

	personid	countyid	income	txcounty	relati~e
1.	1	5	30818	5	.7038001
2.	2	3	30752	3	.4225046
3.	3	2	29673	2	.5230381
4.	4	3	32115	3	.441231
5.	5	2	31189	2	.5497603

Each observation of variable txcounty contains the observation number in frame txcounty that matches the current observation. The above list says that

obs. 5 of frame txcounty matches obs. 1 of the current frame

obs. 3 of frame txcounty matches obs. 2 of the current frame

obs. 2 of frame txcounty matches obs. 3 of the current frame

obs. 3 of frame txcounty matches obs. 4 of the current frame

obs. 2 of frame txcounty matches obs. 5 of the current frame

... assuming the data in frame txcounty are sorted on countyid

Frame txcounty is the other frame. It is the other frame that must be sorted, not the data in the current frame.

Even so, the assumption is iffy. It is true after frlink creates the linkage because frlink itself sorts the data. And fralias add, frget, and frval() check the sort order before using the other frame's data so that accidents do not happen.

The only way things can go wrong are 1) if you change the contents of the link variable txcounty or 2) you drop or modify the match variable countyid. So do not do that.

Advanced examples

Example 1 showed you how linkages are usually used. We linked person data to county data. We could show you another example that links student data to school data and student data to county data, but it amounts to nothing more than example 1, done twice.

We have two more examples to show you, but we admit that they are advanced and abstruse.

The first is an example in which linkage shines, but the solution is seldom useful beyond the particular example shown.

The second concerns `1:1` linkages. If `1:1` is appropriate for your problem, you probably want to merge the datasets, not link them. You probably want to use `merge`, not `frlink`. On occasion, however, a situation arises where linkage is a better solution. We show you one and provide guidelines on how to identify other such situations.

Example 2: A complex m:1 linkage

We have a dataset on families and the file is named, naturally enough, `family.dta`. The dataset contains information on variables of interest, as all datasets do, but that is not what makes this dataset interesting, so the variables are simply named `x1`, `x2`, ..., `x5`. What makes this dataset interesting is that it contains observations on related adult people. It contains adult children, parents, and grandparents.

Such data are notoriously difficult to process and analyze.

In the dataset, every person is identified by a person ID, called a "pid". The data also contain the variables `pid_m` and `pid_f`, which are the pids for the person's mother and father, if they too are in the data. The oldest generation in the data has `pid_m==.` and `pid_f==.`.

One person in the data is person number 14982. Here are the values of ID variables for 14982:

```
. list pid* if pid==14982

     +------------------------+
     |   pid    pid_m   pid_f |
     |------------------------|
  8. | 14982   695966  933335 |
     +------------------------+
```

Variables `pid_m` and `pid_f` are the IDs of 14982's mother and father. The mother is 695966 and the father, 933335.

Here are the recorded ID variables for 695966, 14982's mother:

```
. list pid* if pid==695966

     +-------------------------+
     |    pid    pid_m   pid_f |
     |-------------------------|
431. | 695966   186484  238126 |
     +-------------------------+
```

14982's maternal grandmother is 186484 and maternal grandfather, 238126.

Let's stay with the maternal side of the family. Here are the ID variables for 186484, 14982's maternal grandmother:

```
. list pid* if pid==186484

     +-----------------------+
     |    pid   pid_m  pid_f |
     |-----------------------|
100. | 186484       .      . |
     +-----------------------+
```

The grandmother's variables have missing values for her mother's and father's ID, so we cannot continue back further. Nonetheless, there are other people in this dataset just like 14982, people on whom we have their data, their parents' data, and their parents' parents' data.

frlink can link the data so that we have access to all of them. To do that, we will create six linkages, named

linkage name	meaning linkage to
f	father
m	mother
mm	mother's mother
mf	mother's father
fm	father's mother
ff	father's father

Once we have these six linkages, we will be able to access variables for the person, his or her parents, and their parents. We will be able to do that using the frval() function or the fralias add and frget commands.

If we wanted to access x1 using function frval(), we would do so with the following:

value of x1 desired	type
own value	x1
mother's value	frval(m, x1)
father's value	frval(f, x1)
mother's mother's value	frval(mm, x1)
mother's father's value	frval(mf, x1)
father's mother's value	frval(fm, x1)
father's father's value	frval(ff, x1)

If we wanted to copy all five variables of interest to the current frame, prefixed by their relationship, we would do so with the following:

value of x1-x5 desired	type
own value	x1-x5
mother's variables	frget x1-x5, from(m) prefix(m)
father's variables	frget x1-x5, from(f) prefix(f)
mother's mother's variables	frget x1-x5, from(mm) prefix(mm)
mother's father's variables	frget x1-x5, from(mf) prefix(mf)
father's mother's variables	frget x1-x5, from(fm) prefix(fm)
father's father's variables	frget x1-x5, from(ff) prefix(ff)

Instead, we can alias all five variables of interest to the current frame, prefixed by their relationship, with the following:

value of x1-x5 desired	type
own value	x1-x5
mother's variables	fralias add x1-x5, from(m) prefix(m)
father's variables	fralias add x1-x5, from(f) prefix(f)
mother's mother's variables	fralias add x1-x5, from(mm) prefix(mm)
mother's father's variables	fralias add x1-x5, from(mf) prefix(mf)
father's mother's variables	fralias add x1-x5, from(fm) prefix(fm)
father's father's variables	fralias add x1-x5, from(ff) prefix(ff)

If we combined all 5 variables of interest from all 7 sources, we would have a total of 35 variables of interest. We could form that dataset by typing just six commands. Before we can do any of this, we must build the linkages.

To build them, we start in the usual way. We load the data of interest into the current frame and load into the other frame the data we want to link:

```
. clear all

. use https://www.stata-press.com/data/r19/family
(Fictional family linkage data)

. frame create family

. frame family: use https://www.stata-press.com/data/r19/family // yes, the same data
(Fictional family linkage data)
```

We are in fact going to link `family.dta` to itself, but `frlink` requires that linkages be made from the current frame to the other frame. Nonetheless, we will be able to create all six linkages to that single frame.

To create the first two linkages, we type

```
. frlink m:1 pid_m, frame(family pid) generate(m)
(355 observations in frame default unmatched)

. frlink m:1 pid_f, frame(family pid) generate(f)
(355 observations in frame default unmatched)
```

Because we are linking people to people, your natural inclination might be that the matching needs to be `1:1`. That was our inclination too, but when we tried, `frlink` complained that the data were `m:1` and refused. It took us a minute to realize why. Some of the people in the data have the same mother or father.

We have shown you the commands to build the first two linkages. Four remain to be built. What is different about these four is that the current frame does not contain the necessary match variable. Think about forming the `mm` linkage, which is the maternal grandmother of a person in the current frame. We need a variable containing the ID of the current person's mother's mother or `frval(m, pid_m)`. We could call the variable `pid_mm`, and construct it and the related match variables by typing

```
. generate pid_mm = frval(m, pid_m)
(539 missing values generated)

. generate pid_mf = frval(m, pid_f)
(539 missing values generated)

. generate pid_fm = frval(f, pid_m)
(539 missing values generated)

. generate pid_ff = frval(f, pid_f)
(539 missing values generated)
```

Alternatively, we could have obtained them by using the `frget` command:

```
frget pid_mm = pid_m, from(m)
frget pid_mf = pid_f, from(m)
frget pid_fm = pid_m, from(f)
frget pid_ff = pid_f, from(f)
```

It does not matter which we use.

Once we have the match variables, we can form the linkages:

```
. frlink m:1 pid_mm, frame(family pid) generate(mm)
(539 observations in frame default unmatched)

. frlink m:1 pid_mf, frame(family pid) generate(mf)
(539 observations in frame default unmatched)

. frlink m:1 pid_fm, frame(family pid) generate(fm)
(539 observations in frame default unmatched)

. frlink m:1 pid_ff, frame(family pid) generate(ff)
(539 observations in frame default unmatched)
```

At this point, we are basically done. We are interested, however, in the sample of people for whom data on their parents and grandparents are available. We can drop the other people from the data in the current frame.

```
. drop if pid_m ==. | pid_f ==.
(355 observations deleted)

. drop if pid_mm==. | pid_mf==.
(184 observations deleted)

. drop if pid_fm==. | pid_ff==.
(0 observations deleted)

. count                              // number of observations remaining
  100
```

We now have our data ready for analysis.

What are the chances that an even 100 people would be left? They would be nil if this were real data. We manufactured these data, however, so there is no reason to continue to analyze variables `x1` through `x5`. They contain fictional values, and random.

Example 3: A 1:1 linkage, a simple solution to a hard problem

Most `1:1` cases are better handled by `merge`. Here is an exception.

You are working with hospital patient data, file `discharge1.dta`. The file contains variable `patientid` among other variables, and you receive additional data on the same patients, file `discharge2.dta`. Loading the two datasets into separate frames and linking them is easy to do.

```
. use https://www.stata-press.com/data/r19/discharge1, clear
. frame create discharge2
. frame discharge2: use https://www.stata-press.com/data/r19/discharge2
. frlink 1:1 patientid, frame(discharge2)
```

But should we be doing this at all? Would it not be better to merge `discharge1.dta` with `discharge2.dta`? It usually would be. It would be if you received the following note from George:

> Kathy: Here are new data on the 1,980 patients. The data contain the five variables that were previously omitted. – George.

`merge` will allow you to add these five new variables. Use it.

The note you received from George, however, reads

> Kathy: Here are the data on the 1,980 patients. You're not going to believe this, but even though they said there are five values that needed to be updated, they sent all the data again! Verify their claim, and tell me which variables they updated. – George.

This is a case for linking because you will not have to rename the 19 variables so that you can verify their claim. The link solution of handling George's request is easier:

```
. use https://www.stata-press.com/data/r19/discharge1, clear
(Fictional WA hospital discharges)

. frame create discharge2

. frame discharge2: use https://www.stata-press.com/data/r19/discharge2
(Fictional WA hospital discharges)

. frlink 1:1 patientid, frame(discharge2)
(all observations in frame default matched)

. foreach v of varlist patientid-proc3code {
  2.     quietly count if `v' != frval(discharge2, `v', discharge2)
  3.     if (r(N)!=0) {
  4.       display "`v': " r(N) " value(s) changed"
  5.     }
  6. }
sex: 1 value(s) changed
los: 1 value(s) changed
billed: 1 value(s) changed
diag1code: 1 value(s) changed
diag2code: 1 value(s) changed
```

It turns out that the updated data are just as it was represented to be.

These data had two features that made them a candidate for linking rather than merging:

1. The sample of interest was the observations in the original data, the data in the current frame, and
2. lots of variables in the two datasets had the same names, and we were interested in both sets of values.

Let's now think about other examples. Only some `1:1` problems will have feature 1. `1:1` matches in which you will subsequently analyze the merged data—`_merge==3` in `merge` speak—will all have feature 1.

Feature 2 arises less often. In the example, the new data updated the old. Linkages make comparing values easier when the names are the same. Linkages in general make it easier when variable names are the same, even when there is no reason to compare them. Imagine that both datasets contain a variable called `income`, but they are different measures of income. In the combined result, you want them both, so you need to rename one of them. Now imagine that there are hundreds of variables and a handful share the same names across datasets even though they contain different concepts of whatever is being measured. Linkages make renaming them easy.

First, link the data:

```
. frlink personid, frame(newdata)
```

Then, try to copy all the variables:

```
. frget *, from(newdata)
```

The command will either work or tell you the variables that have the same name in both frames. Imagine that `frget` lists `income` and six other variables. You want to copy `income`, so you rename the variable:

```
. frame newdata: rename income farmincome
```

Now try again:

```
. frget *, from(newdata)
```

Of course the command does nothing but repeat the six variables that still have the same names in both frames. You review the list one last time and decide that you still do not care about those six variables. Then you type

```
. frget *, from(newdata) exclude(`r(dups)')
```

This time it works! When variables have the same name, in addition to listing them, `frget` saves their names in `r(dups)`. That is why we typed `frget *, from(newdata)` when we knew we had not yet resolved all the duplicate names. We wanted `frget` to set `r(dups)` so that we could next tell `frget` to copy all the variables, except `exclude(`r(dups)')`.

Now that we have gotten the variables of interest, we break the link:

```
. drop newdata
. frame drop newdata
```

The data in memory are now the same data that we could have coaxed `merge` into producing had we done everything right.

Stored results

`frlink m:1` and `frlink 1:1` store the following in `r()`

Scalars
- `r(unmatched)` # of observations in the current frame unable to be matched

`frlink dir` stores the following in `r()`:

Scalars
- `r(n_vars)` # of link variables

Macros
- `r(vars)` space-separated list of link-variable names

`frlink describe` stores nothing in `r()`.

`frlink rebuild` stores the following in `r()`:

Scalars
- `r(unmatched)` # of observations in the current frame unable to be matched

Also see

[D] **fralias** — Alias variables from linked frames

[D] **frget** — Copy variables from linked frame

[D] **frames intro** — Introduction to frames

[D] **merge** — Merge datasets

frunalias — Change storage type of alias variables

Description Quick start Syntax Remarks and examples Also see

Description

frunalias changes the storage type of alias variables identified in *varlist* to that of the variable they reference in another frame. If *varlist* is not specified, then all alias variables are changed.

frunalias ignores variables that do not have storage type alias.

Quick start

Recast alias variables v1, v2, and v3 to be copies of the variables they reference in another frame

    frunalias v1 v2 v3

Recast all alias variables in the current dataset

    frunalias

Syntax

frunalias [*varlist*]

Remarks and examples

If x is an alias variable, linked to a *type* variable in another frame, then

    frunalias x

will recast x to be a *type* variable. This effectively makes x a copy of the variable from the linked frame.

The following commands change the values in variables they operate on, so by their very nature, they cannot work with alias variables: cross, dyngen, fillin, the icd suite of commands, recode, reshape, stack, xpose, the mi suite of commands, and snapspan.

The error message they produce, when they detect alias variables, will mention using frunalias to work around this restriction.

```
. xpose, clear
alias variables not allowed
    Alias variables detected: var1 and var2.
    You could use command frunalias to recast these variables to avoid this
    error message.
r(109);
```

As this message indicates, we could now type

    frunalias var1 var2

to make a copy of var1 and var2 in the current frame. Then we can proceed with the xpose command.

Also see

[D] **fralias** — Alias variables from linked frames

[D] **frlink** — Link frames

[D] **frames intro** — Introduction to frames

[D] **merge** — Merge datasets

[M-5] **st_addalias( )** — Add alias variable to current Stata dataset

[M-5] **st_isalias( )** — Properties of alias variable

generate — Create or change contents of variable

Description | Quick start | Menu | Syntax
Options | Remarks and examples | References | Also see

Description

`generate` creates a new variable. The values of the variable are specified by = *exp*.

If no *type* is specified, the new variable type is determined by the type of result returned by =*exp*. A `float` variable (or a `double`, according to `set type`) is created if the result is numeric, and a string variable is created if the result is a string. In the latter case, if the string variable contains values greater than 2,045 characters or contains values with a binary 0 (`\0`), a `strL` variable is created. Otherwise, a `str#` variable is created, where # is the smallest string that will hold the result.

If a *type* is specified, the result returned by =*exp* must be a string or numeric according to whether *type* is string or numeric. If `str` is specified, a `strL` or a `str#` variable is created using the same rules as above.

See [D] **egen** for extensions to `generate`.

`replace` changes the contents of an existing variable. Because `replace` alters data, the command cannot be abbreviated.

`set type` specifies the default storage type assigned to new variables (such as those created by `generate`) when the storage type is not explicitly specified.

Quick start

Create numeric variable `newv1` equal to `v1` + 2

```
generate newv1 = v1 + 2
```

Same as above, but use type `byte` and label the values of `newv1` with value label `mylabel`

```
generate byte newv1:mylabel = v1 + 2
```

String variable `newv2` equal to "my text"

```
generate newv2 = "my text"
```

Variable `newv3` equal to the observation number

```
generate newv3 = _n
```

Replace `newv3` with observation number within each value of `catvar`

```
by catvar: replace newv3 = _n
```

Binary indicator for first observation within each value of `catvar` after sorting on `v2`

```
bysort catvar (v2): generate byte first = _n==1
```

Same as above, but for last observation

```
bysort catvar (v2): generate byte last = _n==_N
```

Combined datetime variable `newv4` from `%td` formatted `date` and `%tc` formatted `time`

```
generate double newv4 = cofd(date) + time
```

Menu

generate

Data > Create or change data > Create new variable

replace

Data > Create or change data > Change contents of variable

Syntax

Create new variable

`generate` [*type*] *newvar* [:*lblname*] = *exp* [*if*] [*in*]

[, `before(`*varname*`)` | `after(`*varname*`)`]

Replace contents of existing variable

`replace` *oldvar* = *exp* [*if*] [*in*] [, `nopromote`]

Specify default storage type assigned to new variables

`set type` { `float` | `double` } [, `permanently`]

type is one of `byte` | `int` | `long` | `float` | `double` | `str` | `str1` | `str2` | ...| `str2045`.

See *Description* below for an explanation of `str`. For the other types, see [U] **12 Data**.

`by` is allowed with `generate` and `replace`; see [D] **by**.

Options

`before(`*varname*`)` or `after(`*varname*`)` may be used with `generate` to place the newly generated variable in a specific position within the dataset. These options are primarily used by the Data Editor and are of limited use in other contexts. A more popular alternative for most users is `order` (see [D] **order**).

`nopromote` prevents `replace` from promoting the variable type to accommodate the change. For instance, consider a variable stored as an integer type (`byte`, `int`, or `long`), and assume that you `replace` some values with nonintegers. By default, `replace` changes the variable type to a floating point (`float` or `double`) and thus correctly stores the changed values. Similarly, `replace` promotes `byte` and `int` variables to longer integers (`int` and `long`) if the replacement value is an integer but is too large in absolute value for the current storage type. `replace` promotes strings to longer strings. `nopromote` prevents `replace` from doing this; instead, the replacement values are truncated to fit into the current storage type.

`permanently` specifies that, in addition to making the change right now, the new limit be remembered and become the default setting when you invoke Stata.

Remarks and examples

Remarks are presented under the following headings:

generate and replace

generate and replace are used to create new variables and to modify the contents of existing variables, respectively. You can do anything with replace that you can do with generate. The only difference between the commands is that replace requires that the variable already exist, whereas generate requires that the variable be new. Because Stata is an interactive system, we force a distinction between replacing existing values and generating new ones so that you do not accidentally replace valuable data while thinking that you are creating a new piece of information.

Detailed descriptions of expressions are given in [U] **13 Functions and expressions**.

Also see [D] **edit**.

See [D] **fralias** for creating alias variables that reference other variables in a linked frame. replace may not make changes to alias variables; see [D] **frunalias** for advice on how to get around this restriction.

▷ Example 1

We have a dataset containing the variable age2, which we have previously defined as age^2 (that is, age^2). We have changed some of the age data and now want to correct age2 to reflect the new values:

```
. use https://www.stata-press.com/data/r19/genxmpl1
(Wages of women)

. generate age2=age^2
variable age2 already defined
r(110);
```

When we attempt to re-generate age2, Stata refuses, telling us that age2 is already defined. We could drop age2 and then re-generate it, or we could use the replace command:

```
. replace age2=age^2
(204 real changes made)
```

When we use replace, we are informed of the number of actual changes made to the dataset.

◁

You can explicitly specify the storage type of the new variable being created by putting the *type*, such as byte, int, long, float, double, or str8, in front of the variable name. For example, you could type generate double revenue = qty * price. Not specifying a type is equivalent to specifying float if the variable is numeric, or, more correctly, it is equivalent to specifying the default type set by the set type command; see below. If the variable is alphanumeric, not specifying a type is equivalent to specifying str#, where # is the length of the largest string in the variable.

You may also specify a value label to be associated with the new variable by including ":*lblname*" after the variable name. This is seldom done because you can always associate the value label later by using the label values command; see [U] **12.6.3 Value labels**.

▷ Example 2

Among the variables in our dataset is `name`, which contains the first and last name of each person. We wish to create a new variable called `lastname`, which we will then use to sort the data. `name` is a string variable.

```
. use https://www.stata-press.com/data/r19/genxmpl2, clear
. list name

     +-------------------+
     |              name |
     |-------------------|
  1. |     Johanna Roman |
  2. |      Dawn Mikulin |
  3. |      Malinda Vela |
  4. |        Kevin Crow |
  5. | Zachary Bimslager |
     +-------------------+

. generate lastname=word(name,2)
. describe
Contains data from https://www.stata-press.com/data/r19/genxmpl2.dta
 Observations:             5
    Variables:             2                  18 Jan 2024 12:24
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
name            str17   %17s
lastname        str9    %9s
--------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

Stata is smart. Even though we did not specify the storage type in our `generate` statement, Stata knew to create a `str9` `lastname` variable, because the longest last name is `Bimslager`, which has nine characters.

◁

▷ Example 3

We wish to create a new variable, `age2`, that represents the variable `age` squared. We realize that because `age` is an integer, `age2` will also be an integer and will certainly be less than 32,740. We therefore decide to store `age2` as an `int` to conserve memory:

```
. use https://www.stata-press.com/data/r19/genxmpl3, clear
. generate int age2=age^2
(9 missing values generated)
```

Preceding `age2` with `int` told Stata that the variable was to be stored as an `int`. After creating the new variable, Stata informed us that nine missing values were generated. `generate` informs us whenever it produces missing values.

◁

See [U] **13 Functions and expressions** and [U] **26 Working with categorical data and factor variables** for more information and examples. Also see [D] **recode** for a convenient way to recode categorical variables.

❑ Technical note

If you specify the if or in qualifier, the = *exp* is evaluated only for those observations that meet the specified condition or are in the specified range (or both, if both if and in are specified). The other observations of the new variable are set to missing:

```
. use https://www.stata-press.com/data/r19/genxmpl3, clear
. generate int age2=age^2 if age>30
(290 missing values generated)
```

❑

▷ Example 4

replace can be used to change just one value, as well as to make sweeping changes to our data. For instance, say that we enter data on the first five odd and even positive integers and then discover that we made a mistake:

```
. use https://www.stata-press.com/data/r19/genxmpl4, clear
. list
```

	odd	even
1.	1	2
2.	3	4
3.	-8	6
4.	7	8
5.	9	10

The third observation is wrong; the value of odd should be 5, not −8. We can use replace to correct the mistake:

```
. replace odd=5 in 3
(1 real change made)
```

We could also have corrected the mistake by typing replace odd=5 if odd==-8.

◁

set type

When you create a new numeric variable and do not specify the storage type for it, say, by typing generate y=x+2, the new variable is made a float if you have not previously issued the set type command. If earlier in your session you typed set type double, the new numeric variable would be made a double.

Video examples

How to create a new variable that is calculated from other variables

How to identify and replace unusual data values

References

Newson, R. B. 2004. Stata tip 13: generate and replace use the current sort order. *Stata Journal* 4: 484–485.

Royston, P. 2013. marginscontplot: Plotting the marginal effects of continuous predictors. *Stata Journal* 13: 510–527.

Also see

[D] **compress** — Compress data in memory

[D] **corr2data** — Create dataset with specified correlation structure

[D] **drawnorm** — Draw sample from multivariate normal distribution

[D] **dyngen** — Dynamically generate new values of variables

[D] **edit** — Browse or edit data with Data Editor

[D] **egen** — Extensions to generate

[D] **encode** — Encode string into numeric and vice versa

[D] **fralias** — Alias variables from linked frames

[D] **frunalias** — Change storage type of alias variables

[D] **label** — Manipulate labels

[D] **recode** — Recode categorical variables

[D] **rename** — Rename variable

[U] 12 Data

[U] 13 Functions and expressions

Description

`gsort` arranges observations to be in ascending or descending order of the specified variables and so differs from `sort` in that `sort` produces ascending-order arrangements only; see [D] **sort**.

Each *varname* can be numeric or a string.

The observations are placed in ascending order of *varname* if + or nothing is typed in front of the name and are placed in descending order if - is typed.

Quick start

Sort dataset in memory by ascending values of `v1`, equivalent to `sort`

```
gsort v1
```

Sort dataset in memory by descending values of `v1`

```
gsort -v1
```

Sort dataset by ascending values of `v1` and descending values of `v2`

```
gsort v1 -v2
```

Create `newv` for use in subsequent `by` operations

```
gsort v1 -v2, generate(newv)
```

Place missing values of descending-order `v2` at the top of the dataset instead of the end

```
gsort v1 -v2, mfirst
```

Menu

Data > Sort

Syntax

gsort [+|-] *varname* [[+|-] *varname* ...] [, generate(*newvar*) mfirst]

Options

generate(*newvar*) creates *newvar* containing 1, 2, 3, ... for each group denoted by the ordered data. This is useful when using the ordering in a subsequent by operation; see **[U] 11.5 by varlist: construct** and examples below.

mfirst specifies that missing values be placed first in descending orderings rather than last.

Remarks and examples

gsort is almost a plug-compatible replacement for sort, except that you cannot specify a general *varlist* with gsort. For instance, sort alpha-gamma means to sort the data in ascending order of alpha, within equal values of alpha; sort on the next variable in the dataset (presumably beta), within equal values of alpha and beta; etc. gsort alpha-gamma would be interpreted as gsort alpha -gamma, meaning to sort the data in ascending order of alpha and, within equal values of alpha, in descending order of gamma.

▷ Example 1

The difference in *varlist* interpretation aside, gsort can be used in place of sort. To list the 10 lowest-priced cars in the data, we might type

```
. use https://www.stata-press.com/data/r19/auto
. gsort price
. list make price in 1/10
```

or, if we prefer,

```
. gsort +price
. list make price in 1/10
```

To list the 10 highest-priced cars in the data, we could type

```
. gsort -price
. list make price in 1/10
```

gsort can also be used with string variables. To list all the makes in reverse alphabetical order, we might type

```
. gsort -make
. list make
```

◁

▷ Example 2

gsort can be used with multiple variables. Given a dataset on hospital patients with multiple observations per patient, typing

```
. use https://www.stata-press.com/data/r19/bp3
. gsort id time
. list id time bp
```

lists each patient's blood pressures in the order the measurements were taken. If we typed

```
. gsort id -time
. list id time bp
```

then each patient's blood pressures would be listed in reverse time order.

◁

❑ Technical note

Say that we wished to attach to each patient's records the lowest and highest blood pressures observed during the hospital stay. The easier way to achieve this result is with egen's min() and max() functions:

```
. egen lo_bp = min(bp), by(id)
. egen hi_bp = max(bp), by(id)
```

See [D] **egen**. Here is how we could do it with gsort:

```
. use https://www.stata-press.com/data/r19/bp3, clear
. gsort id bp
. by id: generate lo_bp = bp[1]
. gsort id -bp
. by id: generate hi_bp = bp[1]
. list, sepby(id)
```

This works, even in the presence of missing values of bp, because such missing values are placed last within arrangements, regardless of the direction of the sort.

❑

❑ Technical note

Assume that we have a dataset containing x for which we wish to obtain the forward and reverse cumulatives. The forward cumulative is defined as $F(X)$ = the fraction of observations such that x $\leq X$. Again let's ignore the easier way to obtain the forward cumulative, which would be to use Stata's cumul command,

```
. set obs 100
. generate x = rnormal()
. cumul x, gen(cum)
```

(see [R] **cumul**). Eschewing cumul, we could type

```
. sort x
. by x: generate cum = _N if _n==1
. replace cum = sum(cum)
. replace cum = cum/cum[_N]
```

That is, we first place the data in ascending order of x; we used sort but could have used gsort. Next, for each observed value of x, we generated cum containing the number of observations that take on that value (you can think of this as the discrete density). We summed the density, obtaining the distribution, and finally normalized it to sum to 1.

The reverse cumulative $G(X)$ is defined as the fraction of data such that x $\geq X$. To obtain this, we could try simply reversing the sort:

```
. gsort -x
. by x: generate rcum = _N if _n==1
. replace rcum = sum(rcum)
. replace rcum = rcum/rcum[_N]
```

This would work, except for one detail: Stata will complain that the data are not sorted in the second line. Stata complains because it does not understand descending sorts (gsort is an ado-file). To remedy this problem, gsort's generate() option will create a new grouping variable that is in ascending order (thus satisfying Stata's narrow definition) and that is, in terms of the groups it defines, identical to that of the true sort variables:

```
. gsort -x, gen(revx)
. by revx: generate rcum = _N if _n==1
. replace rcum = sum(rcum)
. replace rcum = rcum/rcum[_N]
```

❏

Also see

[D] **sort** — Sort data

hexdump — Display hexadecimal report on file

Description | Syntax | Options
Remarks and examples | Stored results | Also see

Description

`hexdump` displays a hexadecimal dump of a file or, optionally, a report analyzing the dump.

Syntax

`hexdump` *filename* [, *options*]

options	Description
`analyze`	display a report on the dump rather than the dump itself
`tabulate`	display a full tabulation of the ASCII and extended ASCII characters in the `analyze` report
`noextended`	do not display printable extended ASCII characters
`results`	store results containing the frequency with which each character code was observed; programmer's option
`from(#)`	dump or analyze first byte of the file; default is to start at first byte, `from(0)`
`to(#)`	dump or analyze last byte of the file; default is to continue to the end of the file

Options

`analyze` specifies that a report on the dump, rather than the dump itself, be presented.

`tabulate` specifies in the `analyze` report that a full tabulation of the ASCII and extended ASCII characters also be presented.

`noextended` specifies that `hexdump` not display printable extended ASCII characters, characters in the range 161–254 or, equivalently, 0xa1–0xfe. (`hexdump` does not display characters 128–160 and 255.)

`results` is for programmers. It specifies that, in addition to other stored results, `hexdump` store `r(c0)`, `r(c1)`, ..., `r(c255)`, containing the frequency with which each character code was observed.

`from(#)` specifies the first byte of the file to be dumped or analyzed. The default is to start at the first byte of the file, `from(0)`.

`to(#)` specifies the last byte of the file to be dumped or analyzed. The default is to continue to the end of the file.

Remarks and examples

`hexdump` is useful when you are having difficulty reading a file with `infile`, `infix`, or `import delimited`. Sometimes, the reason for the difficulty is that the file does not contain what you think it contains, or that it does contain the format you have been told, and looking at the file in text mode is either not possible or not revealing enough.

Pretend that we have the file `myfile.raw` containing

```
Datsun 210      4589  35  5  1
VW Scirocco     6850  25  4  1
Merc. Bobcat    3829  22  4  0
Buick Regal     5189  20  3  0
VW Diesel       5397  41  5  1
Pont. Phoenix   4424  19  .  0
Merc. Zephyr    3291  20  3  0
Olds Starfire   4195  24  1  0
BMW 320i        9735  25  4  1
```

We will use `myfile.raw` with `hexdump` to produce output that looks like the following:

```
. hexdump myfile.raw
                                                                    character
                                  hex representation             representation
         address    0 1  2 3  4 5  6 7  8 9  a b  c d  e f    0123456789abcdef

               0    4461 7473 756e 2032 3130 2020 2020 2034    Datsun 210     4
              10    3538 3920 2033 3520 2035 2020 310a 5657    589  35  5  1.VW
              20    2053 6369 726f 6363 6f20 2020 2036 3835     Scirocco    685
              30    3020 2032 3520 2034 2020 310a 4d65 7263    0  25  4  1.Merc

              40    2e20 426f 6263 6174 2020 2033 3832 3920    . Bobcat   3829
              50    2032 3220 2034 2020 300a 4275 6963 6b20     22  4  0.Buick
              60    5265 6761 6c20 2020 2035 3138 3920 2032    Regal    5189  2
              70    3020 2033 2020 300a 5657 2044 6965 7365    0  3  0.VW Diese

              80    6c20 2020 2020 2035 3339 3720 2034 3120    l      5397  41
              90    2035 2020 310a 506f 6e74 2e20 5068 6f65     5  1.Pont. Phoe
              a0    6e69 7820 2034 3432 3420 2031 3920 202e    nix  4424  19  .
              b0    2020 300a 4d65 7263 2e20 5a65 7068 7972      0.Merc. Zephyr

              c0    2020 2033 3239 3120 2032 3020 2033 2020       3291  20  3
              d0    300a 4f6c 6473 2053 7461 7266 6972 6520    0.Olds Starfire
              e0    2034 3139 3520 2032 3420 2031 2020 300a     4195  24  1  0.
              f0    424d 5720 3332 3069 2020 2020 2020 2039    BMW 320i       9
             100    3733 3520 2032 3520 2034 2020 310a         735  25  4  1.
```

hexdump can also produce output that looks like the following:

```
. hexdump myfile.raw, analyze
  Line-end characters                              Line length (tab=1)
    \r\n         (Windows)              0            minimum                      29
    \r by itself (Mac)                  0            maximum                      29
    \n by itself (Unix)                 9
  Space/separator characters                       Number of lines                 9
    [blank]                            99            EOL at EOF?                 yes
    [tab]                               0
    [comma] (,)                         0          Length of first 5 lines
  Control characters                                 Line 1                       29
    binary 0                            0            Line 2                       29
    CTL excl. \r, \n, \t                0            Line 3                       29
    DEL                                 0            Line 4                       29
    Extended (128-159,255)              0            Line 5                       29
  ASCII printable
    A-Z                                20
    a-z                                61          File format                 ASCII
    0-9                                77
    Special (!@#$ etc.)                 4
    Extended (160-254)                  0
                              ---------------
  Total                               270

  Observed were:
     \n blank . 0 1 2 3 4 5 6 7 8 9 B D M O P R S V W Z a b c d e f g h i k l
     n o p r s t u x y
```

Of the two forms of output, the second is often the more useful because it summarizes the file, and the length of the summary is not a function of the length of the file. Here is the summary for a file that is just over 4 MB long:

```
. hexdump bigfile.raw, analyze
  Line-end characters                              Line length (tab=1)
    \r\n         (Windows)        147,456            minimum                      29
    \r by itself (Mac)                  0            maximum                      30
    \n by itself (Unix)                 2
  Space/separator characters                       Number of lines           147,458
    [blank]                     1,622,039            EOL at EOF?                 yes
    [tab]                               0
    [comma] (,)                         0          Length of first 5 lines
  Control characters                                 Line 1                       30
    binary 0                            0            Line 2                       30
    CTL excl. \r, \n, \t                0            Line 3                       30
    DEL                                 0            Line 4                       30
    Extended (128-159,255)              0            Line 5                       30
  ASCII printable
    A-Z                           327,684
    a-z                           999,436          File format                 ASCII
    0-9                         1,261,587
    Special (!@#$ etc.)            65,536
    Extended (160-254)                  0
                              ---------------
  Total                         4,571,196

  Observed were:
     \n \r blank . 0 1 2 3 4 5 6 7 8 9 B D M O P R S V W Z a b c d e f g h i
     k l n o p r s t u x y
```

Here is the same file but with a subtle problem:

```
. hexdump badfile.raw, analyze
  Line-end characters                          Line length (tab=1)
    \r\n          (Windows)       147,456        minimum                  30
    \r by itself (Mac)                  0        maximum                  90
    \n by itself (Unix)                 0
  Space/separator characters                   Number of lines       147,456
    [blank]                     1,622,016        EOL at EOF?             yes
    [tab]                               0
    [comma] (,)                         0      Length of first 5 lines
  Control characters                             Line 1                   30
    binary 0                            8        Line 2                   30
    CTL excl. \r, \n, \t                4        Line 3                   30
    DEL                                 0        Line 4                   30
    Extended (128-159,255)             24        Line 5                   30
  ASCII printable
    A-Z                           327,683
    a-z                           999,426      File format            BINARY
    0-9                         1,261,568
    Special (!@#$ etc.)            65,539
    Extended (160-254)                 16
                               ───────────
  Total                         4,571,196

  Observed were:
     \0 ^C ^D ^G \n \r ^U blank & . 0 1 2 3 4 5 6 7 8 9 B D E M O P R S U V W
     Z a b c d e f g h i k l n o p r s t u v x y } ~ E^A E^C E^I E^M E^P
     ë é ö 255
```

In the above, the line length varies between 30 and 90 (we were told that each line would be 30 characters long). Also the file contains what `hexdump, analyze` labeled control characters. Finally, `hexdump, analyze` declared the file to be `BINARY` rather than `ASCII`.

We created the second file by removing two valid lines from `bigfile.raw` (60 characters) and substituting 60 characters of binary junk. We would defy you to find the problem without using `hexdump, analyze`. You would succeed, but only after much work. Remember, this file has 147,456 lines, and only two of them are bad. If you print 1,000 lines at random from the file, your chances of listing the bad part are only 0.013472. To have a 50% chance of finding the bad lines, you would have to list 52,000 lines, which is to say, review about 945 pages of output. On those 945 pages, each line would need to be drawn at random. More likely, you would list lines in groups, and that would greatly reduce your chances of encountering the bad lines.

The situation is not as dire as we make it out to be because, were you to read `badfile.raw` by using `infile`, it would complain, and here it would tell you exactly where it was complaining. Still, at that point you might wonder whether the problem was with how you were using `infile` or with the data. Moreover, our 60 bytes of binary junk experiment corresponds to transmission error. If the problem were instead that the person who constructed the file constructed two of the lines differently, `infile` might not complain, but later you would notice some odd values in your data (because obviously you would review the summary statistics, right?). Here `hexdump, analyze` might be the only way you could prove to yourself and others that the raw data need to be reconstructed.

❑ Technical note

In the full hexadecimal dump,

```
. hexdump myfile.raw
                                                                character
                         hex representation                   representation
         address   0 1  2 3  4 5  6 7  8 9  a b  c d  e f    0123456789abcdef

               0   4461 7473 756e 2032 3130 2020 2020 2034   Datsun 210     4
              10   3538 3920 2033 3520 2035 2020 310d 0a56   589  35  5  1..V
              20   5720 5363 6972 6f63 636f 2020 2020 3638   W Scirocco    68
              30   3530 2020 3235 2020 3420 2031 0d0a 4d65   50  25  4  1..Me
 (output omitted)
```

addresses (listed on the left) are listed in hexadecimal. Above, 10 means decimal 16, 20 means decimal 32, and so on. Sixteen characters are listed across each line.

In some other dump, you might see something like

```
. hexdump myfile2.raw
                                                                character
                         hex representation                   representation
         address   0 1  2 3  4 5  6 7  8 9  a b  c d  e f    0123456789abcdef

               0   4461 7473 756e 2032 3130 2020 2020 2034   Datsun 210     4
              10   3538 3920 2033 3520 2035 2020 3120 2020   589  35  5  1
              20   2020 2020 2020 2020 2020 2020 2020 2020
               *
             160   2020 2020 2020 0a56 5720 5363 6972 6f63         .VW Sciroc
             170   636f 2020 2020 3638 3530 2020 3235 2020   co    6850  25
 (output omitted)
```

The * in the address field indicates that the previous line is repeated until we get to hexadecimal address 160 (decimal 352).

❑

Stored results

`hexdump, analyze` and `hexdump, results` store the following in `r()`:

Scalars

`r(Windows)`	number of `\r\n`
`r(Mac)`	number of `\r` by itself
`r(Unix)`	number of `\n` by itself
`r(blank)`	number of blanks
`r(tab)`	number of tab characters
`r(comma)`	number of comma (,) characters
`r(ctl)`	number of binary 0s; A–Z, excluding `\r`, `\n`, `\t`; DELs; and 128–159, 255
`r(uc)`	number of A–Z
`r(lc)`	number of a–z
`r(digit)`	number of 0–9
`r(special)`	number of printable special characters (!@#, etc.)
`r(extended)`	number of printable extended characters (160–254)
`r(filesize)`	number of characters
`r(lmin)`	minimum line length
`r(lmax)`	maximum line length
`r(lnum)`	number of lines
`r(eoleof)`	1 if EOL at EOF, 0 otherwise
`r(l1)`	length of 1st line
`r(l2)`	length of 2nd line
`r(l3)`	length of 3rd line
`r(l4)`	length of 4th line
`r(l5)`	length of 5th line
`r(c0)`	number of binary 0s (`results` only)
`r(c1)`	number of binary 1s (`^A`) (`results` only)
`r(c2)`	number of binary 2s (`^B`) (`results` only)
...	...
`r(c255)`	number of binary 255s (`results` only)

Macros

`r(format)`	`ASCII`, `EXTENDED ASCII`, or `BINARY`

Also see

[D] **filefilter** — Convert ASCII or binary patterns in a file

[D] **type** — Display contents of a file

Description   Remarks and examples   References   Also see

Description

This entry provides a brief introduction to the basic concepts of the International Classification of Diseases (ICD). If you are not familiar with ICD terminology, we recommend that you read this entry before proceeding to the individual command entries.

This entry also provides an overview of the format of the codes from each coding system that Stata's `icd` commands support. Stata supports 9th revision codes (ICD-9) and 10th revision codes (ICD-10). For ICD-9, Stata uses codes from the United States's Clinical Modification, the ICD-9-CM. For ICD-10, Stata uses the World Health Organization's (WHO's) codes for international morbidity and mortality reporting and the United States's Clinical Modification (ICD-10-CM) and Procedure Coding System (ICD-10-PCS). We encourage you to read this entry to ensure that you choose the correct command and that your data are properly formatted for using the `icd` suite of commands.

Finally, this entry provides information about using the `icd` commands with multiple diagnosis or procedure codes at one time. None of the commands accepts a varlist, so we illustrate methods for working with multiple codes.

If you are familiar with ICD coding and the `icd` commands in Stata, you may want to skip to the command-specific entries for details about syntax and examples.

Commands for ICD-9 codes

`icd9`	ICD-9-CM diagnosis codes
`icd9p`	ICD-9-CM procedure codes

Commands for ICD-10 codes

`icd10`	ICD-10 diagnosis codes
`icd10cm`	ICD-10-CM diagnosis codes
`icd10pcs`	ICD-10-PCS procedure codes

Remarks and examples

Remarks are presented under the following headings:

Introduction to ICD coding

The `icd` commands in Stata work with four different diagnosis and procedure coding systems: ICD-9-CM, ICD-10, ICD-10-CM, and ICD-10-PCS.

The International Classification of Diseases (ICD) coding system was developed by and is copyrighted by the World Health Organization (WHO). The ICD coding system is used for standardized mortality reporting and, by many countries, for reporting of morbidity and coding of diagnoses during healthcare encounters. Since 1999, the ICD system has been under its 10th revision, ICD-10 (World Health Organization 2011). These codes provide information only about diagnoses, not about procedures.

The United States and some other countries have also developed country-specific coding systems that are extensions of WHO's system. These systems are used for coding information about healthcare encounters. In the United States, the coding system is referred to as the International Classification of Diseases, Clinical Modification. These codes are maintained and distributed by the National Center for Health Statistics (NCHS) at the US Centers for Disease Control and Prevention (CDC) and by the Centers for Medicare and Medicaid Services (CMS).

Terminology

The `icd9` and `icd10` entries assume knowledge of common terminology used in the ICD-9-CM documentation from the NCHS or CMS or in the ICD-10 revision manuals from WHO. The following brief definitions are provided as a reference.

edition. The ICD-9-CM and ICD-10 each have editions, which represent major periodic changes. ICD-9-CM is currently in its sixth edition (National Center for Health Statistics 2011). ICD-10 is currently in its fifth edition (World Health Organization 2011).

version. In the ICD-9-CM coding system, the version number is a sequential number assigned by CMS that is updated each Federal Fiscal Year when new codes are released. The last version was 32, which was published on October 1, 2014. In ICD-10-CM/PCS, the version corresponds to the Federal Fiscal Year.

update. In the ICD-10 coding system, an update may occur each year. The update is not issued with a number but may be identified by the year in which it occurred.

category code. A category code is the portion of the ICD code that precedes the period. It may represent a single disease or a group of related diseases or conditions.

valid code. A valid code is one that may be used for reporting in the current version of the ICD-10-CM/PCS or current update to the ICD-10 edition. What constitutes a valid code changes over time.

defined code. A defined code is any code that is currently valid, was valid at a previous time, or has meaning as a grouping of codes. See [D] **icd9**, [D] **icd9p**, [D] **icd10**, [D] **icd10cm**, and [D] **icd10pcs** for information about how the individual commands treat defined codes.

Diagnosis codes

Let's begin with the diagnostic codes processed by `icd9`. An ICD-9-CM diagnosis code may have one of two formats. Most use the format

$$\{\texttt{0–9,V}\}\{\texttt{0–9}\}\{\texttt{0–9}\}[\texttt{.}][\texttt{0–9}[\texttt{0–9}]]$$

while E-codes have the format

$$\texttt{E}\{\texttt{0–9}\}\{\texttt{0–9}\}\{\texttt{0–9}\}[\texttt{.}][\texttt{0–9}]$$

where braces, { }, indicate required items and brackets, [ ], indicate optional items.

ICD-9-CM codes begin with a digit from `0` to `9`, the letter `V`, or the letter `E`. E-codes are always followed by three digits and may have another digit in the fifth place. All other codes are followed by two digits and may have up to two more digits.

The format of an ICD-10 diagnosis code is

$$\{\texttt{A–T,V–Z}\}\{\texttt{0–9}\}\{\texttt{0–9}\}[\,\texttt{.}\,][\,\texttt{0–9}\,]$$

Each ICD-10 code begins with a single letter followed by two digits. It may have an additional third digit after the period.

ICD-10-CM diagnosis codes have up to seven characters; otherwise, the format is like that for ICD-10 codes. Each ICD-10-CM code begins with a single letter followed by a digit. However, ICD-10-CM permits the third character to be a digit, the letter A, or the letter B. This forms the category code. The fourth and fifth characters may be used to make up any potential subcategory code. For certain diagnoses, there exist only three-, four- or five-character codes, so the diagnosis code and (sub)category code are equivalent.

Finally, the sixth and seventh characters provide additional detail. A peculiarity of the ICD-10-CM coding system is that it is not strictly hierarchical. The letter X is used as a placeholder if a subcategory has not been defined at a particular level. For example, the code J09 indicates influenza due to an identified virus. There is no subcategory for J09, so the fourth character is an X, and additional detail about complications is provided in the fifth character.

Codes in ICD-10-CM may have up to four more alpha-numeric characters after the period. Only codes with the finest level of detail under a category code are considered valid.

Diagnosis codes must be stored in a string variable (see [D] **Data types**). For codes from either revision, the period separating the category code from the other digits is treated as implied if it is not present.

❑ Technical note

There are defined five- and six-character ICD-10 codes. However, these codes are not part of the standard four-character system codified by WHO for international morbidity and mortality reporting and are not considered valid by `icd10`. See [D] **icd10** for additional details about these codes and options for using `icd10` with them.

❑

❑ Technical note

ICD-10 codes U00–U49 are reserved for use by WHO for provisional assignment of new diseases. Codes U50–U99 may be used for research to identify subjects with specific conditions under study for which there is no defined ICD-10 code (World Health Organization 2011).

If you are working in one of these specialized cases, see the technical note in *Creating new variables* under *Remarks and examples* of [D] **icd10**.

❑

Procedure codes

The ICD-9-CM coding system also includes procedure codes. The format of ICD-9-CM procedure codes is

$$\{\texttt{0–9}\}\{\texttt{0–9}\}[\,\texttt{.}\,][\,\texttt{0–9}[\,\texttt{0–9}\,]\,]$$

The general format of an ICD-10-PCS procedure code is a three-character category code followed by four alpha-numeric characters after an (implied) period. The full codes are always seven characters long and may be any combination of letters and numbers.

Procedure codes must be stored in a string variable.

Working with multiple codes

Oftentimes, multiple diagnoses or procedures are recorded for each observation. None of the `icd` commands accepts a varlist, but you can still work with multiple diagnosis or multiple procedure records. To use the `icd` commands with more than one diagnosis or procedure variable at a time, you must either first `reshape` your data or use a loop; see [D] **reshape** and [P] **forvalues**.

▷ Example 1: Summarizing information from multiple variables

In example 1 of [D] **icd9**, we add a variable indicating whether each diagnosis code was invalid or undefined. Here we use the same extract from the National Hospital Discharge Survey (NHDS).

It is often more useful to add a single variable that summarizes the results from several diagnosis or procedure variables. For example, we may wish to add a variable indicating whether a particular diagnosis code or range of codes appeared in any field. Summary variables can be created from the results of the `check` subcommand with option `generate()` or the `generate` subcommand with option `range()` or option `category()`.

Suppose that we want a single variable that contains the number of improperly formatted or undefined codes that each discharge had. To illustrate, we use the `nhds2010` dataset, keeping the variables for discharge identifier (`recid`), patient age, and patient sex, as well as the three diagnosis variables. We list the first ten observations below.

```
. use https://www.stata-press.com/data/r19/nhds2010
(Adult same-day discharges, 2010)
. keep recid age sex dx1 dx2 dx3
. list in 1/10, noobs
```

age	sex	dx1	dx2	dx3	recid
85	Female	4414	99811	14275	84
23	Male	25013	3572	-2506	105
63	Male	51909	1489	-V146	255
43	Female	9678	E8528	8	651
25	Female	V271	64421	16564	696
57	Female	5409	V1582	2V106	779
61	Female	27651	V1087	7V436	814
60	Male	9951	462	-2724	826
22	Male	42789	5409	-2780	833
49	Male	5770	29181	14255	863

The data are in wide form, so we specify `reshape long` with stub `dx` because our diagnosis codes are in `dx1`, `dx2`, and `dx3`. The observation identifier, `recid`, is specified in `i()`. `reshape` creates the new variable `dxnum` for us.

```
. reshape long dx, i(recid) j(dxnum)
(j = 1 2 3)
Data                               Wide   ->   Long
-----------------------------------------------------------------------------
Number of observations            2,210   ->   6,630
Number of variables                   6   ->   5
j variable (3 values)                     ->   dxnum
xij variables:
                            dx1 dx2 dx3   ->   dx
-----------------------------------------------------------------------------
```

The output shows that `dxnum` has 3 values, so we know that all three diagnosis variables were recognized by `reshape`.

```
. list in 1/9, sepby(recid) noobs
```

recid	dxnum	dx	age	sex
84	1	4414	85	Female
84	2	99811	85	Female
84	3	14275	85	Female
105	1	25013	23	Male
105	2	3572	23	Male
105	3	-2506	23	Male
255	1	51909	63	Male
255	2	1489	63	Male
255	3	-V146	63	Male

Notice that our data on `recid`, `age`, and `sex` are retained and duplicated for each new observation. If you are working with a large dataset, you may wish to drop variables other than a merge key and your diagnosis (or procedure) variables to conserve space and speed up `reshape`.

After we `reshape`, we create `prob` using `icd9 check`, an indicator for whether there was a problem with a given diagnosis code. We then use `egen` to create `anyprob`, the total number of codes that had a problem within each `recid`. See [D] **egen** for information about summary functions.

```
. icd9 check dx, generate(prob)
(dx contains 358 missing values)
dx contains invalid codes:
    1.  Invalid placement of period                 0
    2.  Too many periods                            0
    3.  Code too short                            177
    4.  Code too long                               0
    5.  Invalid 1st char (not 0-9, E, or V)       875
    6.  Invalid 2nd char (not 0-9)                128
    7.  Invalid 3rd char (not 0-9)                  0
    8.  Invalid 4th char (not 0-9)                  0
    9.  Invalid 5th char (not 0-9)                 36
   10.  Code not defined                          778
                                            ---------
        Total                                   1,994
```

```
. generate anyprob=prob>0
. by recid, sort: egen numprobs=total(anyprob)
. list recid dxnum dx anyprob numprobs in 1/9, sepby(recid) noobs
```

recid	dxnum	dx	anyprob	numprobs
84	1	4414	0	1
84	2	99811	0	1
84	3	14275	1	1
105	1	25013	0	1
105	2	3572	0	1
105	3	-2506	1	1
255	1	51909	0	1
255	2	1489	0	1
255	3	-V146	1	1

Before we reshape, we drop prob and anyprob because they are specific to diagnosis variables. By construction, numprobs is constant within recid, so we do not specify it when we reshape.

```
. drop prob anyprob
. reshape wide dx, i(recid) j(dxnum)
(j = 1 2 3)
Data                               Long   ->   Wide
-----------------------------------------------------------------------------

Number of observations            6,630   ->   2,210
Number of variables                   6   ->   7
j variable (3 values)             dxnum   ->   (dropped)
xij variables:
                                     dx   ->   dx1 dx2 dx3
-----------------------------------------------------------------------------

. list in 1/3, noobs
```

recid	dx1	dx2	dx3	age	sex	numprobs
84	4414	99811	14275	85	Female	1
105	25013	3572	-2506	23	Male	1
255	51909	1489	-V146	63	Male	1

The three diagnosis variables are restored to the dataset. We have added a single variable showing the total number of codes with problems for each record.

◁

▷ Example 2: Adding multiple variables from ICD codes

Now suppose that rather than creating a summary variable flagging any problem as we did in example 1, we want a new variable for each diagnosis variable indicating whether there is a coding problem. In example 1 of [D] **icd9**, we icd9 check each diagnosis variable separately, which requires us to type the command three times. While this is not burdensome for 3 variables, the full NHDS includes 14 diagnosis variables, for which we almost certainly would not want to type separate commands.

The easiest way to accomplish this is with a loop. We use `forvalues` because our codes all end in a number.

```
. use https://www.stata-press.com/data/r19/nhds2010, clear
(Adult same-day discharges, 2010)
. forvalues i=1/3 {
  2.     icd9 check dx`i', generate(dx`i'_prob)
  3. }
(dx1 contains defined ICD-9-CM codes; no missing values)
(dx2 contains defined ICD-9-CM codes; 179 missing values)
(dx3 contains 179 missing values)
dx3 contains invalid codes:

    1.  Invalid placement of period                    0
    2.  Too many periods                               0
    3.  Code too short                               177
    4.  Code too long                                  0
    5.  Invalid 1st char (not 0-9, E, or V)          875
    6.  Invalid 2nd char (not 0-9)                   128
    7.  Invalid 3rd char (not 0-9)                     0
    8.  Invalid 4th char (not 0-9)                     0
    9.  Invalid 5th char (not 0-9)                    36
   10.  Code not defined                             778
                                             -----------
        Total                                      1,994
```

This is exactly what we obtain in example 1 of [D] **icd9**.

If our variables had not been numbered sequentially, we could have either renamed them or used `foreach`; see [P] **foreach**.

◁

The methods shown above will work for any of the `icd9`, `icd9p`, `icd10`, `icd10cm`, or `icd10pcs` data management commands.

References

Baum, C. F., and N. J. Cox. 2007. Stata tip 45: Getting those data into shape. *Stata Journal* 7: 268–271.

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World Health Organization. 2011. International Statistical Classification of Diseases and Related Health Problems. Vol. 2, 2016 Edition. Instruction manual. https://www.who.int/publications/m/item/international-statistical-classification-of-diseases-and-related-health-problems---volume-2.

Also see

[D] **icd9** — ICD-9-CM diagnosis codes

[D] **icd9p** — ICD-9-CM procedure codes

[D] **icd10** — ICD-10 diagnosis codes

[D] **icd10cm** — ICD-10-CM diagnosis codes

[D] **icd10pcs** — ICD-10-PCS procedure codes

icd9 — ICD-9-CM diagnosis codes

Description Quick start Menu Syntax Options
Remarks and examples Stored results References Also see

Description

icd9 is a suite of commands for working with ICD-9-CM diagnosis codes from the 16th version (effective October 1998) to the 32nd version. To see the current version of the ICD-9-CM diagnosis codes and any changes that have been applied, type `icd9 query`.

`icd9 check`, `icd9 clean`, and `icd9 generate` are data management commands. `icd9 check` verifies that a variable contains defined ICD-9-CM diagnosis codes and provides a summary of any problems encountered. `icd9 clean` standardizes the format of the codes. `icd9 generate` can create a binary indicator variable for whether the code is in a specified set of codes, a variable containing a corresponding higher-level code, or a variable containing the description of the code.

`icd9 lookup` and `icd9 search` are interactive utilities. `icd9 lookup` displays descriptions of the codes specified on the command line. `icd9 search` looks for relevant ICD-9-CM diagnosis codes from keywords given on the command line.

Quick start

Determine whether ICD-9-CM diagnosis codes in `diag1` are invalid, and store reasons in `invalid`

```
icd9 check diag1, generate(invalid)
```

Standardize display of codes in `diag2` to remove all periods, and align codes by padding with spaces

```
icd9 clean diag2, pad
```

Create `descr3` as the diagnosis code prepended to short description of diagnosis code in `diag3`

```
icd9 generate descr3 = diag3, description long
```

Create `diabetes` as an indicator for a diabetes diagnosis in `diag4` using ICD-9-CM codes 250.xx

```
icd9 generate diabetes = diag4, range(25000/25093)
```

Look up descriptions for ICD-9-CM diagnosis codes E827.0 to E828.9

```
icd9 lookup E8270/E8289
```

Menu

Data > ICD codes > ICD-9

Syntax

Verify that variable contains defined codes

icd9 check *varname* [*if*] [*in*] [, any list generate(*newvar*)]

Clean variable and verify format of codes

icd9 clean *varname* [*if*] [*in*] [, dots pad]

Generate new variable from existing variable

icd9 generate *newvar* = *varname* [*if*] [*in*] , category

icd9 generate *newvar* = *varname* [*if*] [*in*] , description [long end]

icd9 generate *newvar* = *varname* [*if*] [*in*] , range(*codelist*)

Display code descriptions

icd9 lookup *codelist*

Search for codes from descriptions

icd9 search ["]*text*["] [["]*text*["] ...] [, or]

Display ICD-9 code source

icd9 query

codelist is

icd9code	(the particular code)
*icd9code**	(all codes starting with)
icd9code/*icd9code*	(the code range)

or any combination of the above, such as 001* 018/019 E* 018.02. *icd9codes* must be typed with leading 0s. For example, type 001; typing 1 will result in an error.

collect is allowed with icd9 check, icd9 clean, and icd9 lookup; see [U] **11.1.10 Prefix commands**.

The icd9 suite of commands does not allow alias variables; see [D] **frunalias** for advice on how to get around this restriction.

Options

Options are presented under the following headings:

Options for icd9 check

`any` tells `icd9 check` to verify that the codes fit the format of ICD-9-CM diagnosis codes but not to check whether the codes are defined.

`list` specifies that `icd9 check` list the observation number, the invalid or undefined ICD-9-CM diagnosis code, and the reason the code is invalid or whether it is an undefined code.

`generate(`*newvar*`)` specifies that `icd9 check` create a new variable containing, for each observation, 0 if the observation contains a defined code or is missing. Otherwise, it contains a number from 1 to 10. The positive numbers indicate the kind of problem and correspond to the listing produced by `icd9 check`.

Options for icd9 clean

`dots` specifies that the period be included in the final format. If `dots` is not specified, then all periods are removed.

`pad` specifies that `icd9 clean` pad the codes with spaces, front and back, to make the (implied) dots align vertically in listings. Specifying `pad` makes the resulting codes look better when used with most other Stata commands.

Options for icd9 generate

`category`, `description`, and `range(`*codelist*`)` specify the contents of the new variable that `icd9 generate` is to create. You do not need to `icd9 clean` *varname* before using `icd9 generate`; it will accept any supported format or combination of formats.

`category` creates a new variable that contains ICD-9-CM diagnosis category codes. The resulting variable may be used with the other `icd9` subcommands. For diagnosis codes, the category code is the first three characters, except for E-codes, when it is the first four characters.

`description` creates *newvar* containing descriptions of the ICD-9-CM diagnosis codes.

`long` is for use with `description`. It specifies that the code be prepended to the text describing the code.

`end` modifies `long` (specifying `end` implies `long`) and places the code at the end of the string.

`range(`*codelist*`)` creates a new indicator variable equal to 1 when the ICD-9-CM diagnosis code is in the range specified, equal to 0 when the ICD-9-CM diagnosis code is not in the range, and equal to missing when *varname* is missing.

Option for icd9 search

`or` specifies that ICD-9-CM diagnosis codes be searched for descriptions that contain any word specified with `icd9 search`. The default is to list only descriptions that contain all the words specified.

Remarks and examples

Remarks are presented under the following headings:

If you have not yet read *Introduction to ICD coding* in [D] **icd**, please do so before using the `icd9` commands.

Using icd9 and icd9p

The ICD-9-CM coding system includes diagnosis and procedure codes. Some examples of diagnosis codes are 552.3 (Diaphragmatic hernia with obstruction) and E871.0 (Foreign object left in body during surgical operation). Some example of procedure codes are 01.2 (Craniotomy and craniectomy) and 55.23 (Closed renal biopsy).

Many datasets record (and some people write) codes without the period; for example, diagnosis code 550.1 may appear as 5501. The `icd9` commands understand both ways of recording codes. The commands are also insensitive to codes recorded with or without leading and trailing blanks. For E-codes and V-codes, the `icd9` commands are case insensitive. All the following codes are acceptable formats.

```
diagnosis   procedure
001             27.62
001.        72
    00581       32.6
   552.3    97.11
  E800.2        872
 e8002      5523
    v82.2     08.51
```

Important note: What constitutes a valid code changes between versions. For the rest of this entry, a defined code is any code that is currently valid, was valid at some point since version 16 (V16, effective 1 October 1998), or has meaning as a grouping of codes. The list of valid codes and their associated descriptions is from the US Centers for Medicare and Medicaid Services (CMS). These codes are jointly maintained and distributed by the US Centers for Disease Control and Prevention's National Center for Health Statistics and by CMS (Centers for Disease Control and Prevention 2013).

In `icd9`, descriptions that end with an asterisk (`*`) are used to denote codes that are invalid for medical coding purposes but are defined as a category code or a subcategory code that has been further subdivided. For example, diagnosis code 001 (Cholera) is invalid without a fourth digit but is defined as a category code, so its description appears as `cholera*`. CMS does not distribute short descriptions of category and subcategory codes that are defined but not valid for coding. To ensure that Stata reports that these codes are defined, we added them to the dataset `icd9` uses with a description of `*`.

Codes that were valid in the past, but no longer are, have descriptions that end with a hash mark (`#`). For example, the diagnosis code 645.01 was deleted between V16 and V18. It remains a defined code, and its description appears as `prolonged preg-delivered#`.

To view the current version of ICD-9-CM diagnosis codes in Stata, its source, and a log of changes that have been made to the list of ICD-9-CM codes since the icd9 commands were implemented, type

```
. icd9 query
ICD9 Diagnostic Code Mapping Data for use with Stata, History
 (output omitted)
  V32
    Dataset obtained 26aug2014 from
        <http://www.cms.gov/Medicare/Coding/ICD9ProviderDiagnosticCodes/
        > codes.html>, by selecting the 'Version 32...' file. Can be gotten
        directly via
        <http://www.cms.gov/Medicare/Coding/ICD9ProviderDiagnosticCodes/
        > Downloads/ICD-9-CM-v32-master-descriptions.zip>. After unzipping, the
        useful file name is "CMS32_DESC_SHORT_DX.txt (there are other files we
        did not use)."
    09oct2014: V32 put into Stata distribution
    BETWEEN V31 and V32: There were no additional codes.
    BETWEEN V31 and V32: 0 codes were deleted.
    BETWEEN V31 and V32: There were no description changes.
   (output omitted)
```

Throughout the remainder of this entry, we use nhds2010.dta, an extract of adult same-day discharges from the 2010 National Hospital Discharge Survey (NHDS). Below we describe the data and list the first five observations for the diagnosis and procedure code variables.

```
. use https://www.stata-press.com/data/r19/nhds2010
(Adult same-day discharges, 2010)

. describe

Contains data from https://www.stata-press.com/data/r19/nhds2010.dta
 Observations:         2,210                  Adult same-day discharges, 2010
    Variables:            15                  30 Jan 2024 15:03
                                              (_dta has notes)
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
ageu            byte    %8.0g      ageu       Units for age
age             byte    %8.0g                 Age
sex             byte    %8.0g      sex        Sex
race            byte    %8.0g      race       Race
month           byte    %8.0g                 Discharge month
status          byte    %8.0g      status     Discharge status
region          byte    %8.0g      region     Region
atype           byte    %8.0g      atype      Type of admission
dx1             str5    %9s                   Diagnosis 1
dx2             str5    %9s                   Diagnosis 2
dx3             str5    %9s                   Diagnosis 3 (imported incorrectly)
dx3corr         str5    %9s                   Diagnosis 3 (corrected)
pr1             str4    %9s                   Procedure 1
wgt             int     %12.0g                Frequency weight
recid           float   %9.0g                 Order of record (raw data)
--------------------------------------------------------------------------------
Sorted by: recid
```

```
. list recid dx1 dx2 dx3 pr1 in 1/5

     +--------------------------------------+
     | recid   dx1     dx2     dx3     pr1  |
     |--------------------------------------|
  1. |    84   4414    99811   14275   3834 |
  2. |   105   25013   3572    -2506        |
  3. |   255   51909   1489    -V146        |
  4. |   651   9678    E8528       8        |
  5. |   696   V271    64421   16564   7359 |
     +--------------------------------------+
```

Verifying and cleaning variables

icd9 check verifies that *varname* contains defined ICD-9-CM codes and, if not, provides a full report on the problems. It is a good idea to begin with this command and fix any potential problems before proceeding to other icd9 commands. However, the check subcommand is also useful for tracking down problems when any of the other icd9 commands tell you that the "variable does not contain ICD-9 codes".

icd9 clean modifies the variable to ensure consistency and to make subsequent output look better. This is not strictly necessary because all icd9 commands work equally well with cleaned or uncleaned codes. icd9 clean also can be used to verify that the codes in a variable conform with the ICD-9-CM diagnosis format, without checking to see whether the codes are defined.

▷ Example 1: Checking the validity of a variable

We noticed when we listed our data that dx3 appears to be padded with dashes instead of spaces. As a preemptive step, we replace the dashes with spaces by using the subinstr() function because the icd9 commands ignore spaces.

```
. replace dx3=subinstr(dx3,"-"," ",.)
(1,009 real changes made)

. list recid dx1 dx2 dx3 pr1 in 1/5

     +--------------------------------------+
     | recid   dx1     dx2     dx3     pr1  |
     |--------------------------------------|
  1. |    84   4414    99811   14275   3834 |
  2. |   105   25013   3572     2506        |
  3. |   255   51909   1489     V146        |
  4. |   651   9678    E8528       8        |
  5. |   696   V271    64421   16564   7359 |
     +--------------------------------------+
```

Now that we have replaced the characters we know will be a problem, we can icd9 check the diagnosis variables. We add the generate() option so that we can identify any observations with invalid codes.

```
. icd9 check dx1, generate(prob1)
(dx1 contains defined ICD-9-CM codes; no missing values)

. icd9 check dx2, generate(prob2)
(dx2 contains defined ICD-9-CM codes; 179 missing values)
```

```
. icd9 check dx3, generate(prob3)
(dx3 contains 277 missing values)
dx3 contains invalid codes:

    1.  Invalid placement of period                    0
    2.  Too many periods                               0
    3.  Code too short                                79
    4.  Code too long                                  0
    5.  Invalid 1st char (not 0-9, E, or V)            0
    6.  Invalid 2nd char (not 0-9)                   128
    7.  Invalid 3rd char (not 0-9)                     0
    8.  Invalid 4th char (not 0-9)                     0
    9.  Invalid 5th char (not 0-9)                     0
   10.  Code not defined                             793
                                             -----------
        Total                                      1,000
```

We see that all codes in dx1 are valid and all discharges have a primary diagnosis recorded. Likewise, all codes in dx2 are defined, and we see that 179 observations did not have a second diagnosis.

However, icd9 check reports that 1,000 of the 2,210 observations on dx3 have some sort of problem: 79 codes are too short, 128 have an invalid second character, and 793 are undefined. After some investigation, we discover that when we imported the data, we started reading from the wrong position in the file. Hereafter, we use the correctly imported variable, dx3corr.

```
. icd9 check dx3corr
(dx3corr contains defined ICD-9-CM codes; 356 missing values)
```

◁

Rather than typing the icd9 check command once for each variable, we could have checked all three simultaneously. See *Working with multiple codes* in [D] **icd**.

▷ Example 2: Standardizing the format of codes

If we plan to do any reporting with these codes later, we may want to make them more readable. Suppose we want to report the primary diagnosis and procedure for each discharge. We can use icd9 clean with the dots and pad options to add the period between the category code and any subsequent digits and to align the periods.

```
. icd9 clean dx1, dots pad
(2210 changes made)
```

Using icd9 clean with undefined codes will not result in an error message. So if you are using codes from a country other than the United States, the clean subcommand can still be used to standardize the format of your codes and check for correct placement of the period.

◁

Interactive utilities

icd9 search looks for relevant ICD-9-CM diagnosis codes from the description given on the command line, and icd9 lookup lists the descriptions of codes given on the command line. The two commands complement each other.

▷ Example 3: Finding diagnosis codes

Suppose that we want to identify the observations for which the primary diagnosis is congestive heart failure (CHF). As part of a quick exploratory analysis, we can use `icd9 search` to find ICD-9-CM codes that we may want to use to define our study population. We use the terms "heart failure" and "chf". We enclose "heart failure" in quotation marks and use the `or` option so that `icd9 search` looks for either term.

```
. icd9 search "heart failure" chf, or
5 matches found:
    398.91    rheumatic heart failure
    428       heart failure*
    428.0     chf nos
    428.1     left heart failure
    428.9     heart failure nos
```

Because the descriptions are abbreviated, we are concerned that some of the 428 codes may be left out. So we use `icd9 lookup` to list a range of codes.

```
. icd9 lookup 428*
19 matches found:
    428       heart failure*
    428.0     chf nos
    428.1     left heart failure
    428.2     *
    428.20    systolic hrt failure nos
    428.21    ac systolic hrt failure
    428.22    chr systolic hrt failure
    428.23    ac on chr syst hrt fail
    428.3     *
    428.30    diastolc hrt failure nos
    428.31    ac diastolic hrt failure
    428.32    chr diastolic hrt fail
    428.33    ac on chr diast hrt fail
    428.4     *
    428.40    syst/diast hrt fail nos
    428.41    ac syst/diastol hrt fail
    428.42    chr syst/diastl hrt fail
    428.43    ac/chr syst/dia hrt fail
    428.9     heart failure nos
```

The same result could be found by typing

```
. icd9 lookup 428/4289
```

if we knew that 428.9 was the last code in the 428 category.

◁

Creating new variables

`icd9 generate` produces new variables based on existing variables containing (cleaned or uncleaned) ICD-9-CM diagnosis codes. `icd9 generate, category` creates *newvar* containing the category code that corresponds to the code in the existing variable. `icd9 generate, description` creates *newvar* containing the abbreviated textual description of the ICD-9-CM diagnosis code. `icd9 generate, range()` produces numeric *newvar* containing 1 if *varname* records an ICD-9-CM diagnosis code in the range listed and containing 0 otherwise.

▷ Example 4: Creating an indicator variable

We review the list of codes we found in example 3 and decide that we will use 398.91 and all of the 428 codes in our definition of a CHF diagnosis. Now we can use `icd9 generate` with the `range()` option to create an indicator variable.

```
. icd9 generate chf = dx1, range(398.91 428*)
. tabulate chf [fweight=wgt]

        chf |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |    563,048       97.88       97.88
          1 |     12,192        2.12      100.00
------------+-----------------------------------
      Total |    575,240      100.00
```

After tabulating the results, we see that about 2.1% of all same-day discharges were for CHF in 2010.

◁

❑ Technical note

The dataset that supports `icd9` includes all codes that were added or deleted between V16 and the last version (V32). However, the descriptions were updated with each new version. If you are using `icd9 generate` with option `description` for codes from a version other than 32, please review the `icd9 query` log for any changes to descriptions between the version you are using and version 32.

❑

▷ Example 5: Combining commands for reporting

The `icd9 generate` commands are useful in isolation, but their real power comes when they are combined. For example, suppose that we want to make a graph showing the number of discharges in each diagnosis category for ICD-9-CM chapter 4, "Diseases of Blood and Blood-Forming Organs". We could use several `generate` commands and string functions, but `icd9 generate` greatly reduces our work.

First, we extract the category code from the detailed diagnosis code. Then, because the `icd9` commands work equally well with complete codes or category codes, we can use `icd9 generate` with the `range(280/289)` option to create an indicator variable for whether the discharge had a primary diagnosis in chapter 4.

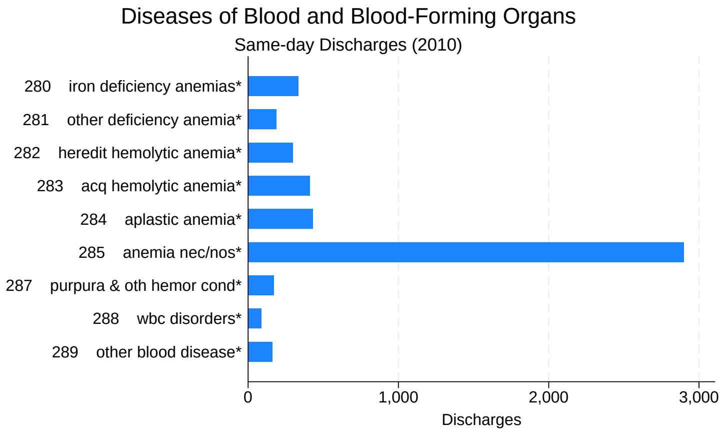
```
. icd9 generate dx1cat = dx1, category
. icd9 generate ch4 = dx1cat, range(280/289)
```

Next, we create a variable with the descriptions of the category codes in chapter 4.

```
. icd9 generate ch4des = dx1cat if ch4==1, description long
```

Finally, we use `graph hbar` to make a horizontal bar graph showing the frequencies of same-day discharges by diagnosis category.

```
. graph hbar (count) [fweight=wgt], over(ch4des) ytitle(Discharges)
> title(Diseases of Blood and Blood-Forming Organs, span)
> subtitle(Same-day Discharges (2010), span)
```



See [G-2] **graph bar** for information about customizing the graph above. For more information about graphing results, see [G-2] **graph**.

◁

Stored results

`icd9 check` stores the following in `r()`:

Scalars

`r(e#)`	number of errors of type #
`r(esum)`	total number of errors

`icd9 clean` stores the following in `r()`:

Scalars

`r(N)`	number of changes

`icd9 lookup` stores the following in `r()`:

Scalars

`r(N)`	number of codes found

References

Centers for Disease Control and Prevention. 2013. International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). https://www.cdc.gov/nchs/icd/icd9cm.htm.

National Center for Health Statistics. 2011. International Classification of Diseases, Ninth Revision, Clinical Modification. https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/ICD9-CM/2011/.

———. 2012. National Hospital Discharge Survey: 2010 Public Use Data File Documentation. https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHDS/NHDS_2010_Documentation.pdf.

Also see

[D] **icd** — Introduction to ICD commands

[D] **icd9p** — ICD-9-CM procedure codes

[D] **icd10cm** — ICD-10-CM diagnosis codes

[D] **frunalias** — Change storage type of alias variables

icd9p — ICD-9-CM procedure codes

Description

icd9p is a suite of commands for working with ICD-9-CM procedure codes from the 16th version (effective October 1998) to the 32nd version. To see the current version of the ICD-9-CM procedure codes and any changes that have been applied, type icd9p query.

icd9p check, icd9p clean, and icd9p generate are data management commands. icd9p check verifies that a variable contains defined ICD-9-CM procedure codes and provides a summary of any problems encountered. icd9p clean standardizes the format of the codes. icd9p generate can create a binary indicator variable for whether the code is in a specified set of codes, a variable containing a corresponding higher-level code, or a variable containing the description of the code.

icd9p lookup and icd9p search are interactive utilities. icd9p lookup displays descriptions of the codes specified on the command line. icd9p search looks for relevant ICD-9-CM procedure codes from keywords given on the command line.

Quick start

Determine whether ICD-9-CM procedure codes in proc1 are invalid, and store reasons in invalid

```
icd9p check proc1, generate(invalid)
```

Standardize display of codes in proc2 to remove all periods

```
icd9p clean proc2
```

Create descr3 as the procedure code prepended to short description of procedure code in proc3

```
icd9p generate descr3 = proc3, description long
```

Create eye as an indicator for eye surgery in proc4 using ICD-9-CM procedure codes 16.1 through 16.99

```
icd9p generate eye = proc4, range(16*)
```

Look up descriptions for ICD-9-CM procedure codes 25.0 through 25.4 and 25.9 through 25.99

```
icd9p lookup 25.0/25.4 25.9*
```

Menu

Data > ICD codes > ICD-9

Syntax

Verify that variable contains defined codes

`icd9p check` *varname* [*if*] [*in*] [, `any` `list` `generate(`*newvar*`)`]

Clean variable and verify format of codes

`icd9p clean` *varname* [*if*] [*in*] [, `dots` `pad`]

Generate new variable from existing variable

`icd9p generate` *newvar* = *varname* [*if*] [*in*] , `category`

`icd9p generate` *newvar* = *varname* [*if*] [*in*] , `description` [`long` `end`]

`icd9p generate` *newvar* = *varname* [*if*] [*in*] , `range(`*codelist*`)`

Display code descriptions

`icd9p lookup` *codelist*

Search for codes from descriptions

`icd9p search` ["]*text*["] [["]*text*["] ...] [, `or`]

Display ICD-9 code source

`icd9p query`

codelist is

icd9code	(the particular code)
icd9code`*`	(all codes starting with)
icd9code`/`*icd9code*	(the code range)

or any combination of the above, such as `50.21 37.7* 88.71/88.79`. *icd9codes* must be typed with leading 0s. For example, type `01`; typing `1` will result in an error.

`collect` is allowed with `icd9p check`, `icd9p clean`, and `icd9p lookup`; see **[U] 11.1.10 Prefix commands**.

The `icd9p` suite of commands does not allow alias variables; see **[D] frunalias** for advice on how to get around this restriction.

Options

Options are presented under the following headings:

Options for icd9p check

`any` tells `icd9p check` to verify that the codes fit the format of ICD-9-CM procedure codes but not to check whether the codes are defined.

`list` specifies that `icd9p check` list the observation number, the invalid or undefined ICD-9-CM procedure code, and the reason the code is invalid or whether it is an undefined code.

`generate(`*newvar*`)` specifies that `icd9p check` create a new variable containing, for each observation, 0 if the observation contains a defined code or is missing. Otherwise, it contains a number from 1 to 10. The positive numbers indicate the kind of problem and correspond to the listing produced by `icd9p check`.

Options for icd9p clean

`dots` specifies that the period be included in the final format. If `dots` is not specified, then all periods are removed.

`pad` specifies that `icd9p clean` pad the codes with spaces, front and back, to make the (implied) dots align vertically in listings. Specifying `pad` makes the resulting codes look better when used with most other Stata commands.

Options for icd9p generate

`category`, `description`, and `range(`*codelist*`)` specify the contents of the new variable that `icd9p generate` is to create. You do not need to `icd9p clean` *varname* before using `icd9p generate`; it will accept any supported format or combination of formats.

`category` creates a new variable that contains ICD-9-CM procedure category codes. The resulting variable may be used with the other `icd9p` subcommands. For procedure codes, the category code is the first two characters.

`description` creates *newvar* containing descriptions of the ICD-9-CM procedure codes.

`long` is for use with `description`. It specifies that the code be prepended to the text describing the code.

`end` modifies `long` (specifying `end` implies `long`) and places the code at the end of the string.

`range(`*codelist*`)` creates a new indicator variable equal to 1 when the ICD-9-CM procedure code is in the range specified, equal to 0 when the ICD-9-CM procedure code is not in the range, and equal to missing when *varname* is missing.

Option for icd9p search

`or` specifies that ICD-9-CM procedure codes be searched for descriptions that contain any word specified with `icd9p search`. The default is to list only descriptions that contain all the words specified.

Remarks and examples

Remarks are presented under the following headings:

Verifying and cleaning variables
Interactive utilities
Creating new variables

If you have not yet read *Introduction to ICD coding* in [D] **icd**, please do so before using the `icd9p` commands. Please also see *Using icd9 and icd9p* in [D] **icd9** for information about Stata's implementation of the ICD-9 coding system.

Throughout the remainder of this entry, we use `nhds2010.dta`, an extract of adult same-day discharges from the 2010 National Hospital Discharge Survey (NHDS). Below we `describe` the data.

```
. use https://www.stata-press.com/data/r19/nhds2010
(Adult same-day discharges, 2010)

. describe

Contains data from https://www.stata-press.com/data/r19/nhds2010.dta
 Observations:         2,210                  Adult same-day discharges, 2010
    Variables:            15                  30 Jan 2024 15:03
                                              (_dta has notes)
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
ageu            byte    %8.0g      ageu       Units for age
age             byte    %8.0g                 Age
sex             byte    %8.0g      sex        Sex
race            byte    %8.0g      race       Race
month           byte    %8.0g                 Discharge month
status          byte    %8.0g      status     Discharge status
region          byte    %8.0g      region     Region
atype           byte    %8.0g      atype      Type of admission
dx1             str5    %9s                   Diagnosis 1
dx2             str5    %9s                   Diagnosis 2
dx3             str5    %9s                   Diagnosis 3 (imported incorrectly)
dx3corr         str5    %9s                   Diagnosis 3 (corrected)
pr1             str4    %9s                   Procedure 1
wgt             int     %12.0g                Frequency weight
recid           float   %9.0g                 Order of record (raw data)
--------------------------------------------------------------------------------
Sorted by: recid
```

Verifying and cleaning variables

`icd9p check` verifies that *varname* contains defined ICD-9-CM procedure codes and, if not, provides a full report on the problems. It is a good idea to begin with this command and fix any potential problems before proceeding to other `icd9p` commands. However, the `check` subcommand is also useful for tracking down problems when any of the other `icd9p` commands tell you that the "variable does not contain ICD-9 codes".

`icd9p clean` modifies the variable to ensure consistency and to make subsequent output look better. This is not strictly necessary because all `icd9p` commands work equally well with cleaned or uncleaned codes. `icd9p clean` also can be used to verify that the codes in a variable conform with the ICD-9-CM procedure format, without checking to see whether the codes are defined.

▷ Example 1: Standardizing the format of codes

If we plan to do any reporting with the codes in our data, we may want to make them more readable. Suppose we want to report the primary procedure for each discharge. We can use `icd9p clean` with the `dots` option to add the period between the category code and any subsequent digits.

```
. icd9p clean pr1, dots pad
(821 changes made)
. list recid pr1 in 1/5
```

	recid	pr1
1.	84	38.34
2.	105	
3.	255	
4.	651	
5.	696	73.59

Using `icd9p clean` with undefined codes will not result in an error message. So if you are using codes from a country other than the United States, the `clean` subcommand can still be used to standardize the format of your codes and check for correct placement of the period.

◁

Interactive utilities

`icd9p search` looks for relevant ICD-9-CM procedure codes from the description given on the command line, and `icd9p lookup` lists the descriptions of codes given on the command line. The two commands complement each other.

▷ Example 2: Finding procedure code descriptions

If we wanted to find the corresponding abbreviated description for procedure code 38.34, we would type

```
. icd9p lookup 38.34
1 match found:
    38.34     aorta resection & anast
```

If you are curious, the cryptic result translates into resection with anastomosis of the aorta.

To find a list of other procedure codes for resection with anastomosis and their descriptions, we could type `icd9p lookup 38.3*`. Or if we were interested in finding codes for procedures on the aorta, we could type

```
. icd9p search aorta
  (output omitted)
```

◁

Creating new variables

`icd9p generate` produces new variables based on existing variables containing (cleaned or uncleaned) ICD-9-CM procedure codes. `icd9p generate, category` creates *newvar* containing the category code that corresponds to the code in the existing variable. `icd9p generate, description` creates *newvar* containing the abbreviated textual description of the ICD-9-CM procedure code. `icd9p generate, range()` produces numeric *newvar* containing 1 if *varname* records an ICD-9-CM procedure code in the range listed and containing 0 otherwise.

▷ Example 3: Adding descriptions to codes

In example 4 of [D] **icd9**, we created an indicator variable for whether a patient had congestive heart failure (CHF). We may want to know what procedures were performed for patients with CHF. We check the procedure codes in `pr1` and then generate a new variable with their descriptions. We include the `long` option so that we can see the ICD-9-CM procedure code as well.

```
. icd9p check pr1
(pr1 contains defined ICD-9-CM procedure codes; 1389 missing values)

. icd9p generate pr1descr = pr1, description long

. tabulate pr1descr [fweight=wgt] if chf==1, missing sort

                   label for pr1 |      Freq.     Percent        Cum.
---------------------------------+-----------------------------------
                                 |      7,185       58.93       58.93
  37.22  left heart cardiac cath |      1,906       15.63       74.57
 92.05  c-vasc scan/isotop funct |      1,027        8.42       82.99
       88.72  dx ultrasound-heart |        776        6.36       89.35
              03.31  spinal tap |        498        4.08       93.44
            39.95  hemodialysis |        388        3.18       96.62
           34.91  thoracentesis |        138        1.13       97.75
 99.60  cardiopulm resuscita nos |        112        0.92       98.67
 37.94  implt/repl carddefib tot |        110        0.90       99.57
  89.44  cardiac stress test nec |         52        0.43      100.00
---------------------------------+-----------------------------------
                           Total |     12,192      100.00
```

We see that the majority of same-day discharges (58.9%) did not involve any procedure. When a procedure was performed, the most common was left heart cardiac catheterization (15.6%).

◁

❑ Technical note

The dataset that supports `icd9p` includes all codes that were added or deleted between V16 and the last version (V32). However, the descriptions were updated with each new version. If you are using `icd9p generate` with option `description` for codes from a version other than 32, please review the `icd9p query` log for any changes to descriptions between the version you are using and version 32.

❑

Stored results

icd9p check stores the following in r():

Scalars

r(e#)	number of errors of type #
r(esum)	total number of errors

icd9p clean stores the following in r():

Scalars

r(N)	number of changes

icd9p lookup stores the following in r():

Scalars

r(N)	number of codes found

References

National Center for Health Statistics. 2011. International Classification of Diseases, Ninth Revision, Clinical Modification. https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/ICD9-CM/2011/.

———. 2012. National Hospital Discharge Survey: 2010 Public Use Data File Documentation. https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHDS/NHDS_2010_Documentation.pdf.

Also see

[D] **icd** — Introduction to ICD commands

[D] **icd9** — ICD-9-CM diagnosis codes

[D] **icd10pcs** — ICD-10-PCS procedure codes

[D] **frunalias** — Change storage type of alias variables

Description

`icd10` is a suite of commands for working with the World Health Organization's (WHO's) ICD-10 diagnosis codes from the second edition (2003) to the sixth edition (2019). To see the current version of the ICD-10 diagnosis codes and any changes that have been applied, type `icd10 query`.

`icd10 check`, `icd10 clean`, and `icd10 generate` are data management commands. `icd10 check` verifies that a variable contains defined ICD-10 diagnosis codes and provides a summary of any problems encountered. `icd10 clean` standardizes the format of the codes. `icd10 generate` can create a binary indicator variable for whether the code is in a specified set of codes, a variable containing a corresponding higher-level code, or a variable containing the description of the code.

`icd10 lookup` and `icd10 search` are interactive utilities. `icd10 lookup` displays descriptions of the codes specified on the command line. `icd10 search` looks for relevant ICD-10 diagnosis codes from keywords given on the command line.

Quick start

Determine whether ICD-10 diagnosis codes in `diag1` are invalid, and store reasons in `invalid`

```
icd10 check diag1, generate(invalid)
```

Standardize display of codes in `diag2` to add a period and left-align codes

```
icd10 clean diag2, replace
```

Generate `descr3` as descriptions of the diagnosis codes in `diag3`

```
icd10 generate descr3 = diag3, description
```

Generate binary indicator for malignant or benign neoplasm, as indicated by an ICD-10 code beginning with C or D in `diag4`

```
icd10 generate cancer = diag4, range(C* D*)
```

Look up current descriptions for ICD-10 diagnosis codes W70 through W79

```
icd10 lookup W70/W79
```

Look up codes where the description contains the words "delivery" or "birth"

```
icd10 search delivery birth, or
```

Menu

Data > ICD codes > ICD-10

Syntax

Verify that variable contains defined codes

`icd10 check` *varname* [*if*] [*in*] [, *checkopts*]

Clean variable and verify format of codes

`icd10 clean` *varname* [*if*] [*in*] , {`generate(`*newvar*`)` | `replace`} [*cleanopts*]

Generate new variable from existing variable

`icd10 generate` *newvar* = *varname* [*if*] [*in*] , {`category` | `short`} [`check`]

`icd10 generate` *newvar* = *varname* [*if*] [*in*] , `description` [*genopts*]

`icd10 generate` *newvar* = *varname* [*if*] [*in*] , `range(`*codelist*`)` [`check`]

Display code descriptions

`icd10 lookup` *codelist* [, `version(#)`]

Search for codes from descriptions

`icd10 search` ["]*text*["] [["]*text*["] ...] [, *searchopts*]

Display ICD-10 version

`icd10 query`

codelist is one of the following:

icd10code	(the particular code)
icd10code∗	(all codes starting with)
icd10code/*icd10code*	(the code range)

or any combination of the above, such as `A27.0 G40* Y60/Y69.9`.

checkopts	Description
`fmtonly`	check only format of the codes
`summary`	frequency of each invalid or undefined code
`list`	list observations with invalid or undefined ICD-10 codes
`generate(`*newvar*`)`	create new variable marking invalid codes
`version(#)`	year to check codes against; default is `version(2019)`

cleanopts	Description
* generate(*newvar*)	create new variable containing cleaned codes
* replace	replace existing codes with the cleaned codes
check	check that variable contains ICD-10 codes before cleaning
nodots	format codes without a period
pad	add space to the right of three-character codes

* Either generate() or replace is required.

genopts	Description
addcode(begin | end)	add code to the beginning or end of the description
pad	add spaces to the right of the code; must specify addcode(begin)
nodots	format codes without a period; must specify addcode()
check	check that variable contains ICD-10 codes before generating new variable
version(#)	select description from year #; default is version(2019)

searchopts	Description
or	match any keyword
matchcase	match case of keywords
version(#)	search description from year #; default is all

collect is allowed with icd10 check and icd10 clean; see [U] **11.1.10 Prefix commands**.

The icd10 suite of commands does not allow alias variables; see [D] **frunalias** for advice on how to get around this restriction.

Options

Options are presented under the following headings:

Options for icd10 check
Options for icd10 clean
Options for icd10 generate
Option for icd10 lookup
Options for icd10 search

Warning: The option descriptions are brief and use jargon. Please read *Introduction to ICD coding* in [D] **icd** before using the icd10 command.

Options for icd10 check

fmtonly tells icd10 check to verify that the codes fit the format of ICD-10 diagnosis codes but not to check whether the codes are defined.

summary specifies that icd10 check should report the frequency of each invalid or undefined code that was found in the data. Codes are displayed in descending order by frequency. summary may not be combined with list.

list specifies that icd10 check list the observation number, the invalid or undefined ICD-10 diagnosis code, and the reason the code is invalid or whether it is an undefined code. list may not be combined with summary.

`generate(`*newvar*`)` specifies that `icd10 check` create a new variable containing, for each observation, 0 if the observation contains a defined code. Otherwise, it contains a number from 1 to 8 if the code is invalid, 99 if the code is undefined, or missing if the code is missing. The positive numbers indicate the kind of problem and correspond to the listing produced by `icd10 check`.

`version(#)` specifies the version of the codes that `icd10 check` should reference. # may be any value between 2003, which is the second edition of ICD-10 without any updates applied, and 2019, which is the sixth edition of ICD-10. The appropriate value of # should be determined from the data source. The default is `version(2019)`.

Options for icd10 clean

`generate(`*newvar*`)` and `replace` specify how the formatted values of *varname* are to be handled. You must specify either `generate()` or `replace`.

`generate()` specifies that the cleaned values be placed in the new variable specified in *newvar*.

`replace` specifies that the existing values of *varname* be replaced with the formatted values.

`check` specifies that `icd10 clean` should first check that *varname* contains codes that fit the format of ICD-10 diagnosis codes. Specifying the `check` option will slow down `icd10 clean`.

`nodots` specifies that the period be removed in the final format.

`pad` specifies that spaces be added to the end of the codes to make the (implied) dots align vertically in listings. The default is to left-align codes without adding spaces.

Options for icd10 generate

`category`, `short`, `description`, and `range(`*codelist*`)` specify the contents of the new variable that `icd10 generate` is to create. You do not need to `icd10 clean` *varname* before using `icd10 generate`; it will accept any supported format or combination of formats.

`category` and `short` generate a new variable that also contains ICD-10 diagnosis codes. The resulting variable may be used with the other `icd10` subcommands.

`category` specifies to extract the three-character category code from the ICD-10 diagnosis code.

`short` is designed for users who have data with greater specificity than the standard four-character ICD-10 codes. `short` will reduce five- and six-character codes to their first four characters. Three- and four-character codes are left as they are.

`description` creates *newvar* containing descriptions of the ICD-10 diagnosis codes.

`range(`*codelist*`)` creates a new indicator variable equal to 1 when the ICD-10 diagnosis code is in the range specified, equal to 0 when the ICD-10 diagnosis code is not in the range, and equal to missing when *varname* is missing.

`addcode(begin | end)` specifies that the code should be included with the text describing the code. Specifying `addcode(begin)` will prepend the code to the text. Specifying `addcode(end)` will append the code to the text.

`pad` specifies that the code that is to be added to the description should be padded spaces to the right of the code so that the start of description text is aligned for all codes. `pad` may be specified only with `addcode(begin)`.

`nodots` specifies that the code that is added to the description should be formatted without a period. `nodots` may be specified only if `addcode()` is also specified.

`check` specifies that `icd10 generate` should first check that *varname* contains codes that fit the format of ICD-10 diagnosis codes. Specifying the `check` option will slow down the `generate` subcommand.

`version(#)` specifies the version of the codes that `icd10 generate` should reference. # may be any value between 2003, which is the second edition of ICD-10 without any updates applied, and 2019, which is the sixth edition of ICD-10. The appropriate value of # should be determined from the data source. The default is `version(2019)`.

Option for icd10 lookup

`version(#)` specifies the version of the codes that `icd10 lookup` should reference. # may be any value between 2003, which is the second edition of ICD-10 without any updates applied, and 2019, which is the sixth edition of ICD-10. The appropriate value of # should be determined from the data source. The default is `version(2019)`.

Options for icd10 search

`or` specifies that ICD-10 diagnosis codes be searched for descriptions that contain any word specified with `icd10 search`. The default is to list only descriptions that contain all the words specified.

`matchcase` specifies that `icd10 search` should match the case of the keywords given on the command line. The default is to perform a case-insensitive search.

`version(#)` specifies the version of the codes that `icd10 search` should reference. # may be any value between 2003, which is the second edition of ICD-10 without any updates applied, and 2019, which is the sixth edition of ICD-10.

By default, descriptions for all versions are searched, meaning that codes that changed descriptions and that have descriptions in multiple versions that contain the search terms will be duplicated. To ensure a list of unique code values, specify the version number.

Remarks and examples

Remarks are presented under the following headings:

Introduction
Managing datasets with ICD-10 codes
Creating new variables

If you have not yet read *Introduction to ICD coding* in [D] **icd**, please do so before using the `icd10` commands.

Introduction

The general format of an ICD-10 diagnosis code is

$$\{\texttt{A–Z}\}\{\texttt{0–9}\}\{\texttt{0–9}\}[\texttt{.}][\texttt{0–9}]$$

The code begins with a single letter followed by two digits. It may have an additional third digit after the period.

For example, in the ICD-10 coding system, E11.0 (Type 2 diabetes mellitus: With coma) and C56 (Malignant neoplasm of ovary) are diagnosis codes, although some datasets record (and some people write) E110 rather than E11.0. The `icd10` commands understand both ways of recording codes. The commands are also insensitive to codes recorded with or without leading and trailing blanks and are case insensitive.

All the following are acceptable formats to record codes in Stata.

```
N94.0
  M32
K12
F102
x40
```

The list of defined codes and their associated descriptions is provided under license from the World Health Organization (WHO); see [R] **Copyright ICD-10**. To view the current license and a log of changes that WHO has made to the list of ICD-10 codes since the `icd10` commands were implemented in Stata, type

```
. icd10 query
ICD-10 Version and Change Log
  License agreement
    ICD-10 codes used by permission of the World Health Organization (WHO),
        from: International Statistical Classification of Diseases and
        Related Health Problems, Tenth Revision (ICD-10) 2010 Edition. Vols.
        1-3. Geneva, World Health Organization, 2011.
    See copyright icd10 for the ICD-10 copyright notification.
  Edition 2019
    The ICD-10 data were obtained from WHO on 27feb2023.
    All updates scheduled for implementation through 01jan2023 have been
        applied.
    Between 2016 and 2019:
          137 codes added,   23 codes deleted,   58 code descriptions changed.
 (output omitted)
```

❑ Technical note

Codes can have up to two more digits to form five- and six-character codes. Supplemental subdivisions of ICD-10 codes may occur at the fifth and sixth characters. These supplemental subdivisions are primarily used to indicate anatomical site and additional information about the diagnosis, for example, whether a fracture was open or closed (World Health Organization 2011). However, these codes are not part of the standard four-character system codified by WHO for international morbidity and mortality reporting and are not considered valid by `icd10`.

If your data contain these longer codes, you can use `icd10 generate` with option `short` to shorten your codes to the relevant four-character subcategory code. Any existing three- and four-character codes in the data are left as they were originally.

❑

Managing datasets with ICD-10 codes

The `icd10` suite of commands has three data management commands. `icd10 check` verifies that the ICD-10 codes in *varname* are valid. `icd10 clean` standardizes the format of ICD-10 codes in *varname*. And `icd10 generate` produces a new variable from an existing variable containing ICD-10 codes. It will create a variable containing the associated category code, a description of the code, or a binary indicator for whether the code is in a specified set of codes.

▷ Example 1: Checking the validity of a variable

Although not necessary, a good place to start is with `icd10 check`. The commands in the `icd10` suite will return an error message if the codes in your data are not valid. Running `icd10 check` is a good way to avoid error messages later.

`australia10.dta` contains total deaths in 2010 for males and females from Australia, taken from the WHO Mortality Database . Below we `list` the first 10 observations.

```
. use https://www.stata-press.com/data/r19/australia10
(Australian mortality data, 2010)
. list in 1/10, sepby(cause) noobs
```

cause	sex	deaths
A020	Male	1
A020	Female	4
A021	Male	3
A021	Female	1
A047	Male	16
A047	Female	25
A048	Female	4
A049	Male	1
A049	Female	1
A063	Male	1

We will specify the `generate()` option to create a new variable called `prob` that will indicate that the code in `cause` is valid (`prob` = 0) or will indicate a value of 1 through 8 for the reason the code is not valid. `icd10 check` also creates a value of 99, which indicates that the code is not defined but otherwise conforms to the formatting requirements for ICD-10 codes.

```
. icd10 check cause, generate(prob)
(cause contains no missing values)
cause contains undefined codes:
     1.  Invalid placement of period                   0
     2.  Too many periods                              0
     3.  Code too short                                0
     4.  Code too long                                 0
     5.  Invalid 1st char (not A-Z)                    0
     6.  Invalid 2nd char (not 0-9)                    0
     7.  Invalid 3rd char (not 0-9)                    0
     8.  Invalid 4th char (not 0-9)                    0
    77.  Valid only for previous versions              9
    88.  Valid only for later versions                 0
    99.  Code not defined                              0
                                              ──────────
         Total                                         9
```

`icd10 check` reports that there are six observations with undefined codes. In this case, this is because we failed to specify that the data were reported using the ICD-10 codes from 2010.

```
. drop prob
. icd10 check cause, generate(prob) year(2010)
(cause contains defined codes; no missing values)
```

We see now that there are no errors in our dataset.

◁

▷ Example 2: Standardizing the format of codes

If we plan to do any reporting with these codes later, we may want to make them more readable, so we use `icd10 clean`. This command will automatically add a dot after the third character and change the display format of the diagnosis variable so that it is left aligned. We specify `replace` so that the standardized codes are placed in the existing `cause` variable.

When we listed our data before, they were sorted by cause of death and showed very few deaths assigned to the first several codes. It might be more interesting to see the most frequent causes of death. So before we list the data this time, we sort them in descending order with `gsort`.

```
. icd10 clean cause, replace
variable cause was str4 now str5
(2,921 real changes made)
. gsort -deaths
. list cause sex deaths in 1/10, sepby(cause)
```

	cause	sex	deaths
1.	I21.9	Male	5,057
2.	I21.9	Female	4,885
3.	C34.9	Male	4,859
4.	I25.9	Male	3,805
5.	I25.9	Female	3,636
6.	F03	Female	3,517
7.	C61	Male	3,236
8.	I64	Female	3,204
9.	C34.9	Female	3,130
10.	C50.9	Female	2,842

Now it is clear that we have a mix of three- and four-character codes.

◁

▷ Example 3: Looking up a single code

In example 2, we see that the highest number of reported deaths for men and women is for code I21.9. If we were curious about what this code is, we could type

```
. icd10 lookup I21.9
    I21.9 Acute myocardial infarction, unspecified
```

and we would see that these are deaths from acute myocardial infarction, commonly known as heart attacks. Because the `icd10` commands are case insensitive and do not care whether we use the dot, we could have typed `i21.9`, `I219`, or `i219`, and Stata would have returned the same results.

◁

Creating new variables

We now proceed to create new variables for later use.

▷ Example 4: Creating an indicator variable

Suppose that after watching several high-action nature shows on television, we now believe that death due to shark attack is common in Australia. It did not show up in our top-ten list above, but we would like to see how many deaths we have in our data. We can look up the code using WHO's interactive web utility (http://apps.who.int/classifications/icd10/browse/2010/en/) and then use `icd10 generate` with the `range()` option to create an indicator for whether death occurred by shark bite (`shark`).

```
. icd10 generate shark=cause, range(W56)
. tabulate shark [fweight=deaths]
```

shark	Freq.	Percent	Cum.
0	143,472	100.00	100.00
1	1	0.00	100.00
Total	143,473	100.00	

Reality was not nearly as exciting as television—there was only one death with a code relating to shark bite in Australia in 2010.

If we wanted to study something less sensational, we could expand the *icd10rangelist* to a more complex list of codes. For example, perhaps we want to study the number of deaths from myocardial infarction (MI) and complications that occurred afterward. We might pick codes I21.0 through I21.9, I22.0 through I22.9, and I23.0 through I23.8. We could create the variable `mi` by typing

```
. icd10 generate mi=cause, range(I210/I219 I220/I229 I230/I238)
. tabulate mi [fweight=deaths]
```

mi	Freq.	Percent	Cum.
0	133,522	93.06	93.06
1	9,951	6.94	100.00
Total	143,473	100.00	

We see that 9,951 deaths were from MI or complications thereof, which equates to about 6.9% of all deaths in Australia in 2010. It appears that hearts are far more dangerous than sharks.

◁

❑ Technical note

WHO reserves codes in categories U00 through U49 for the provisional assignment of new diseases and designates codes U50 through U99 for research purposes (World Health Organization 2011).

In general, codes in categories U50 through U99 are treated as undefined. This means that you do not need to take any special steps as long as your codes fit within the accepted four-character format. However, if you wish to exclude U codes from the commands, you can use the `if` qualifier.

With the exception of `icd10 generate` with the `description` option, the `icd10` commands will continue to work as normal with undefined U codes. As a rule, `icd10 generate` with the `description` option will return missing values for codes U50 through U99. Note that some of these codes, however, are defined and considered valid by `icd10` because WHO has distributed descriptions for them. For these codes, `icd10 generate` with option `description` will return results. The affected codes vary by year.

❑

Stored results

icd10 check stores the following in r():

Scalars	
r(e#)	number of errors of type #
r(esum)	total number of errors
r(miss)	number of missing values
r(N)	number of nonmissing values

icd10 clean stores the following in r():

Scalars	
r(N)	number of changes

icd10 lookup and icd10 search store the following in r():

Scalars	
r(N_codes)	number of codes found

Acknowledgments

We thank the World Health Organization for making ICD-10 codes available to Stata users. See [R] **Copyright ICD-10** for allowed usage.

We thank Joe Canner, who while at Yale University School of Medicine, wrote mycd10 and mycd10p, which provide many utilities for ICD-10 diagnosis and procedure codes. The commands rely on a user-supplied ICD-10 lookup dataset for diagnosis codes and ICD-10-PCS codes from the US Centers for Medicare and Medicaid Services for procedure codes.

References

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Also see

[D] **icd** — Introduction to ICD commands

[D] **icd10cm** — ICD-10-CM diagnosis codes

[D] **frunalias** — Change storage type of alias variables

Description

`icd10cm` is a suite of commands for working with ICD-10-CM diagnosis codes from US federal fiscal year 2016 to the present. To see the current version of the ICD-10-CM diagnosis codes and any changes that have been applied, type `icd10cm query`.

`icd10cm check`, `icd10cm clean`, and `icd10cm generate` are data management commands. `icd10cm check` verifies that a variable contains defined ICD-10-CM diagnosis codes and provides a summary of any problems encountered. `icd10cm clean` standardizes the format of the codes. `icd10cm generate` can create a binary indicator variable for whether the code is in a specified set of codes, a variable containing a corresponding higher-level code, or a variable containing the description of the code.

`icd10cm lookup` and `icd10cm search` are interactive utilities. `icd10cm lookup` displays descriptions of the codes specified on the command line. `icd10cm search` looks for relevant ICD-10-CM diagnosis codes from keywords given on the command line.

Quick start

Determine whether ICD-10-CM diagnosis codes in `diag1` are invalid, and store reasons in `invalid`

```
icd10cm check diag1, generate(invalid)
```

Standardize display of codes in `diag2` to add a period and left-align codes

```
icd10cm clean diag2, replace
```

Generate `descr3` as the diagnosis code prepended to the short description of diagnosis code in `diag3`

```
icd10cm generate descr3 = diag3, description addcode(begin)
```

Generate `mhypertn` as an indicator for a maternal hypertension diagnosis in `diag4` using ICD-10-CM codes O16.1 through O16.5 or O16.9

```
icd10cm generate mhypertn = diag4, range(O161/O165 O169)
```

Look up descriptions for ICD-10-CM diagnosis codes T46.1X1, T46.1X1A, T46.1X1D, and T46.1X1S

```
icd10cm lookup T46.1X1*
```

Look up codes where the description contains the words "delivery" or "birth"

```
icd10cm search delivery birth, or
```

Menu

Data > ICD codes > ICD-10-CM

Syntax

Verify that variable contains defined codes

icd10cm check *varname* [*if*] [*in*] [, *checkopts*]

Clean variable and verify format of codes

icd10cm clean *varname* [*if*] [*in*], {generate(*newvar*) | replace} [*cleanopts*]

Generate new variable from existing variable

icd10cm generate *newvar* = *varname* [*if*] [*in*], category [check]

icd10cm generate *newvar* = *varname* [*if*] [*in*], description [*genopts*]

icd10cm generate *newvar* = *varname* [*if*] [*in*], range(*codelist*) [check]

Display code descriptions

icd10cm lookup *codelist* [, version(#)]

Search for codes from descriptions

icd10cm search ["]*text*["] [["]*text*["] ...] [, *searchopts*]

Display ICD-10-CM version

icd10cm query

codelist is one of the following:

icd10code	(the particular code)
*icd10code**	(all codes starting with)
icd10code/icd10code	(the code range)

or any combination of the above, such as A27.0 G40* Y60/Y69.9.

checkopts	Description
fmtonly	check only format of the codes
summary	frequency of each invalid or undefined code
list	list observations with invalid or undefined ICD-10-CM codes
generate(*newvar*)	create new variable marking invalid codes
version(#)	fiscal year to check codes against; default is the current year

cleanopts	Description
* generate(*newvar*)	create new variable containing cleaned codes
* replace	replace existing codes with the cleaned codes
check	check that variable contains ICD-10-CM codes before cleaning
nodots	format codes without a period
pad	add space to the right of codes shorter than seven characters

* Either generate() or replace is required.

genopts	Description
addcode(begin | end)	add code to the beginning or end of the description
pad	add spaces to the right of the code; must specify addcode(begin)
nodots	format codes without a period; must specify addcode()
check	check that variable contains ICD-10-CM codes before generating new variable
long	use long description rather than short
version(#)	select description from fiscal year #; default is the current year

searchopts	Description
or	match any keyword
matchcase	match case of keywords
version(#)	search description from fiscal year #; default is all

collect is allowed with icd10cm check and icd10cm clean; see **[U] 11.1.10 Prefix commands**.

The icd10cm suite of commands does not allow alias variables; see [D] **frunalias** for advice on how to get around this restriction.

Options

Options are presented under the following headings:

Options for icd10cm check
Options for icd10cm clean
Options for icd10cm generate
Option for icd10cm lookup
Options for icd10cm search

Options for icd10cm check

fmtonly tells icd10cm check to verify that the codes fit the format of ICD-10-CM diagnosis codes but not to check whether the codes are defined.

summary specifies that icd10cm check should report the frequency of each invalid or undefined code that was found in the data. Codes are displayed in descending order by frequency. summary may not be combined with list.

list specifies that icd10cm check list the observation number, the invalid or undefined ICD-10-CM diagnosis code, and the reason the code is invalid or whether it is an undefined code. list may not be combined with summary.

`generate(`*newvar*`)` specifies that `icd10cm check` create a new variable containing, for each observation, 0 if the observation contains a defined code. Otherwise, it contains a number from 1 to 11 if the code is invalid, 77 if the code is valid only for a previous version, 88 if the code is valid only for a later version, 99 if the code is undefined, or missing if *varname* is missing.. The positive numbers indicate the kind of problem and correspond to the listing produced by `icd10cm check`.

`version(`#`)` specifies the version of the codes that `icd10cm check` should reference. # indicates the federal fiscal year for the codes. For example, use `2016` for federal fiscal year 2016 (FFY-2016), which is October 1, 2015 to September 30, 2016. `icd10cm` supports all years after the United States officially adopted ICD-10-CM. The appropriate value of # should be determined from the data source. The default is the current year.

Warning: The default value of `version()` will change over time so that the most recent codes are used. Using the default value rather than specifying a specific version may change results after a new version of the codes is introduced.

Options for icd10cm clean

`generate(`*newvar*`)` and `replace` specify how the formatted values of *varname* are to be handled. You must specify either `generate()` or `replace`.

`generate()` specifies that the cleaned values be placed in the new variable specified in *newvar*.

`replace` specifies that the existing values of *varname* be replaced with the formatted values.

`check` specifies that `icd10cm clean` should first check that *varname* contains codes that fit the format of ICD-10-CM diagnosis codes. Specifying the `check` option will slow down `icd10cm clean`.

`nodots` specifies that the period be removed in the final format.

`pad` specifies that spaces be added to the end of the codes to make the (implied) dots align vertically in listings. The default is to left-align codes without adding spaces.

Options for icd10cm generate

`category`, `description`, and `range(`*codelist*`)` specify the contents of the new variable that `icd10cm generate` is to create. You do not need to `icd10cm clean` *varname* before using `icd10cm generate`; it will accept any supported format or combination of formats.

`category` specifies to extract the three-character category code from the ICD-10-CM diagnosis code. The resulting variable may be used with the other `icd10cm` subcommands.

`description` creates *newvar* containing descriptions of the ICD-10-CM diagnosis codes.

`range(`*codelist*`)` creates a new indicator variable equal to 1 when the ICD-10-CM diagnosis code is in the range specified, equal to 0 when the ICD-10-CM diagnosis code is not in the range, and equal to missing when *varname* is missing.

`addcode(begin | end)` specifies that the code should be included with the text describing the code. Specifying `addcode(begin)` will prepend the code to the text. Specifying `addcode(end)` will append the code to the text.

`pad` specifies that the code that is to be added to the description should be padded spaces to the right of the code so that the start of description text is aligned for all codes. `pad` may be specified only with `addcode(begin)`.

`nodots` specifies that the code that is added to the description should be formatted without a period. `nodots` may be specified only if `addcode()` is also specified.

`check` specifies that `icd10cm generate` should first check that *varname* contains codes that fit the format of ICD-10-CM diagnosis codes. Specifying the `check` option will slow down the `generate` subcommand.

`long` specifies that the long description of the code be used rather than the short (abbreviated) description.

`version(#)` specifies the version of the codes that `icd10cm generate` should reference. # indicates the federal fiscal year for the codes. For example, use `2016` for federal fiscal year 2016 (FFY-2016), which is October 1, 2015 to September 30, 2016. `icd10cm` supports all years after the United States officially adopted ICD-10-CM. The appropriate value of # should be determined from the data source. The default is the current year.

Warning: The default value of `version()` will change over time so that the most recent codes are used. Using the default value rather than specifying a specific version may change results after a new version of the codes is introduced.

Option for icd10cm lookup

`version(#)` specifies the version of the codes that `icd10cm lookup` should reference. # indicates the federal fiscal year for the codes. For example, use `2016` for federal fiscal year 2016 (FFY-2016), which is October 1, 2015 to September 30, 2016. `icd10cm` supports all years after the United States officially adopted ICD-10-CM. The appropriate value of # should be determined from the data source. The default is the current year.

Warning: The default value of `version()` will change over time so that the most recent codes are used. Using the default value rather than specifying a specific version may change results after a new version of the codes is introduced.

Options for icd10cm search

`or` specifies that ICD-10-CM diagnosis codes be searched for descriptions that contain any word specified with `icd10cm search`. The default is to list only descriptions that contain all the words specified.

`matchcase` specifies that `icd10cm search` should match the case of the keywords given on the command line. The default is to perform a case-insensitive search.

`version(#)` specifies the version of the codes that `icd10cm search` should reference. # indicates the federal fiscal year for the codes. For example, use `2016` for federal fiscal year 2016 (FFY-2016), which is October 1, 2015 to September 30, 2016. `icd10cm` supports all years after the United States officially adopted ICD-10-CM.

By default, descriptions for all versions are searched, meaning that codes that changed descriptions and that have descriptions in multiple versions that contain the search terms will be duplicated. To ensure a list of unique code values, specify the version number.

Remarks and examples

Remarks are presented under the following headings:

If you have not yet read *Introduction to ICD coding* in [D] **icd**, please do so before using the `icd10cm` commands.

Introduction

The general format of an ICD-10-CM diagnosis code is a three-character category code followed by up to four characters after an (implied) period. The first character is always a letter and the second character is always a number, but the remaining characters may be any combination of letters and numbers.

Some examples of ICD-10-CM diagnosis codes are B69 (cysticercosis) and W20.0XXA (struck by falling object in cave-in, initial encounter). Many datasets record (and some people write) codes without the period; for example, the code I74.3 may appear as I743. The `icd10cm` commands understand both ways of recording codes. The commands are also insensitive to codes recorded with or without leading and trailing blanks and are case insensitive.

All the following are acceptable formats to record codes in Stata:

```
    T37.0X3A
A25.1
    C52
       a80.0
       z8261
```

Important note: What constitutes a valid code changes between versions. For the rest of this entry, a defined code is any code that is currently valid, was valid at some point since the ICD-10-CM coding system was introduced, or has a meaning as a grouping of codes. The list of valid codes and their associated descriptions is from the US Centers for Disease Control and Prevention's National Center for Health Statistics (Centers for Disease Control and Prevention 2013). The ICD-10-CM is a licensed adaptation of the ICD-10, which is copyrighted by the World Health Organization (WHO); see [R] **Copyright ICD-10**.

To view the current version of the ICD-10-CM diagnosis codes in Stata, its source, and a log of changes that have been made to the list of ICD-10-CM diagnosis codes since the `icd10cm` commands were implemented, type

```
. icd10cm query
ICD-10-CM Diagnosis Code Version and Change Log
  Note
    The ICD-10 coding system is copyrighted by the World Health Organization.
        The ICD-10-CM is the WHO's authorized adaptation for use in the
        United States.  It is maintained by the National Center for Health
        Statistics (NCHS), at the Center for Disease Control and Prevention.
        Stata obtains the ICD-10-CM data from the NCHS website.
    See copyright icd10 for the ICD-10 copyright notification.
  (output omitted)
```

Managing datasets with ICD-10-CM codes

The `icd10cm` suite of commands has three data management commands. `icd10cm check` verifies that the ICD-10-CM diagnosis codes in *varname* are valid. `icd10cm clean` standardizes the format of ICD-10-CM diagnosis codes in *varname*. And `icd10cm generate` produces a new variable from an existing variable containing ICD-10-CM diagnosis codes.

Examples in this section use `hosp2015.dta`, a fictional sample of inpatient hospital discharges in Washington State from July 2015 to December 2015. The data were simulated based on the Comprehensive Hospital Abstract Reporting System (CHARS); see https://www.doh.wa.gov/DataandStatisticalReports/HealthcareinWashington/HospitalandPatientData/HospitalDischargeDataCHARS. Examples analyzing the procedure codes for this dataset may be found in [D] **icd10pcs**.

```
. use https://www.stata-press.com/data/r19/hosp2015
(Fictional WA hospital discharges)

. describe

Contains data from https://www.stata-press.com/data/r19/hosp2015.dta
 Observations:         3,935                  Fictional WA hospital discharges
    Variables:            18                  6 Apr 2024 13:10
────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
────────────────────────────────────────────────────────────────────────────────
hospid          str5    %9s                   Hospital ID
age             byte    %11.0g     age        Age (years)
sex             byte    %8.0g      sex        Sex
ins             byte    %9.0g      ins        Insurance type
los             byte    %19.0g     los        Length of stay (days)
atype           byte    %9.0g      admtype    Admission type
asource         byte    %18.0g     admsrc     Admission source
aday            byte    %8.0g      day        Admission day of week
dmonth          int     %tm                   Discharge month
dstatus         byte    %22.0g     status     Discharge status
died            byte    %8.0g                 Patient died (1=yes)
diag1           str7    %9s                   Diagnosis 1
diag2           str7    %9s                   Diagnosis 2
diag3           str7    %9s                   Diagnosis 3
proc1           str7    %9s                   Procedure 1
proc2           str7    %9s                   Procedure 2
proc3           str7    %9s                   Procedure 3
billed          float   %8.2fc                Amount billed ($1,000s)
────────────────────────────────────────────────────────────────────────────────
Sorted by: hospid  dmonth
```

Although not necessary, it is a good idea to begin with `icd10cm check` and fix any potential problems before proceeding to other `icd10cm` commands. By default, it verifies that *varname* contains defined ICD-10-CM diagnosis codes and, if not, tabulates the type of problems encountered.

▷ Example 1: Checking the validity of a variable

We want to verify that the primary diagnosis code (`diag1`) contains only valid ICD-10-CM diagnosis codes. Because any discharges that use ICD-10-CM diagnosis codes in our data will be from October 1, 2015 to December 31, 2015, we use `version(2016)` to specify the FFY-2016 version of ICD-10-CM. If there are invalid or undefined codes in our data, we want to see what the codes are, their frequency, and the reason they were not valid, so we add the `summary` option.

```
. icd10cm check diag1, version(2016) summary
(diag1 contains no missing values)

diag1 contains invalid codes:

    1.  Invalid placement of period                  0
    2.  Too many periods                             0
    3.  Code too short                               0
    4.  Code too long                                0
    5.  Invalid 1st char (not A-Z)               1,916
    6.  Invalid 2nd char (not 0-9)                   0
    7.  Invalid 3rd char (not 0-9 A or B)            0
    8.  Invalid 4th char (not 0-9 or A-Z)            0
    9.  Invalid 5th char (not 0-9 or A-Z)            0
   10.  Invalid 6th char (not 0-9 or A-Z)            0
   11.  Invalid 7th char (not 0-9 or A-Z)            0
   77.  Valid only for previous versions             0
   88.  Valid only for later versions                0
   99.  Code not defined                            32
                                             ---------
        Total                                    1,948

Summary of invalid and undefined codes
```

diag1	Count	Problem
0389	91	Invalid 1st char
65421	57	Invalid 1st char
64511	45	Invalid 1st char
71536	33	Invalid 1st char
66411	31	Invalid 1st char
(output omitted)		
4940	1	Invalid 1st char
4270	1	Invalid 1st char
1570	1	Invalid 1st char
53550	1	Invalid 1st char
64413	1	Invalid 1st char

It looks like the records with problems used ICD-9-CM codes instead of ICD-10-CM codes. We could confirm our suspicion by using `icd9 check` or `icd9 lookup` to see whether the codes are defined in the ICD-9-CM coding system.

Because our data span the date the US switched to ICD-10-CM (October 1, 2015), we create an indicator for whether the record should use ICD-10-CM based on the date of discharge (`dmonth`). We then run `icd10cm check` again for only these records.

```
. generate use10 = (dmonth>=tm(2015m10))

. icd10cm check diag1 if use10==1, version(2016)
(diag1 contains defined codes; no missing values)
```

All the problems in `diag1` are before the switch, so we proceed without concern about our data.

In the `generate` command above, we used the `tm()` function, which lets us easily provide date values to Stata in string form; see [D] **Datetime** for more information about working with dates.

◁

If we wanted to check codes in more than one diagnosis variable, we could use a `foreach` loop or `reshape` our data; see *Working with multiple codes* in [D] **icd**. Also, additional options for `icd10cm check` help you identify the source of any errors. For example, you can obtain a list of observations that have invalid codes. See *Options for icd10cm check*.

icd10cm clean formats the variable to ensure consistency and to make subsequent output from other commands such as list and tabulate look better. icd10cm clean also can be used to verify that the codes in a variable conform to the ICD-10-CM format, without checking to see whether the codes are defined.

▷ Example 2: Creating a variable with standardized codes

We would like to find the frequency of each primary diagnosis in our dataset. We can use tabulate with the sort option to see the most common primary diagnoses first.

So that the codes in diag1 are more readable in the tabulate output, we first use icd10cm clean. This adds a period after the three-character category code. We specify the pad option to make sure our codes align and store the result in the new variable pdx.

```
. icd10cm clean diag1 if use10==1, pad generate(pdx)
(1,955 missing values generated)
. tabulate pdx, sort
```

pdx	Freq.	Percent	Cum.
A41.9	105	5.30	5.30
O48.0	40	2.02	7.32
I21.4	37	1.87	9.19
O70.1	36	1.82	11.01
M17.11	33	1.67	12.68
O34.21	28	1.41	14.09
J96.01	21	1.06	15.15
M16.11	21	1.06	16.21
J18.9	20	1.01	17.22
O70.0	20	1.01	18.23
(output omitted)			
Total	1,980	100.00	

Notice that we used if with the use10 variable we created in example 1 to restrict icd10cm clean to just those diagnosis codes where the ICD-10-CM coding system should have been applied.

◁

Aside from validating values of codes, the icd10cm command is primarily used to create inputs for other Stata commands. For example, in example 5 of [D] **icd9**, we show how to graph the frequency of category codes with descriptions, and in example 3 of [D] **icd10pcs**, we calculate average billed amounts over different procedures.

▷ Example 3: Creating a variable indicating diagnosis

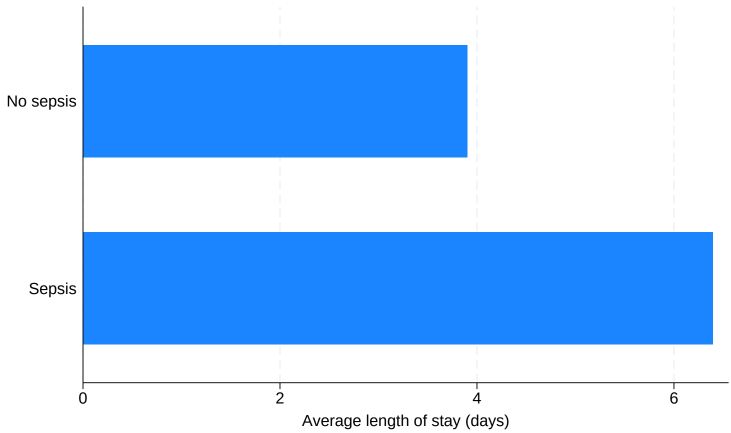
In example 2, we found that the most common primary diagnosis code in our data is A41.9, a code for a type of sepsis (a complication of infection).

Suppose we are interested in differences in length of stay (los) for discharges with and without a primary diagnosis of sepsis. We can use icd10cm generate with the range() option to search records for other diagnosis codes starting with A40, A41, and A42, which also indicate a sepsis diagnosis.

```
. icd10cm generate sepsis=diag1 if use10==1, range(A40* A41* A42*)
```

An informal way to examine differences is to plot the average length of stay for discharges with and without a sepsis diagnosis. We first label the values of our sepsis variable so that it displays nicely in the graph.

```
. label define sepsis 0 "No sepsis" 1 "Sepsis"
. label values sepsis sepsis
. graph hbar los, over(sepsis) ytitle("Average length of stay (days)")
```



More formally, we could include the new `sepsis` indicator as a factor variable in a regression model.

◁

Interactive utilities

`icd10cm lookup` and `icd10cm search` are interactive tools. You can use them without having any ICD-10-CM diagnosis data in memory.

`icd10cm lookup` lists the descriptions of codes given on the command line, and `icd10cm search` looks for relevant ICD-10-CM diagnosis codes from the specified keywords. The two commands complement each other.

▷ Example 4: Finding diagnosis codes from descriptions

In example 3, we specified codes for sepsis as any code starting with A40, A41, or A42. Suppose we want to look for other relevant codes. We can search the descriptions of the ICD-10-CM codes to locate codes of interest.

```
. icd10cm search sepsis, version(2016)
    A02.1    Salmonella sepsis
    A22.7    Anthrax sepsis
    A26.7    Erysipelothrix sepsis
    A32.7    Listerial sepsis
      (output omitted)
```

Note that `icd10cm search` is case insensitive. If you want `icd10cm search` to respect the case of the search terms you type, specify the `matchcase` option.

◁

Using `icd10cm lookup` is similar to `icd10pcs lookup`. See example 4 in [D] **icd10pcs**.

Stored results

`icd10cm check` stores the following in `r()`:

Scalars

`r(e#)`	number of errors of type #
`r(esum)`	total number of errors
`r(miss)`	number of missing values
`r(N)`	number of nonmissing values

`icd10cm clean` stores the following in `r()`:

Scalars

`r(N)`	number of changes

`icd10cm lookup` and `icd10cm search` store the following in `r()`:

Scalars

`r(N_codes)`	number of codes found

Acknowledgments

We thank the Washington State Department of Health's Center for Health Statistics for providing us with access to its 2015 Comprehensive Hospital Abstract Reporting System (CHARS) inpatient dataset. The `hosp2015` dataset used here was partially simulated based on information from the 2015 limited use CHARS. We also thank Jeanne M. Sears (retired) of the University of Washington for bringing the CHARS to our attention.

We thank Joe Canner, who while at Yale University School of Medicine, wrote `mycd10` and `mycd10p`, which provide many utilities for ICD-10 diagnosis and procedure codes. The commands rely on a user-supplied ICD-10 lookup dataset for diagnosis codes and ICD-10-PCS codes from the US Centers for Medicare and Medicaid Services for procedure codes.

Reference

Centers for Disease Control and Prevention. 2013. International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). https://www.cdc.gov/nchs/icd/icd9cm.htm.

Also see

[D] **icd** — Introduction to ICD commands

[D] **icd9** — ICD-9-CM diagnosis codes

[D] **icd10** — ICD-10 diagnosis codes

[D] **icd10pcs** — ICD-10-PCS procedure codes

[D] **frunalias** — Change storage type of alias variables

Description

icd10pcs is a suite of commands for working with ICD-10-PCS procedure codes from US federal fiscal year 2016 to the present. To see the current version of the ICD-10-PCS procedure codes and any changes that have been applied, type icd10pcs query.

icd10pcs check, icd10pcs clean, and icd10pcs generate are data management commands. icd10pcs check verifies that a variable contains defined ICD-10-PCS procedure codes and provides a summary of any problems encountered. icd10pcs clean standardizes the format of the codes. icd10pcs generate can create a binary indicator variable for whether the code is in a specified set of codes, a variable containing a corresponding higher-level code, or a variable containing the description of the code.

icd10pcs lookup and icd10pcs search are interactive utilities. icd10pcs lookup displays descriptions of the codes specified on the command line. icd10pcs search looks for relevant ICD-10-PCS procedure codes from keywords given on the command line.

Quick start

Determine whether ICD-10-PCS procedure codes in proc1 are invalid, and store reasons in invalid

```
icd10pcs check proc1, generate(invalid)
```

Standardize display of codes in proc2 to add a period and left-align codes

```
icd10pcs clean proc2, replace
```

Check that the codes in proc3 conform to ICD-10-PCS formatting rules, and if so, create main as the corresponding three-character category code

```
icd10pcs generate main = proc3, category check
```

Generate descr4 as the current short description of procedure code in proc4

```
icd10pcs generate descr4 = proc4, description
```

Look up current descriptions for procedure codes 081.23J4 through 081.Y3Z3

```
icd10pcs lookup 081.23J4/081.Y3Z3
```

Look up codes where the description from FFY-2016 contains the word “foot”

```
icd10pcs search foot, version(2016)
```

Menu

Data > ICD codes > ICD-10-PCS

Syntax

Verify that variable contains defined codes

`icd10pcs check` *varname* [*if*] [*in*] [, *checkopts*]

Clean variable and verify format of codes

`icd10pcs clean` *varname* [*if*] [*in*] , {`generate(`*newvar*`)` | `replace`} [*cleanopts*]

Generate new variable from existing variable

`icd10pcs generate` *newvar* = *varname* [*if*] [*in*] , `category` [`check`]

`icd10pcs generate` *newvar* = *varname* [*if*] [*in*] , `description` [*genopts*]

`icd10pcs generate` *newvar* = *varname* [*if*] [*in*] , `range(`*codelist*`)` [`check`]

Display code descriptions

`icd10pcs lookup` *codelist* [, `version(#)`]

Search for codes from descriptions

`icd10pcs search` [`"`]*text*[`"`] [[`"`]*text*[`"`] ...] [, *searchopts*]

Display ICD-10-PCS version

`icd10pcs query`

codelist is one of the following:

icd10code	(the particular code)
icd10code`*`	(all codes starting with)
icd10code`/`*icd10code*	(the code range)

or any combination of the above, such as `041.E09P 2W3* BQ2L/BQ2LZZZ`.

checkopts	Description
`fmtonly`	check only format of the codes
`summary`	frequency of each invalid or undefined code
`list`	list observations with invalid or undefined ICD-10-PCS codes
`generate(`*newvar*`)`	create new variable marking invalid codes
`version(#)`	fiscal year to check codes against; default is the current year

cleanopts	Description
* generate(*newvar*)	create new variable containing cleaned codes
* replace	replace existing codes with the cleaned codes
check	check that variable contains ICD-10-PCS codes before cleaning
nodots	format codes without a period

* Either generate() or replace is required.

genopts	Description
addcode(begin | end)	add code to the beginning or end of the description
nodots	format codes without a period; must specify addcode()
check	check that variable contains ICD-10-PCS codes before generating new variable
long	use long description rather than short
version(#)	select description from fiscal year #; default is the current year

searchopts	Description
or	match any keyword
matchcase	match case of keywords
version(#)	search description from fiscal year #; default is all

collect is allowed with icd10pcs check and icd10pcs clean; see [U] **11.1.10 Prefix commands**.

The icd10pcs suite of commands does not allow alias variables; see [D] **frunalias** for advice on how to get around this restriction.

Options

Options are presented under the following headings:

Options for icd10pcs check
Options for icd10pcs clean
Options for icd10pcs generate
Option for icd10pcs lookup
Options for icd10pcs search

Options for icd10pcs check

fmtonly tells icd10pcs check to verify that the codes fit the format of ICD-10-PCS procedure codes but not to check whether the codes are defined.

summary specifies that icd10pcs check should report the frequency of each invalid or undefined code that was found in the data. Codes are displayed in descending order by frequency. summary may not be combined with list.

list specifies that icd10pcs check list the observation number, the invalid or undefined ICD-10-PCS procedure code, and the reason the code is invalid or whether it is an undefined code. list may not be combined with summary.

`generate(`*newvar*`)` specifies that `icd10pcs check` create a new variable containing, for each observation, 0 if the observation contains a defined code. Otherwise, it contains a number from 1 to 11 if the code is invalid, 77 if the code is valid only for a previous version, 88 if the code is valid only for a later version, 99 if the code is undefined, or missing if the code is missing. The positive numbers indicate the kind of problem and correspond to the listing produced by `icd10pcs check`.

`version(`#`)` specifies the version of the codes that `icd10pcs check` should reference. # indicates the federal fiscal year for the codes. For example, use `2016` for federal fiscal year 2016 (FFY-2016), which is October 1, 2015 to September 30, 2016. `icd10pcs` supports all years after the United States officially adopted ICD-10-PCS. The appropriate value of # should be determined from the data source. The default is the current year.

Warning: The default value of `version()` will change over time so that the most recent codes are used. Using the default value rather than specifying a specific version may change results after a new version of the codes is introduced.

Options for icd10pcs clean

`generate(`*newvar*`)` and `replace` specify how the formatted values of *varname* are to be handled. You must specify either `generate()` or `replace`.

`generate()` specifies that the cleaned values be placed in the new variable specified in *newvar*.

`replace` specifies that the existing values of *varname* be replaced with the formatted values.

`check` specifies that `icd10pcs clean` should first check that *varname* contains codes that fit the format of ICD-10-PCS procedure codes. Specifying the `check` option will slow down `icd10pcs clean`.

`nodots` specifies that the period be removed in the final format.

Options for icd10pcs generate

`category`, `description`, and `range(`*codelist*`)` specify the contents of the new variable that `icd10pcs generate` is to create. You do not need to `icd10pcs clean` *varname* before using `icd10pcs generate`; it will accept any supported format or combination of formats.

`category` specifies to extract the three-character category code from the ICD-10-PCS procedure code. The resulting variable may be used with the other `icd10pcs` subcommands.

`description` creates *newvar* containing descriptions of the ICD-10-PCS procedure codes.

`range(`*codelist*`)` creates a new indicator variable equal to 1 when the ICD-10-PCS procedure code is in the range specified, equal to 0 when the ICD-10-PCS procedure code is not in the range, and equal to missing when *varname* is missing.

`addcode(begin | end)` specifies that the code should be included with the text describing the code. Specifying `addcode(begin)` will prepend the code to the text. Specifying `addcode(end)` will append the code to the text.

`nodots` specifies that the code that is added to the description should be formatted without a period. `nodots` may be specified only if `addcode()` is also specified.

`check` specifies that `icd10pcs generate` should first check that *varname* contains codes that fit the format of ICD-10-PCS procedure codes. Specifying the `check` option will slow down the `generate` subcommand.

`long` specifies that the long description of the code be used rather than the short (abbreviated) description.

`version(#)` specifies the version of the codes that `icd10pcs generate` should reference. # indicates the federal fiscal year for the codes. For example, use `2016` for federal fiscal year 2016 (FFY-2016), which is October 1, 2015 to September 30, 2016. `icd10pcs` supports all years after the United States officially adopted ICD-10-PCS. The appropriate value of # should be determined from the data source. The default is the current year.

Warning: The default value of `version()` will change over time so that the most recent codes are used. Using the default value rather than specifying a specific version may change results after a new version of the codes is introduced.

Option for icd10pcs lookup

`version(#)` specifies the version of the codes that `icd10pcs lookup` should reference. # indicates the federal fiscal year for the codes. For example, use `2016` for federal fiscal year 2016 (FFY-2016), which is October 1, 2015 to September 30, 2016. `icd10pcs` supports all years after the United States officially adopted ICD-10-PCS. The appropriate value of # should be determined from the data source. The default is the current year.

Warning: The default value of `version()` will change over time so that the most recent codes are used. Using the default value rather than specifying a specific version may change results after a new version of the codes is introduced.

Options for icd10pcs search

`or` specifies that ICD-10-PCS procedure codes be searched for descriptions that contain any word specified with `icd10pcs search`. The default is to list only descriptions that contain all the words specified.

`matchcase` specifies that `icd10pcs search` should match the case of the keywords given on the command line. The default is to perform a case-insensitive search.

`version(#)` specifies the version of the codes that `icd10pcs search` should reference. # indicates the federal fiscal year for the codes. For example, use `2016` for federal fiscal year 2016 (FFY-2016), which is October 1, 2015 to September 30, 2016. `icd10pcs` supports all years after the United States officially adopted ICD-10-PCS.

By default, descriptions for all versions are searched, meaning that codes that changed descriptions and that have descriptions in multiple versions that contain the search terms will be duplicated. To ensure a list of unique code values, specify the version number.

Remarks and examples

Remarks are presented under the following headings:

If you have not yet read *Introduction to ICD coding* in [D] **icd**, please do so before using the `icd10pcs` commands.

Introduction

The general format of an ICD-10-PCS procedure code is a three-character category code followed by four alpha-numeric characters after an (implied) period. The full codes are always seven characters long and may be any combination of letters and numbers.

Some examples of ICD-10-PCS procedure codes are 081 (Eye, Bypass) and 0GT.D0ZZ (Resection of Aortic Body, Open Approach). Many datasets record (and some people write) codes without the period; for example, the code 090.KXZZ may appear as 090KXZZ. The `icd10pcs` commands understand both ways of recording codes. The commands are also insensitive to codes recorded with or without leading and trailing blanks and are case insensitive.

All the following are acceptable formats to record codes in Stata:

```
03R
        0jj
    00f53zz
    0TL.C0ZZ
     091
```

Important note: What constitutes a valid code changes between versions. For the rest of this entry, a defined code is any code that is currently valid, was valid at some point since the ICD-10-CM/PCS coding system was introduced, or has a meaning as a grouping of codes. The list of valid codes and their associated descriptions is from the US Centers for Medicare and Medicaid Services (CMS).

To view the current version of the ICD-10-PCS procedure codes in Stata, its source, and a log of changes that have been made to the list of ICD-10-PCS procedure codes since the `icd10pcs` commands were implemented, type

```
. icd10pcs query
ICD-10-PCS Procedure Code Version and Change Log
  Note
    Stata obtains the ICD-10-PCS dataset from the Centers for Medicare and
        Medicaid Services website.
 (output omitted)
```

Managing datasets with ICD-10-PCS codes

The `icd10pcs` suite of commands has three data management commands. `icd10pcs check` verifies that the ICD-10-PCS procedure codes in *varname* are valid. `icd10pcs clean` standardizes the format of ICD-10-PCS procedure codes in *varname*. And `icd10pcs generate` produces a new variable from an existing variable containing ICD-10-PCS procedure codes.

Examples in this section use `hosp2015.dta`, a fictional sample of inpatient hospital discharges in Washington state from July 2015 to December 2015. The data were simulated based on the Comprehensive Hospital Abstract Reporting System (CHARS); see https://www.doh.wa.gov/DataandStatisticalReports/HealthcareinWashington/HospitalandPatientData/HospitalDischargeDataCHARS. Examples analyzing the diagnosis codes for this dataset can be found in [D] **icd10cm**.

```
. use https://www.stata-press.com/data/r19/hosp2015
(Fictional WA hospital discharges)
```

`icd10pcs check` is the primary subcommand for validating ICD-10-PCS procedure codes. However, if you just want to verify that the codes conform to the formatting rules for ICD-10-PCS procedure, you can use the `check` option with `icd10pcs clean` or `icd10pcs generate`.

▷ Example 1: Checking for valid code values

You use `icd10pcs check` just like you do `icd10cm check`. Because the data are from federal fiscal year 2016, we specify `version(2016)`.

In example 1 of [D] **icd10cm**, we found that we needed to account for the date of the admission when we used the `icd10cm` commands. The same is true of the `icd10pcs` commands because the two systems were implemented simultaneously. We preemptively exclude records before October 2015 here.

```
. drop if dmonth < tm(2015m10)
(1,955 observations deleted)

. icd10pcs check proc1, version(2016)
(proc1 contains defined codes; 594 missing values)
```

We find that there are no errors in the coding of the `proc1` variable and that 594 records in our dataset did not have any procedure at all.

◁

If we wanted to check codes in more than one procedure variable, we could use a `foreach` loop or `reshape` our data; see *Working with multiple codes* in [D] **icd**. With large datasets, it is generally faster to use a loop.

It is a good idea to begin with `icd10pcs check` and fix any potential problems before proceeding to other `icd10pcs` commands. The `icd10pcs check` command with the `generate()` or `list` option is also useful for tracking down problems when any of the other `icd10pcs` commands tell you that the variable "contains invalid codes".

`icd10pcs clean` formats the variable to ensure consistency and to make subsequent output from other commands such as `list` and `tabulate` look better. `icd10pcs clean` also can be used to verify that the codes in a variable conform to the ICD-10-CM format, without checking to see whether the codes are defined.

▷ Example 2: Cleaning an existing variable

We standardize all the ICD-10-PCS procedure codes in `proc1` to include a period after the third character. We specify the `replace` option rather than the `generate()` option so that the values in `proc1` are replaced with their formatted values.

```
. icd10pcs clean proc1, replace
variable proc1 was str7 now str8
(1,980 real changes made)
```

`icd10pcs clean` reports that 1,980 values were replaced. If we wanted to standardize to a format without the period, we could have specified the `nodots` option.

◁

Aside from validating values of codes, the `icd10pcs` command is primarily used to create inputs for other Stata commands. For example, in example 5 of [D] **icd9**, we show how to graph the frequency of category codes with descriptions, and in example 3 of [D] **icd10cm**, we show how to graph summary statistics by diagnosis.

▷ Example 3: Creating an indicator for common procedures

If we use `tabulate` on the primary procedure code (`proc1`) the same way we did for the primary diagnosis in example 2, we find that the three most frequent primary procedure codes in our data are 10E0XZZ, 10D00Z1, and 0SRC0J9. Suppose we want to know the average billed amount (`billed`) for all admissions that had one of these procedure codes in the primary procedure field.

Our first step is to create an indicator for whether one of these codes is present in `proc1`. Then, we summarize `billed` over the three top values of `proc1` by using `tabulate`; see [R] **tabulate, summarize()**.

```
. icd10pcs generate top3 = proc1, range(10E0XZZ 10D00Z1 0SRC0J9)

. tabulate proc1 if top3==1, summarize(billed) freq means

              Summary of Amount
              billed ($1,000s)
Procedure 1        Mean       Freq.

    0SR.C0J9      60.62          40
    10D.00Z1      27.55          92
    10E.0XZZ      14.05         180

       Total      24.00         312
```

We find that the highest average billed amount for the top three codes is for ICD-10-PCS procedure code 0SR.C0J9. There are 40 discharges in our dataset with this code as their principal procedure, and their average billed amount is about $60,620.

◁

Interactive utilities

`icd10pcs lookup` and `icd10pcs search` are interactive tools. You can use them without having any ICD-10-PCS procedure data in memory.

`icd10pcs lookup` lists the descriptions of codes given on the command line, and `icd10pcs search` looks for relevant ICD-10-PCS procedure codes from the specified keywords. The two commands complement each other.

▷ Example 4: Finding procedure code descriptions

Suppose we wanted to find the short descriptions of the most frequent codes in our dataset. We can supply `icd10pcs lookup` with the same list of codes we used in example 3.

```
. icd10pcs lookup 10E0XZZ 10D00Z1 0SRC0J9, version(2016)
    0SR.C0J9 Replace of R Knee Jt with Synth Sub, Cement, Open Approach
    10D.00Z1 Extraction of POC, Low Cervical, Open Approach
    10E.0XZZ Delivery of Products of Conception, External Approach
```

We see, for example, that ICD-10-PCS procedure code 0SR.C0J9 is for a type of knee replacement surgery.

◁

Using `icd10pcs search` is similar to using `icd10cm search`. See example 4 in [D] **icd10cm**.

Stored results

`icd10pcs check` stores the following in `r()`:

Scalars

`r(e#)`	number of errors of type #
`r(esum)`	total number of errors
`r(miss)`	number of missing values
`r(N)`	number of nonmissing values

`icd10pcs clean` stores the following in `r()`:

Scalars

`r(N)`	number of changes

`icd10pcs lookup` and `icd10pcs search` store the following in `r()`:

Scalars

`r(N_codes)`	number of codes found

Acknowledgments

We thank the Washington State Department of Health's Center for Health Statistics for providing us with access to its 2015 Comprehensive Hospital Abstract Reporting System (CHARS) inpatient dataset. The `hosp2015` dataset used here was partially simulated based on information from the 2015 limited use CHARS. We also thank Jeanne M. Sears (retired) of the University of Washington for bringing the CHARS to our attention.

We thank Joe Canner, who while at Yale University School of Medicine, wrote `mycd10` and `mycd10p`, which provide many utilities for ICD-10 diagnosis and procedure codes. The commands rely on a user-supplied ICD-10 lookup dataset for diagnosis codes and ICD-10-PCS codes from the US Centers for Medicare and Medicaid Services for procedure codes.

Also see

[D] **icd** — Introduction to ICD commands

[D] **icd9p** — ICD-9-CM procedure codes

[D] **icd10cm** — ICD-10-CM diagnosis codes

[D] **frunalias** — Change storage type of alias variables

Description Remarks and examples References Also see

Description

This entry provides a quick reference for determining which method to use for reading non-Stata data into memory. See [U] **22 Entering and importing data** for more details.

Remarks and examples

Remarks are presented under the following headings:

Summary of the different methods

import excel

- `import excel` reads worksheets from Microsoft Excel (`.xls` and `.xlsx`) files.
- Entire worksheets can be read, or custom cell ranges can be read.
- See [D] **import excel**.

import delimited

- `import delimited` reads text-delimited files.
- The data can be tab-separated or comma-separated. A custom delimiter may also be specified.
- An observation must be on only one line.
- The first line in the file can optionally contain the names of the variables.
- See [D] **import delimited**.

jdbc

- Java Database Connectivity (JDBC) is an application programming interface for the programming language Java. The `jdbc` command allows you to connect to, load data from, insert data into, and execute queries on a database using JDBC.

- See [D] **jdbc**.

odbc

- ODBC, an acronym for Open DataBase Connectivity, is a standard for exchanging data between programs. Stata supports the ODBC standard for importing data via the `odbc` command and can read from any ODBC data source on your computer.
- See [D] **odbc**.

infile (free format)—infile without a dictionary

- The data can be space-separated, tab-separated, or comma-separated.
- Strings with embedded spaces or commas must be enclosed in quotes (even if tab- or comma-separated).
- An observation can be on more than one line, or there can even be multiple observations per line.
- See [D] **infile (free format)**.

infix (fixed format)

- The data must be in fixed-column format.
- An observation can be on more than one line.
- `infix` has simpler syntax than `infile` (fixed format).
- See [D] **infix (fixed format)**.

infile (fixed format)—infile with a dictionary

- The data may be in fixed-column format.
- An observation can be on more than one line.
- ASCII or EBCDIC data can be read.
- `infile` (fixed format) has the most capabilities for reading data.
- See [D] **infile (fixed format)**.

import sas

- `import sas` reads Version 7 SAS (`.sas7bdat`) files.
- `import sas` will also read value-label information from a `.sas7bcat` file.
- See [D] **import sas**.

import sasxport5 and import sasxport8

- `import sasxport5` reads SAS XPORT Version 5 Transport format files.
- `import sasxport5` will also read value-label information from a `formats.xpf` XPORT file.
- `import sasxport8` reads SAS XPORT Version 8 Transport format files.
- See [D] **import sasxport5** and [D] **import sasxport8**.

import spss

- `import spss` reads IBM SPSS Statistics (`.sav` and `.zsav`) files.
- See [D] **import spss**.

import fred

- `import fred` reads Federal Reserve Economic Data.
- To use `import fred`, you must have a valid API key obtained from the St. Louis Federal Reserve.
- See [D] **import fred**.

import haver (Windows only)

- `import haver` reads data from Haver Analytics (https://www.haver.com/) databases.
- See [D] **import haver**.

import haverdirect (Windows only)

- `import haverdirect` reads data from Haver Analytics (https://www.haver.com/) cloud servers.
- See [D] **import haverdirect**.

import dbase

- `import dbase` reads a version III or version IV dBase (`.dbf`) file.
- See [D] **import dbase**.

spshape2dta

- `spshape2dta` translates the `.dbf` and `.shp` files of a shapefile into two Stata datasets.
- See [SP] **spshape2dta**.

Examples

▷ Example 1: Tab-separated data

begin example1.raw

```
1       0       1       John Smith      m
0       0       1       Paul Lin        m
0       1       0       Jan Doe f
0       0       .       Julie McDonald  f
```

end example1.raw

contains tab-separated data. The `type` command with the `showtabs` option shows the tabs:

```
. type example1.raw, showtabs
1<T>0<T>1<T>John Smith<T>m
0<T>0<T>1<T>Paul Lin<T>m
0<T>1<T>0<T>Jan Doe<T>f
0<T>0<T>.<T>Julie McDonald<T>f
```

It could be read in by

```
. import delimited a b c name gender using example1
```

◁

▷ Example 2: Comma-separated data

begin example2.raw

```
a,b,c,name,gender
1,0,1,John Smith,m
0,0,1,Paul Lin,m
0,1,0,Jan Doe,f
0,0,,Julie McDonald,f
```

end example2.raw

could be read in by

```
. import delimited using example2
```

◁

▷ Example 3: Tab-separated data with double-quoted strings

begin example3.raw

```
1       0       1       "John Smith"    m
0       0       1       "Paul Lin"      m
0       1       0       "Jan Doe"       f
0       0       .       "Julie McDonald"        f
```

end example3.raw

contains tab-separated data with strings in double quotes.

```
. type example3.raw, showtabs
1<T>0<T>1<T>"John Smith"<T>m
0<T>0<T>1<T>"Paul Lin"<T>m
0<T>1<T>0<T>"Jan Doe"<T>f
0<T>0<T>.<T>"Julie McDonald"<T>f
```

It could be read in by

```
. infile byte (a b c) str15 name str1 gender using example3
```

or

```
. import delimited a b c name gender using example3
```

or

```
. infile using dict3
```

where the dictionary `dict3.dct` contains

begin dict3.dct
```
infile dictionary using example3 {
        byte    a
        byte    b
        byte    c
        str15   name
        str1    gender
}
```
end dict3.dct

◁

▷ Example 4: Space-separated data with double-quoted strings

begin example4.raw
```
1 0 1 "John Smith" m
0 0 1 "Paul Lin" m
0 1 0 "Jan Doe" f
0 0 . "Julie McDonald" f
```
end example4.raw

could be read in by

```
. infile byte (a b c) str15 name str1 gender using example4
```

or

```
. infile using dict4
```

where the dictionary `dict4.dct` contains

begin dict4.dct
```
infile dictionary using example4 {
        byte    a
        byte    b
        byte    c
        str15   name
        str1    gender
}
```
end dict4.dct

◁

▷ Example 5: Fixed-column format

begin example5.raw
```
101mJohn Smith
001mPaul Lin
010fJan Doe
00 fJulie McDonald
```
end example5.raw

could be read in by

```
. infix a 1 b 2 c 3 str gender 4 str name 5-19 using example5
```

or

```
. infix using dict5a
```

where `dict5a.dct` contains

begin dict5a.dct
```
infix dictionary using example5 {
                a       1
                b       2
                c       3
        str     gender  4
        str     name    5-19
}
```
end dict5a.dct

or

```
. infile using dict5b
```

where `dict5b.dct` contains

begin dict5b.dct
```
infile dictionary using example5 {
        byte      a         %1f
        byte      b         %1f
        byte      c         %1f
        str1      gender    %1s
        str15     name      %15s
}
```
end dict5b.dct

◁

▷ Example 6: Fixed-column format with headings

begin example6.raw
```
line 1 : a heading
There are a total of 4 lines of heading.
The next line contains a useful heading:
----+----1----+----2----+----3----+----4----+-
1       0       1       m       John Smith
0       0       1       m       Paul Lin
0       1       0       f       Jan Doe
0       0               f       Julie McDonald
```
end example6.raw

could be read in by

```
. infile using dict6a
```

where `dict6a.dct` contains

begin dict6a.dct
```
infile dictionary using example6 {
_firstline(5)
              byte    a
              byte    b
_column(17)   byte    c         %1f
              str1    gender
_column(33)   str15   name      %15s
}
```
end dict6a.dct

or could be read in by

```
. infix 5 first a 1 b 9 c 17 str gender 25 str name 33-46 using example6
```

or could be read in by

```
. infix using dict6b
```

where `dict6b.dct` contains

begin dict6b.dct

```
infix dictionary using example6 {
5 first
               a         1
               b         9
               c         17
          str  gender    25
          str  name      33-46
}
```

end dict6b.dct

◁

▷ Example 7: Fixed-column format with observations spanning multiple lines

begin example7.raw

```
a b c gender name
1 0 1
m
John Smith
0 0 1
m
Paul Lin
0 1 0
f
Jan Doe
0 0
f
Julie McDonald
```

end example7.raw

could be read in by

```
. infile using dict7a
```

where `dict7a.dct` contains

begin dict7a.dct

```
infile dictionary using example7 {
_firstline(2)
            byte   a
            byte   b
            byte   c
_line(2)
            str1   gender
_line(3)
            str15  name   %15s
}
```

end dict7a.dct

or, if we wanted to include variable labels,

```
. infile using dict7b
```

where dict7b.dct contains

begin dict7b.dct
```
infile dictionary using example7 {
_firstline(2)
            byte    a           "Question 1"
            byte    b           "Question 2"
            byte    c           "Question 3"
_line(2)
            str1    gender      "Gender of subject"
_line(3)
            str15   name    %15s
}
```
end dict7b.dct

infix could also read these data,

```
. infix 2 first 3 lines a 1 b 3 c 5 str gender 2:1 str name 3:1-15 using example7
```

or the data could be read in by

```
. infix using dict7c
```

where dict7c.dct contains

begin dict7c.dct
```
infix dictionary using example7 {
2 first
                 a         1
                 b         3
                 c         5
          str    gender    2:1
          str    name      3:1-15
}
```
end dict7c.dct

or the data could be read in by

```
. infix using dict7d
```

where dict7d.dct contains

begin dict7d.dct
```
infix dictionary using example7 {
2 first
                  a       1
                  b       3
                  c       5
/
          str     gender  1
/
          str     name    1-15
}
```
end dict7d.dct

◁

Video example

Copy/paste data from Excel into Stata

References

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Also see

[D] **edit** — Browse or edit data with Data Editor

[D] **export** — Overview of exporting data from Stata

[D] **input** — Enter data from keyboard

[U] 22 Entering and importing data

import dbase — Import and export dBase files

Description

`import dbase` reads into memory a version III or version IV dBase (`.dbf`) file. `export dbase` exports data in memory to a version IV dBase (`.dbf`) file.

Stata has other commands for importing data. If you are not sure that `import dbase` will do what you are looking for, see [D] **import** and [U] **22 Entering and importing data**.

Quick start

Load the contents of the dBase file called `mydata.dbf`

```
import dbase mydata
```

Write data in memory to a version IV dBase file called `mydata.dbf`

```
export dbase mydata
```

Same as above, but export only variables `v1` and `v2`

```
export dbase v1 v2 using mydata
```

Menu

import dbase

File > Import > dBase (*.dbf)

export dbase

File > Export > dBase (*.dbf)

Syntax

Load a dBase file

`import dbase` [`using`] *filename* [`, clear case(preserve | lower | upper)`]

Save data in memory to a dBase file

`export dbase` [`using`] *filename* [*if*] [*in*] [`, datafmt replace`]

Save subset of variables in memory to a dBase file

`export dbase` [*varlist*] `using` *filename* [*if*] [*in*] [`, datafmt replace`]

If *filename* is specified without an extension, `.dbf` is assumed for both `import dbase` and `export dbase`. If *filename* contains embedded spaces, enclose it in double quotes.

`collect` is allowed with `import dbase`; see **[U] 11.1.10 Prefix commands**.

Options for import dbase

`clear` specifies that it is okay to replace the data in memory, even though the current data have not been saved to disk.

`case(preserve | lower | upper)` specifies the case of the variable names after import. The default is `case(preserve)`.

Options for export dbase

`datafmt` specifies that all variables be exported using their display format. For example, the number 1000 with a display format of `%7.2f` would export as `1000.00`, not `1000`. The default is to use the raw, unformatted value when exporting.

`replace` specifies that *filename* be replaced if it already exists.

Remarks

`import dbase` reads into memory a version III or version IV dBase (`.dbf`) file. If the dBase file is not version III or IV, `import dbase` will issue an error. dBase files are often paired with shapefiles for storing geometric location data. To import a shapefile, see **[SP] spshape2dta**.

`export dbase` exports data in memory to a version IV dBase (`.dbf`) file. dBase version IV has several file limitations when exporting.

1. Unicode is not supported.
2. Data cannot be more than 2 GB in size.
3. Data in memory must be less than 1,000,000,000 observations.
4. Data in memory must have less than 255 variables.
5. Variable names cannot exceed 10 characters in length.

6. Maximum string variable length is 255 characters.
7. Data width must be less than 4,000.

If your data in memory exceed any of these limits, `export dbase` will issue an error when trying to export the data.

To demonstrate the use of `import dbase` and `export dbase`, we will first load `autornd.dta` and export it as a dBase file named `auto.dbf`.

```
. use https://www.stata-press.com/data/r19/autornd
(1978 automobile data)

. export dbase auto.dbf
file auto.dbf saved
```

To import the data back into Stata, we need only to specify the filename. `import dbase` assumes an extension of `.dbf`.

```
. import dbase auto, clear
(3 vars, 74 obs)
```

We could verify that our data loaded correctly by using `list` or `browse`.

Stored results

`import dbase` stores the following in `r()`:

Scalars

`r(N)`	number of observations imported
`r(k)`	number of variables imported

Also see

[D] **export** — Overview of exporting data from Stata

[D] **import** — Overview of importing data into Stata

[SP] **spshape2dta** — Translate shapefile to Stata format

import delimited — Import and export delimited text data

Description

`import delimited` reads into memory a text file in which there is one observation per line and the values are separated by commas, tabs, or some other delimiter. The two most common types of text data to import are comma-separated values (`.csv`) text files and tab-separated text files, often `.txt` files. Similarly, `export delimited` writes Stata's data to a text file.

Stata has other commands for importing data. If you are not sure that `import delimited` will do what you are looking for, see [D] **import** and [U] **22 Entering and importing data**.

Quick start

Load comma-delimited mydata.csv with the variable names on the first row

```
import delimited mydata
```

Same as above, but with variable names in row 5 and an ignorable header in the first 4 rows

```
import delimited mydata, varnames(5)
```

Load only columns 2 to 300 and the first 1,000 rows with variable names in row 1

```
import delimited mydata, colrange(2:300) rowrange(:1000)
```

Load tab-delimited data from `mydata.txt`

```
import delimited mydata.txt, delimiters(tab)
```

Load semicolon-delimited data from `mydata.txt`

```
import delimited mydata.txt, delimiters(";")
```

Force columns 2 to 6 to be read as string to preserve leading zeros

```
import delimited mydata, stringcols(2/6)
```

Load comma-delimited `mydata2.csv` without variable names in row 1 and with two variables to be named `v1` and `v2`

```
import delimited v1 v2 using mydata
```

Export data in memory to `mydata.csv`

```
export delimited mydata
```

Same as above, but export only `v1` and `v2`

```
export delimited v1 v2 using mydata
```

Same as above, but output numeric values for variables with value labels

```
export delimited v1 v2 using mydata, nolabel
```

Menu

import delimited

File > Import > Text data (delimited, *.csv, ...)

export delimited

File > Export > Text data (delimited, *.csv, ...)

Syntax

Load a delimited text file

`import delimited` [`using`] *filename* [, *import_delimited_options*]

Rename specified variables from a delimited text file

`import delimited` *extvarlist* `using` *filename* [, *import_delimited_options*]

Save data in memory to a delimited text file

`export delimited` [`using`] *filename* [*if*] [*in*] [, *export_delimited_options*]

Save subset of variables in memory to a delimited text file

`export delimited` [*varlist*] `using` *filename* [*if*] [*in*] [, *export_delimited_options*]

If *filename* is specified without an extension, `.csv` is assumed for both `import delimited` and `export delimited`. If *filename* contains embedded spaces, enclose it in double quotes.

extvarlist specifies variable names of imported columns.

import_delimited_options	Description
delimiters("*chars*" [, collapse | asstring])	use *chars* as delimiters
varnames(# | nonames)	treat row # of data as variable names or the data do not have variable names
case(preserve | lower | upper)	preserve the case or read variable names as lowercase (the default) or uppercase
asfloat	import all floating-point data as floats
asdouble	import all floating-point data as doubles
encoding(*encoding*)	specify the encoding of the text file being imported
emptylines(skip | include)	specify how to handle empty lines in data; default is emptylines(skip)
stripquotes(yes | no | default)	remove or keep double quotes in data
bindquotes(loose | strict | nobind)	specify how to handle double quotes in data
maxquotedrows(# | unlimited)	number of rows of data allowed inside a quoted string when bindquote(strict) is specified
rowrange([*start*][:*end*])	row range of data to load
colrange([*start*][:*end*])	column range of data to load
parselocale(*locale*)	specify the locale to use for interpreting numbers in the text file being imported
decimalseparator(*character*)	character to use for the decimal separator when parsing numbers
groupseparator(*character*)	character to use for the grouping separator when parsing numbers
numericcols(*numlist* | _all)	force specified columns to be numeric
stringcols(*numlist* | _all)	force specified columns to be string
clear	replace data in memory
favorstrfixed	favor storing string variables as str# rather than strL

collect is allowed with import delimited; see **[U] 11.1.10 Prefix commands**.

favorstrfixed does not appear in the dialog box.

export_delimited_options	Description
Main	
delimiter("*char*" | tab)	use *char* as delimiter
novarnames	do not write variable names on the first line
nolabel	output numeric values (not labels) of labeled variables
datafmt	use the variables' display format upon export
quote	always enclose strings in double quotes
replace	overwrite existing *filename*

Options for import delimited

`delimiters("`*chars*`"` [`, collapse` | `asstring`] `)` allows you to specify other separation characters. For instance, if values in the file are separated by a semicolon, specify `delimiters(";")`. By default, `import delimited` will check if the file is delimited by tabs or commas based on the first line of data. Specify `delimiters("\t")` to use a tab character, or specify `delimiters("whitespace")` to use whitespace as a delimiter.

`collapse` forces `import delimited` to treat multiple consecutive delimiters as just one delimiter.

`asstring` forces `import delimited` to treat *chars* as one delimiter. By default, each character in *chars* is treated as an individual delimiter.

`varnames(`# | `nonames)` specifies where or whether variable names are in the data. By default, `import delimited` tries to determine whether the file includes variable names. `import delimited` translates the names in the file to valid Stata variable names. The original names from the file are stored unmodified as variable labels.

`varnames(`#`)` specifies that the variable names are in row # of the data; any data before row # should not be imported.

`varnames(nonames)` specifies that the variable names are not in the data.

`case(preserve` | `lower` | `upper)` specifies the case of the variable names after import. The default is `case(lowercase)`.

`asfloat` imports floating-point data as type `float`. The default storage type of the imported variables is determined by `set type`.

`asdouble` imports floating-point data as type `double`. The default storage type of the imported variables is determined by `set type`.

`encoding(`*encoding*`)` specifies the encoding of the text file to be read. If `encoding()` is not specified, the file will be scanned to try to automatically determine the correct encoding. `import delimited` uses encodings available in Java, a list of which can be found at https://www.oracle.com/java/technologies/javase/jdk11-suported-locales.html.

Option `charset()` is a synonym for `encoding()`.

`emptylines(skip` | `include)` specifies how `import delimited` handles empty lines in data. `skip` (the default) specifies that empty lines to be processed as observations should be skipped. `include` specifies that empty lines to be processed as observations should be included. The resulting observations in Stata will simply contain missing values.

`stripquotes(yes` | `no` | `default)` tells `import delimited` how to handle double quotes. `yes` causes all double quotes to be stripped. `no` leaves double quotes in the data unchanged. `default` automatically strips quotes that can be identified as binding quotes. `default` also will identify two adjacent double quotes as a single double quote because some software encodes double quotes that way.

`bindquotes(loose` | `strict` | `nobind)` specifies how `import delimited` handles double quotes in data. Specifying `loose` (the default) tells `import delimited` that it must have a matching open and closed double quote on the same line of data. `strict` tells `import delimited` that once it finds one double quote on a line of data, it should keep searching through the data for the matching double quote even if that double quote is on another line. Specifying `nobind` tells `import delimited` to ignore double quotes for binding.

`maxquotedrows(#|unlimited)` specifies the number of rows allowed inside a quoted string when parsing the file to import. The default is `maxquotedrows(20)`. If this option is specified without `bindquote(strict)`, then `maxquotedrows()` will be ignored.

Option `maxquotedrows(0)` is a synonym for `maxquotedrows(unlimited)`.

`rowrange(`[*start*][`:`*end*]`)` specifies a range of rows within the data to load. *start* and *end* are integer row numbers.

`colrange(`[*start*][`:`*end*]`)` specifies a range of variables within the data to load. *start* and *end* are integer column numbers.

`parselocale(`*locale*`)` specifies the locale to use for interpreting numbers in the text file being imported. This option invokes an alternative parsing method and can result in slightly different behavior than not specifying this option. The default is to not use a locale when parsing numbers where the behavior is to treat `.` as the decimal separator. A list of available locales can be found at https://www.oracle.com/technetwork/java/javase/java8locales-2095355.html.

`decimalseparator(`*character*`)` specifies the character to use for interpreting the decimal separator when parsing numbers. This option implicitly invokes option `parselocale()` with your system's default locale. `parselocale(`*locale*`)` can be specified to override the default system locale.

`groupseparator(`*character*`)` specifies the character to use for interpreting the grouping separator when parsing numbers. This option implicitly invokes option `parselocale()` with your system's default locale. `parselocale(`*locale*`)` can be specified to override the default system locale.

`numericcols(`*numlist*`|_all)` forces the data type of the column numbers in *numlist* to be numeric. Specifying `_all` will import all data as numeric.

`stringcols(`*numlist*`|_all)` forces the data type of the column numbers in *numlist* to be string. Specifying `_all` will import all data as strings.

`clear` specifies that it is okay to replace the data in memory, even though the current data have not been saved to disk.

The following option is available with `import delimited` but is not shown in the dialog box:

`favorstrfixed` forces `import delimited` to favor storing strings as a `str#`.

By default, `import delimited` will attempt to save space by importing string data as a `strL` if doing so will save space. The `favorstrfixed` option prevents the space-saving calculation from occurring, causing strings to be stored as a `str#` unless the string is larger than a `str#` can hold. In that case, `strL` must be used. See [R] **Limits** for details about the maximum size of a `str#`.

Options for export delimited

Main

`delimiter("`*char*`"|tab)` allows you to specify other separation characters. For instance, if you want the values in the file to be separated by a semicolon, specify `delimiter(";")`. The default delimiter is a comma.

`delimiter(tab)` specifies that a tab character be used as the delimiter.

`novarnames` specifies that variable names not be written in the first line of the file; the file is to contain data values only.

`nolabel` specifies that the numeric values of labeled variables be written into the file rather than the label associated with each value.

`datafmt` specifies that all variables be exported using their display format. For example, the number 1000 with a display format of `%4.2f` would export as `1000.00`, not `1000`. The default is to use the raw, unformatted value when exporting.

`quote` specifies that string variables always be enclosed in double quotes. The default is to only double quote strings that contain spaces or the delimiter.

`replace` specifies that *filename* be replaced if it already exists.

Remarks and examples

Remarks are presented under the following headings:

Introduction

`import delimited` reads into memory a text file in which there is one observation per line and the values are separated by commas, tabs, or some other delimiter. The two most common types of text data to import are comma-separated values (`.csv`) text files and tab-separated text files, often `.txt` files. `import delimited` will automatically detect either a comma or a tab as the delimiter.

Similarly, `export delimited` writes Stata data to a text file. By default, `export delimited` uses a comma as the delimiter, but you may specify another delimiter.

Imported string data containing ASCII or UTF-8 will always display correctly in the Data Editor and Results window. Imported string data containing extended ASCII may not display correctly unless you specify the character encoding using the `encoding()` option to convert the extended ASCII to UTF-8.

Exported text files are UTF-8 encoded.

If you are not sure that `import delimited` will do what you are looking for, see [D] **import** and **[U] 22 Entering and importing data** for information about Stata's other commands for importing data.

Importing a text file

Suppose we have a .csv data file such as the following auto.csv, which contains variable names and data for different cars.

```
. copy https://www.stata.com/examples/auto.csv auto.csv
. type auto.csv
make,price,mpg,rep78,foreign
"AMC Concord",4099,22,3,"Domestic"
"AMC Pacer",4749,17,3,"Domestic"
"AMC Spirit",3799,22,,"Domestic"
"Buick Century",4816,20,3,"Domestic"
"Buick Electra",7827,15,4,"Domestic"
"Buick LeSabre",5788,18,3,"Domestic"
"Buick Opel",4453,26,,"Domestic"
"Buick Regal",5189,20,3,"Domestic"
"Buick Riviera",10372,16,3,"Domestic"
"Buick Skylark",4082,19,3,"Domestic"
```

We would like to import these data into Stata for subsequent analysis.

▷ Example 1: Importing all data

To import the complete dataset, we need to specify only the filename. import delimited assumes an extension of .csv. If our data were stored in a .txt file instead, we would need to specify the file extension. Here we enclose auto in double quotes (" "). We do this to remind you to use quotes for filenames with spaces, but it is not necessary here.

```
. import delimited "auto"
(encoding automatically selected: ISO-8859-1)
(5 vars, 10 obs)
```

We can verify that our data loaded correctly by using list or browse.

```
. list
```

	make	price	mpg	rep78	foreign
1.	AMC Concord	4099	22	3	Domestic
2.	AMC Pacer	4749	17	3	Domestic
3.	AMC Spirit	3799	22	.	Domestic
4.	Buick Century	4816	20	3	Domestic
5.	Buick Electra	7827	15	4	Domestic
6.	Buick LeSabre	5788	18	3	Domestic
7.	Buick Opel	4453	26	.	Domestic
8.	Buick Regal	5189	20	3	Domestic
9.	Buick Riviera	10372	16	3	Domestic
10.	Buick Skylark	4082	19	3	Domestic

Notice that import delimited automatically assigned the variable names such as make and price based on the first row of the data. If the variable names were located on, for example, line 3, we would have specified varnames(3), and import delimited would have ignored the first two rows. If our file did not contain any variable names, we would have specified varnames(nonames).

◁

▷ Example 2: Importing a subset of the data

import delimited also allows you to import a subset of the text data by using the rowrange() and colrange() options. Use rowrange() to specify which observations you want to import and colrange() to specify which variables you want to import.

Suppose that we want only cars that were manufactured by AMC. We can use the drop command to drop the cars manufactured by Buick after we import the data. If we know the rows in which AMC cars are located, we can also restrict our import to just those rows. Because foreign is constant, we also want to skip the last column.

To import rows 1 through 3 of the data in auto.csv, we need to specify rowrange(2:4) because the first row of the file contains the variable names. To import the first four columns, we need to also specify colrange(1:4).

```
. clear

. import delimited "auto", rowrange(2:4) colrange(1:4)
(encoding automatically selected: ISO-8859-1)
(4 vars, 3 obs)

. list

     +-------------------------------------+
     |        make   price   mpg   rep78 |
     |-------------------------------------|
  1. | AMC Concord    4099    22       3 |
  2. |   AMC Pacer    4749    17       3 |
  3. |  AMC Spirit    3799    22       . |
     +-------------------------------------+
```

import delimited still used the first line of the file to obtain the variable names even though we did not start our rowrange() specification with 1. rowrange() controls only which rows are read as data to be imported into Stata.

◁

Using other delimiters

Many delimited files use commas or tabs; other common delimiters are semicolons and whitespace. import delimited detects commas and tabs by default but can handle other characters. Suppose that you had the auto.txt file, which contains the following data.

```
"AMC Concord"    4099   22  3   "Domestic"
"AMC Pacer"      4749   17  3   "Domestic"
"AMC Spirit"     3799   22  NA  "Domestic"
"Buick Century" 4816    20  3   "Domestic"
"Buick Electra" 7827    15  4   "Domestic"
"Buick LeSabre" 5788    18  3   "Domestic"
"Buick Opel"     4453   26  NA  "Domestic"
"Buick Regal"    5189   20  3   "Domestic"
"Buick Riviera" 10372   16  3   "Domestic"
"Buick Skylark" 4082    19  3   "Domestic"
```

These data are whitespace delimited. If you use import delimited without any options, you will not get the results you expect.

```
. clear

. import delimited "auto.txt"
(encoding automatically selected: ISO-8859-1)
(1 var, 10 obs)
```

When import delimited tries to read data that have no tabs or commas, it is fooled into thinking that the data contain just one variable.

▷ Example 3: Changing the delimiter

We can use the delimiters() option to import the data correctly. delimiters(" ") tells import delimited to use spaces (" ") as the delimiter. Adding the collapse suboption will treat multiple consecutive space delimiters as one delimiter.

```
. clear

. import delimited "auto.txt", delimiters(" ", collapse)
(encoding automatically selected: ISO-8859-1)
(5 vars, 10 obs)

. describe

Contains data
 Observations:            10
    Variables:             5
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
v1              str13   %13s
v2              int     %8.0g
v3              byte    %8.0g
v4              str2    %9s
v5              str8    %9s
-------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

The data that were imported now contain the correct number of variables and observations.

Because import delimited did not find variable names in the first row of auto.txt, Stata assigned default names of v# to the imported variables. If we wanted to specify our own names, we could have instead submitted

```
. clear

. import delimited make price mpg rep78 foreign using auto.txt,
> delimiters(" ", collapse)
(encoding automatically selected: ISO-8859-1)
(5 vars, 10 obs)
```

◁

Specifying variable types

The data in a file may contain a combination of string and numeric variables. import delimited will generally determine the correct data type for each variable. However, you may want to force a different data type by using the numericcols() or stringcols() option. For example, string values may be used to indicate missing values in a numeric variable, or you may want to import numeric values as strings to preserve leading zeros.

Another common case where you want to control the import type is when your data contain identifiers or other large numeric values. In this case, you should specify the asdouble option to avoid introducing duplicate values or losing values after the import.

▷ Example 4: Specify the storage type

Continuing with example 3, we know that the fourth variable, `rep78`, should be a numeric variable. But it was imported as a string because the value `NA` was used for missing values.

```
. list

     +------------------------------------------------------+
     |          make   price   mpg   rep78          foreign |
     |------------------------------------------------------|
  1. |   AMC Concord    4099    22       3         Domestic |
  2. |     AMC Pacer    4749    17       3         Domestic |
  3. |    AMC Spirit    3799    22      NA         Domestic |
  4. | Buick Century    4816    20       3         Domestic |
  5. | Buick Electra    7827    15       4         Domestic |
     |------------------------------------------------------|
  6. | Buick LeSabre    5788    18       3         Domestic |
  7. |    Buick Opel    4453    26      NA         Domestic |
  8. |   Buick Regal    5189    20       3         Domestic |
  9. | Buick Riviera   10372    16       3         Domestic |
 10. | Buick Skylark    4082    19       3         Domestic |
     +------------------------------------------------------+
```

To force `rep78` to have a numeric storage type, we can use the `numericcols(4)` option.

```
. clear

. import delimited make price mpg rep78 foreign using "auto.txt",
> delimiters(" ", collapse) numericcols(4)
(encoding automatically selected: ISO-8859-1)
(5 vars, 10 obs)

. describe

Contains data
 Observations:            10
    Variables:             5
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
make            str13   %13s
price           int     %8.0g
mpg             byte    %8.0g
rep78           int     %8.0g
foreign         str8    %9s
-------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

```
. list

     +-----------------------------------------------------+
     |          make   price   mpg   rep78       foreign   |
     |-----------------------------------------------------|
  1. |   AMC Concord    4099    22       3      Domestic   |
  2. |     AMC Pacer    4749    17       3      Domestic   |
  3. |    AMC Spirit    3799    22       .      Domestic   |
  4. | Buick Century    4816    20       3      Domestic   |
  5. | Buick Electra    7827    15       4      Domestic   |
     |-----------------------------------------------------|
  6. | Buick LeSabre    5788    18       3      Domestic   |
  7. |    Buick Opel    4453    26       .      Domestic   |
  8. |   Buick Regal    5189    20       3      Domestic   |
  9. | Buick Riviera   10372    16       3      Domestic   |
 10. | Buick Skylark    4082    19       3      Domestic   |
     +-----------------------------------------------------+
```

`rep78` is now stored as an `int` variable, and the `NA` values are replaced by `.`, the system missing value for numeric variables.

◁

Exporting to a text file

`export delimited` creates text files from the Stata dataset in memory. A comma-separated `.csv` file is created by default, but you can change the delimiter by specifying the `delimiter()` option and the file extension by specifying it with the *filename*.

▷ Example 5: Export all data

We want to export the data from example 4 to `myauto.csv`. We can use the `type` command to see the contents of the file.

```
. export delimited "myauto"
file myauto.csv saved

. type "myauto.csv"
make,price,mpg,rep78,foreign
AMC Concord,4099,22,3,Domestic
AMC Pacer,4749,17,3,Domestic
AMC Spirit,3799,22,,Domestic
Buick Century,4816,20,3,Domestic
Buick Electra,7827,15,4,Domestic
Buick LeSabre,5788,18,3,Domestic
Buick Opel,4453,26,,Domestic
Buick Regal,5189,20,3,Domestic
Buick Riviera,10372,16,3,Domestic
Buick Skylark,4082,19,3,Domestic
```

◁

▷ Example 6: Export a subset of the data

You can also export a subset of the data in memory by typing a variable list, specifying an `if` condition, specifying a range with an `in` condition, or a combination of the three. For example, here we export only the first 5 observations of the `make`, `mpg`, and `rep78` variables.

```
. export delimited make mpg rep78 in 1/5 using "myauto", replace
file myauto.csv saved
```

If you open `myauto.csv`, you will see that only the 5 observations shown in example 5 appear in the file. We specified the `replace` option because we previously exported data to `myauto.csv`. If we had not specified `replace`, we would have received an error message.

◁

Video example

Importing delimited data

Stored results

`import delimited` stores the following in `r()`:

Scalars

`r(N)`	number of observations imported
`r(k)`	number of variables imported

Macros

`r(delimiter)`	delimiters used when importing the file
`r(encoding)`	encoding used when importing the file

Also see

[D] **export** — Overview of exporting data from Stata

[D] **import** — Overview of importing data into Stata

import excel — Import and export Excel files

Description

`import excel` loads an Excel file, also known as a workbook, into Stata. `import excel` *filename*`,` `describe` lists available sheets and ranges of an Excel file. `export excel` saves data in memory to an Excel file. Excel 1997/2003 (`.xls`) files and Excel 2007/2010 (`.xlsx`) files can be imported, exported, and described using `import excel`, `export excel`, and `import excel, describe`.

`import excel` and `export excel` are supported on Windows, Mac, and Linux.

`import excel` and `export excel` look at the file extension, `.xls` or `.xlsx`, to determine which Excel format to read or write.

For performance, `import excel` imposes a size limit of 40 MB for Excel 2007/2010 (`.xlsx`) files. Be warned that importing large `.xlsx` files can severely affect your machine's performance.

`import excel auto` first looks for `auto.xls` and then looks for `auto.xlsx` if `auto.xls` is not found in the current directory.

The default file extension for `export excel` is `.xlsx` if a file extension is not specified.

Quick start

Check the contents of Excel file `mydata.xls` before importing

```
import excel mydata, describe
```

Same as above, but for `mydata.xlsx`

```
import excel mydata.xlsx, describe
```

Load data from `mydata.xls`

```
import excel mydata
```

Same as above, but load data from cells A1:G10 of `mysheet`

```
import excel mydata, cellrange(A1:G10) sheet(mysheet)
```

Read first row as lowercase variable names

```
import excel mydata, firstrow case(lower)
```

Import only `v1` and `v2`

```
import excel v1 v2 using mydata
```

Save data in memory to `mydata.xlsx`

```
export excel mydata
```

Same as above, but export variables `v1`, `v2`, and `v3`

```
export excel v1 v2 v3 using mydata
```

Menu

import excel

File > Import > Excel spreadsheet (*.xls;*.xlsx)

export excel

File > Export > Data to Excel spreadsheet (*.xls;*.xlsx)

Syntax

Load an Excel file

`import excel` [`using`] *filename* [, *import_excel_options*]

Load subset of variables from an Excel file

`import excel` *extvarlist* `using` *filename* [, *import_excel_options*]

Describe contents of an Excel file

`import excel` [`using`] *filename* , `describe`

Save data in memory to an Excel file

`export excel` [`using`] *filename* [*if*] [*in*] [, *export_excel_options*]

Save subset of variables in memory to an Excel file

`export excel` [*varlist*] `using` *filename* [*if*] [*in*] [, *export_excel_options*]

import_excel_options	Description
`sheet("`*sheetname*`")`	Excel worksheet to load
`cellrange(`[*start*][`:`*end*]`)`	Excel cell range to load
`firstrow`	treat first row of Excel data as variable names
`case(preserve`|`lower`|`upper)`	preserve the case (the default) or read variable names as lowercase or uppercase when using `firstrow`
`allstring`[`("`*format*`")`]	import all Excel data as strings; optionally, specify the numeric display format
`clear`	replace data in memory
`locale("`*locale*`")`	specify the locale used by the workbook; has no effect on Microsoft Windows

`allstring("`*format*`")` and `locale()` do not appear in the dialog box.

export_excel_options	Description
Main	
sheet("*sheetname*"[, modify | replace])	save to Excel worksheet
cell(*start*)	start (upper-left) cell in Excel to begin saving to
firstrow(variables | varlabels)	save variable names or variable labels to first row
nolabel	export values instead of value labels
keepcellfmt	when writing data, preserve the cell style and format of existing worksheet
replace	overwrite Excel file
Advanced	
datestring("*datetime_format*")	save dates as strings with a *datetime_format*
missing("*repval*")	save missing values as *repval*
locale("*locale*")	specify the locale used by the workbook; has no effect on Microsoft Windows

collect is allowed with import excel; see [U] **11.1.10 Prefix commands**.

locale() does not appear in the dialog box.

extvarlist specifies variable names of imported columns. An *extvarlist* is one or more of any of the following:

varname

varname=*columnname*

Example: import excel make mpg weight price using auto.xlsx, clear imports columns A, B, C, and D from the Excel file auto.xlsx.

Example: import excel make=A mpg=B price=D using auto.xlsx, clear imports columns A, B, and D from the Excel file auto.xlsx. Column C and any columns after D are skipped.

Options for import excel

sheet("*sheetname*") imports the worksheet named *sheetname* in the workbook. The default is to import the first worksheet.

cellrange([*start*][:*end*]) specifies a range of cells within the worksheet to load. *start* and *end* are specified using standard Excel cell notation, for example, A1, BC2000, and C23.

firstrow specifies that the first row of data in the Excel worksheet consists of variable names. This option cannot be used with *extvarlist*. firstrow uses the first row of the cell range for variable names if cellrange() is specified. import excel translates the names in the first row to valid Stata variable names. The original names in the first row are stored unmodified as variable labels.

case(preserve | lower | upper) specifies the case of the variable names read when using the firstrow option. The default is case(preserve), meaning to preserve the variable name case. Only the ASCII letters in names are changed to lowercase or uppercase. Unicode characters beyond ASCII range are not changed.

allstring[("*format*")] forces import excel to import all Excel data as string data. You can specify the numeric display format used to convert the numeric data to string using the optional argument *format*. See [D] **format**.

`clear` clears data in memory before loading data from the Excel workbook.

The following option is available with `import excel` but is not shown in the dialog box:

`locale("`*locale*`")` specifies the locale used by the workbook. You might need this option when working with extended ASCII character sets. This option has no effect on Microsoft Windows. The default locale is UTF-8.

Options for export excel

Main

`sheet("`*sheetname*`"` [`, modify` | `replace`]`)` saves to the worksheet named *sheetname*. If there is no worksheet named *sheetname* in the workbook, a new sheet named *sheetname* is created. If this option is not specified, the first worksheet of the workbook is used. If *sheetname* does exist in the workbook, you can either `modify` or `replace` the worksheet.

`modify` exports data to the worksheet without changing the cells outside the exported range. This option cannot be specified with `replace`, nor when overwriting the Excel workbook.

`replace` clears the worksheet before the data are exported to it. `replace` cannot be specified with `modify`, nor when overwriting the Excel workbook.

`cell(`*start*`)` specifies the start (upper-left) cell in the Excel worksheet to begin saving to. By default, `export excel` saves starting in the first row and first column of the worksheet.

`firstrow(variables` | `varlabels)` specifies that the variable names or the variable labels be saved in the first row in the Excel worksheet. The variable name is used if there is no variable label for a given variable.

`nolabel` exports the underlying numeric values instead of the value labels.

`keepcellfmt` specifies that, when writing data, `export excel` should preserve the existing worksheet's cell style and format. By default, `export excel` does not preserve a cell's style or format.

`replace` overwrites an existing Excel workbook. `replace` cannot be specified when modifying or replacing a given worksheet: `export excel ..., sheet("", modify)` or `export excel ... sheet("", replace)`.

Advanced

`datestring("`*datetime_format*`")` exports all datetime variables as strings formatted by *datetime_format*. See [D] **Datetime display formats**.

`missing("`*repval*`")` exports missing values as *repval*. *repval* can be either string or numeric. Without specifying this option, `export excel` exports the missing values as empty cells.

The following option is available with `export excel` but is not shown in the dialog box:

`locale("`*locale*`")` specifies the locale used by the workbook. You might need this option when working with extended ASCII character sets. The default locale is UTF-8.

Remarks and examples

To demonstrate the use of `import excel` and `export excel`, we will first load `auto.dta` and export it as an Excel file named `auto.xlsx`:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. export excel auto, firstrow(variables)
file auto.xlsx saved
```

Now we can import from the `auto.xlsx` file we just created, telling Stata to clear the current data from memory and to treat the first row of the worksheet in the Excel file as variable names:

```
. import excel auto.xlsx, firstrow clear
(12 vars, 74 obs)

. describe

Contains data
 Observations:            74
    Variables:            12
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
make            str17   %17s                  make
price           int     %10.0gc               price
mpg             byte    %10.0g                mpg
rep78           byte    %10.0g                rep78
headroom        double  %10.0g                headroom
trunk           byte    %10.0g                trunk
weight          int     %10.0gc               weight
length          int     %10.0g                length
turn            byte    %10.0g                turn
displacement    int     %10.0g                displacement
gear_ratio      double  %14.2f                gear_ratio
foreign         str8    %9s                   foreign
-------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

We can also import a subrange of the cells in the Excel file:

```
. import excel auto.xlsx, cellrange(:D70) firstrow clear
(4 vars, 69 obs)

. describe

Contains data
 Observations:            69
    Variables:             4
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
make            str17   %17s                  make
price           int     %10.0gc               price
mpg             byte    %10.0g                mpg
rep78           byte    %10.0g                rep78
-------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

Both `.xls` and `.xlsx` files are supported by `import excel` and `export excel`. If a file extension is not specified with `export excel`, `.xlsx` is assumed, because this format is more common and is compatible with more applications that also can read from Excel files. To save the data in memory as a `.xls` file, specify the extension:

```
. use https://www.stata-press.com/data/r19/auto, clear
(1978 automobile data)

. export excel auto.xls
file auto.xls saved
```

To export a subset of variables and overwrite the existing `auto.xlsx` Excel file, specify a variable list and the `replace` option:

```
. export excel make mpg weight using auto, replace
file auto.xlsx saved
```

For additional examples illustrating `import excel` and `export excel`, see Mitchell (2020, chap. 2–3).

❑ Technical note: Excel data size limits

For an Excel `.xls`-type workbook, the worksheet size limits are 65,536 rows by 256 columns. The string size limit is 255 characters.

For an Excel `.xlsx`-type workbook, the worksheet size limits are 1,048,576 rows by 16,384 columns. The string size limit is 32,767 characters.

❑

❑ Technical note: Dates and times

Excel has two different date systems, the "1900 Date System" and the "1904 Date System". Excel stores a date and time as an integer representing the number of days since a start date plus a fraction of a 24-hour day.

In the 1900 Date System, the start date is 00Jan1900; in the 1904 Date System, the start date is 01Jan1904. In the 1900 Date System, there is another artificial date, 29feb1900, besides 00Jan1900. `import excel` translates 29feb1900 to 28feb1900 and 00Jan1900 to 31dec1899.

See *Converting Excel dates* in [D] **Datetime values from other software** for a discussion of the relationship between Stata datetimes and Excel datetimes.

❑

❑ Technical note: Mixed data types

Because Excel's data type is cell based, `import excel` may encounter a column of cells with mixed data types. In such a case, the following rules are used to determine the variable type in Stata of the imported column.

- If the column contains at least one cell with nonnumerical text, the entire column is imported as a string variable.
- If an all-numerical column contains at least one cell formatted as a date or time, the entire column is imported as a Stata date or datetime variable. `import excel` imports the column as a Stata date if all date cells in Excel are dates only; otherwise, a datetime is used.

❑

Video example

Import Excel data into Stata

Stored results

`import excel` *filename*, `describe` stores the following in `r()`:

Scalars

`r(N_worksheet)`	number of worksheets in the Excel workbook

Macros

`r(worksheet_#)`	name of worksheet # in the Excel workbook
`r(range_#)`	available cell range for worksheet # in the Excel workbook

References

Crow, K. 2012. Using import excel with real world data. *The Stata Blog: Not Elsewhere Classified.* https://blog.stata.com/2012/06/25/using-import-excel-with-real-world-data/.

Jeanty, P. W. 2013. Dealing with identifier variables in data management and analysis. *Stata Journal* 13: 699–718.

Mitchell, M. N. 2020. *Data Management Using Stata: A Practical Handbook*. 2nd ed. College Station, TX: Stata Press.

Also see

[D] **Datetime** — Date and time values and variables

[D] **export** — Overview of exporting data from Stata

[D] **import** — Overview of importing data into Stata

[M-5] **_docx*()** — Generate Office Open XML (.docx) file

[M-5] **xl()** — Excel file I/O class

[RPT] **putexcel** — Export results to an Excel file

import fred — Import data from Federal Reserve Economic Data

Description

`import fred` imports data from the Federal Reserve Economic Data (FRED) into Stata. `import fred` supports data on FRED as well as historical vintage data on Archival FRED (ALFRED). `freddescribe` and `fredsearch` provide tools to describe series in the database and to search FRED for data based on keywords and tags.

Quick start

Before running any of the commands below, you will need to obtain a FRED key and set it using `set fredkey`.

Import series `code1` and `code2` from FRED

```
import fred code1 code2
```

Import vintage series `code1` and `code2` as available on September 15, 2008, and September 15, 2009, from FRED

```
import fred code1 code2, vintage(2008-9-15 2009-9-15)
```

Display metadata describing series `code1` and `code2`

```
freddescribe code1 code2
```

Search FRED for series matching keywords “investment” and “share” and tagged with “pwt” and “usa”

```
fredsearch investment share, tags(pwt usa)
```

Menu

File > Import > Federal Reserve Economic Data (FRED)

Syntax

Set FRED key

set fredkey *key* [, permanently]

Import FRED data

import fred *series_list* [, *options*]

or

import fred, serieslist(*filename*) [*options*]

Describe series

freddescribe *series_list* [, detail realtime(*start end*)]

Search series

fredsearch *keyword_list* [, *search_options*]

key is a valid API key, which is provided by the St. Louis Federal Reserve and may be obtained from https://research.stlouisfed.org/docs/api/api_key.html.

series_list is a list of FRED codes, for example, FEDFUNDS.

keyword_list is a list of keywords.

options	Description
* serieslist(*filename*)	specify series IDs using a file
daterange(*start end*)	restrict to only observations within specified date range
aggregate(*frequency*[, *method*])	specify the aggregation level and aggregation type
realtime(*start end*)	import historical vintages between specified dates
vintage(*datespec*)	import historical data by vintage dates
nrobs	import only new and revised observations
initial	import only first value for each observation in a series
long	import data in long format
nosummary	suppress summary table
clear	clear data in memory before importing FRED series

* serieslist() is required if *series_list* is not specified.

collect is allowed with fredsearch; see **[U] 11.1.10 Prefix commands**.

clear does not appear in the dialog box.

If *start* and *end* are provided as dates, they must be daily dates using notation of the form 31Jan2016, 2016-01-31, 2016/01/31, or 01/31/2016.

datespec may be

date	a daily date
$date_1$ $date_2$ ... $date_n$	a list of daily dates
_all	all available dates

search_options	Description
idonly	require *keywords* to appear in series IDs only
tags(*tag_list*)	search by *tag_list*
taglist	list tags present in current search results
sort(*sortby*[, *sortorder*])	list matched series in order specified by *sortby*
detail	list full metainformation for each search result
saving(*filename*[, replace])	save series information to *filename*.dta

saving() does not appear in the dialog box.

Options

Options are presented under the following headings:

Option for set fredkey
Options for import fred
Options for freddescribe
Options for fredsearch

Option for set fredkey

permanently specifies that, in addition to setting the key for the current Stata session, the key be remembered and become the default key when you invoke Stata.

Options for import fred

seriеslist(*filename*) allows you to import the series specified in *filename*. The series file must contain a variable called seriesid that contains the IDs of the series you wish to import. serieslist() is required if *series_list* is not specified.

daterange(*start end*) specifies that only observations between the *start* date and *end* date should be imported. *start* and *end* must be specified as either a daily date or a missing value (.). Use daterange(. *end*) to import all observations from the first available through *end*. Use daterange(*start* .) to import from *start* through the most recently available date.

aggregate(*frequency*[, *method*]) specifies that the data should be imported at a lower frequency than the series' native frequency along with an optional method of aggregation.

frequency may be daily, weekly, biweekly, monthly, quarterly, semiannual, annual, weekly ending friday, weekly ending thursday, weekly ending wednesday, weekly ending tuesday, weekly ending monday, weekly ending sunday, weekly ending saturday, biweekly ending wednesday, or biweekly ending monday.

method may be avg (the within-period average), sum (the within-period sum), or eop (the end-of-period value). The default is avg.

realtime(*start end*) specifies a real-time period between which all vintages for each series are imported. The vintage available on *start* is imported, as are all vintages released between *start* and *end*. Either of *start* or *end* may be replaced by a missing value (.). If *start* is a missing value, then all vintages from the first available up through *end* are imported. If *end* is a missing value, then all vintages from *start* up through the most recent available are imported. realtime() may not be combined with vintage().

`vintage(`*datespec*`)` imports historical vintage data according to *datespec*. *datespec* may either be a list of daily dates or `_all`. When *datespec* is a list of dates, the specified series are imported as they were available on the dates in *datespec*. When *datespec* is `_all`, all vintages of the specified series are imported. `vintage()` may not be combined with `realtime()`.

`nrobs` specifies that only observations that are new or revised in each vintage be imported. Old and unrevised observations are imported as the missing value `.u`.

`initial` specifies that only the first value for each observation of the series be imported. This option may not be combined with `nrobs`.

`long` specifies that each series be imported in long format.

`nosummary` suppresses the summary table.

The following option is available with `import fred` but is not shown in the dialog box:

`clear` specifies that the data in memory should be replaced with the imported FRED data.

Options for freddescribe

`detail` displays full metainformation available about *series_list*.

`realtime(`*start end*`)` provides historical vintage information about *series_list* during the real-time period specified by *start* and *end*. Either *start* or *end* may be replaced by a missing value (`.`). If *start* is a missing value, then all vintages from the first available up through *end* are described. If *end* is a missing value, then all vintages from *start* up through the most recent available are described.

Options for fredsearch

`idonly` specifies that the keywords in *keyword_list* be found in series IDs rather than elsewhere in the metadata.

`tags(`*tag_list*`)` searches for series that have all the tags specified in *tag_list*. The complete list of available tags is provided by FRED. Tags form a space-separated list. Tags are case-sensitive and all FRED tags are in lowercase.

`taglist` lists all the tags present in the current search results.

`sort(`*sortby*[`,` *sortorder*]`)` lists the search results in the order specified by *sortby*.

When searching series, *sortby* may be `popularity`, `id`, `title`, `lastupdated`, `frequency`, `obsstart`, `obsend`, `units`, or `seasonaladj`. By default, `popularity` is used.

When searching with the `taglist` option, *sortby* may be `name` or `series_count`. `name` means the tag name, and `series_count` is the count of series associated with the tag in the search results. By default, `series_count` is used.

You can optionally change the order of the search results from descending (`descending`) to ascending (`ascending`) order. The default order when searching by `popularity`, `lastupdated`, or `series_count` is `descending`; otherwise, the default sort order is `ascending`.

`detail` lists full metainformation for each series that appears in the search results.

The following option is available with `fredsearch` but is not shown in the dialog box:

`saving(`*filename*[`, replace`]`)` saves the search results to a file. The filename may then be specified in the `serieslist()` option of `import fred` to import the series located by the search. The optional `replace` specifies that *filename* be overwritten if it exists.

Remarks and examples

Remarks are presented under the following headings:

Introduction and setup

`import fred` imports data from the Federal Reserve Economic Data (FRED) into Stata. FRED is maintained by the Economic Research Division of the Federal Reserve Bank of St. Louis and contains hundreds of thousands of economic and financial time series. FRED includes data from a variety of sources, including the Federal Reserve, the Penn World Table, Eurostat, the World Bank, and US statistical agencies, among others. `import fred` extends `freduse` discussed in Drukker (2006).

Series in FRED are updated and revised over time as new observations are added and as older observations are revised in light of more complete source information. The series are updated on an annual, quarterly, monthly, weekly, or daily basis, depending on the series. Each time a series is updated or revised, a new "vintage" is created. The archived data, or historical vintage data, are data in their unrevised form as they would have been available on a particular date in history. These data are from Archival FRED, or ALFRED. `import fred` can import data from either FRED or ALFRED.

FRED data can be imported using the `import fred` command or using the FRED interface. If you are exploring FRED, learning the names of series, or importing series occasionally, we recommend using the FRED interface. If you already know the names of the series that you would like to import or if you repeatedly download series as they are updated, we recommend using the `import fred` command. You may also use the FRED interface to learn series names that you subsequently specify in `import fred` commands. See *The FRED interface* below to learn more about using this tool.

Whether you plan to use the FRED interface or the `import fred` command, you must first have a valid API key. API keys are provided by the St. Louis Federal Reserve and may be obtained from https://research.stlouisfed.org/docs/api/api_key.html. The key will be a 32-character alphanumeric string. You will be prompted to enter this key the first time you open the FRED interface. Alternatively, you can type

```
. set fredkey key, permanently
```

where *key* is your API key.

▷ Example 1: A basic search and import

Suppose we want monthly data on the exchange rate between the US dollar and the Japanese Yen. We can use `fredsearch` to find the name of this series in FRED.

```
. fredsearch us dollar yen exchange rate monthly
```

Series ID	Title	Data range	Frequency
EXJPUS	Japanese Yen to U....	1971-01-01 to 2025-02-01	Monthly

```
Total: 1
```

The output says that EXJPUS is the name that FRED uses for this series. When we performed this search, 2025-02-01 was the last available observation. More data will be available when you type this command, so the endpoint of the data range will be more recent.

Having learned from the output that EXJPUS is the name that FRED uses for this series, we use `import fred` to import it.

```
. import fred EXJPUS
Summary
```

Series ID	Nobs	Date range	Frequency
EXJPUS	650	1971-01-01 to 2025-02-01	Monthly

```
# of series imported: 1
   highest frequency: Monthly
    lowest frequency: Monthly
```

The output says that 650 monthly observations on EXJPUS were imported.

To clarify what we imported, we can describe the imported data and list the first five observations.

```
. describe
Contains data
 Observations:           650
    Variables:             3
```

Variable name	Storage type	Display format	Value label	Variable label
datestr	str10	%-10s		observation date
daten	int	%td		numeric (daily) date
EXJPUS	float	%9.0g		Japanese Yen to U.S. Dollar Spot Exchange Rate

```
Sorted by: datestr
     Note: Dataset has changed since last saved.
. list datestr daten EXJPUS in 1/5
```

	datestr	daten	EXJPUS
1.	1971-01-01	01jan1971	358.02
2.	1971-02-01	01feb1971	357.545
3.	1971-03-01	01mar1971	357.5187
4.	1971-04-01	01apr1971	357.5032
5.	1971-05-01	01may1971	357.413

Each series in FRED is paired with a string variable that records the daily date for each observation. `import fred` imports this daily date variable as the string variable `datestr`, and it creates `daten`, which is a Stata datetime variable that encodes the date in `datestr`. EXJPUS contains the observations on the FRED series EXJPUS.

Each series has metadata associated with it that is stored in the characteristics and may be viewed with the char list command. We now list out the metadata on EXJPUS.

```
. char list EXJPUS[]
  EXJPUS[Title]:               Japanese Yen to U.S. Dollar Spot Exchange Rate
  EXJPUS[Series_ID]:           EXJPUS
  EXJPUS[Source]:              Board of Governors of the Federal Reserve Syste..
  EXJPUS[Release]:             G.5 Foreign Exchange Rates
  EXJPUS[Seasonal_Adjustment]:
                               Not Seasonally Adjusted
  EXJPUS[Date_Range]:          1971-01-01 to 2025-02-01
  EXJPUS[Frequency]:           Monthly
  EXJPUS[Units]:               Japanese Yen to One U.S. Dollar
  EXJPUS[Last_Updated]:        2025-03-03 15:19:41-06
  EXJPUS[Notes]:               Averages of daily figures. Noon buying rates in..
```

See [P] **char** for more about characteristics.

◁

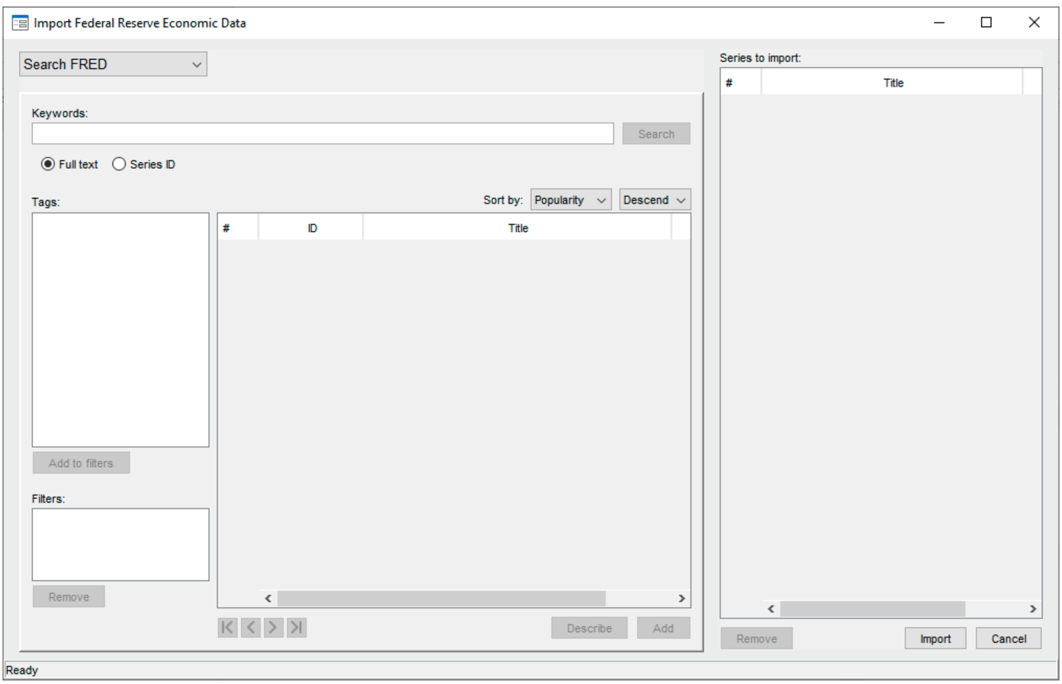
The FRED interface

The names of FRED series are not predictable. The FRED interface makes it easy to find series, to import series, and to explore the thousands of series by keyword searches or by browsing by category, release type, source, or release date.

Selecting

File > Import > Federal Reserve Economic Data (FRED)

from the menu opens the FRED interface.



In the top left-hand corner, the drop-down menu defaults to `Search FRED`, which searches for series by keywords that appear in those series' metadata. From this menu, we can also select `Browse by category`, `Browse by release`, `Browse by source`, and `Search by release date`.

`Browse by category` finds series by browsing through FRED defined categories, such as `Production & Business Activity`.

`Browse by release` finds series by browsing through FRED defined release types, such as the `BEA Regions Employment and Unemployment` and the `Consumer Price Index`.

`Browse by source` finds series by browsing through sources, such as the `Bank of England`, the `US Bureau of the Census`, and the `University of Pennsylvania`.

`Search by release date` finds regularly released series that were updated in a specified date range.

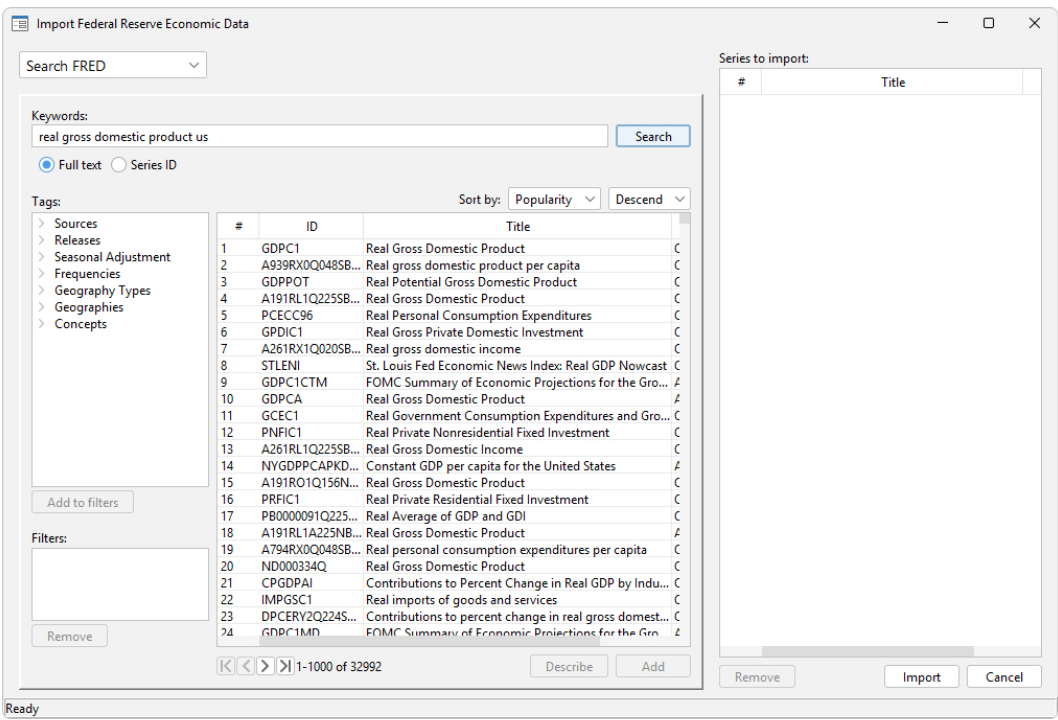
▷ Example 2: Finding and importing series with the FRED interface

Suppose we want to import series measuring the real gross domestic product (GDP) in the US and the three-month Treasury bill interest rate, known as the Federal Funds Rate. We can use a keyword search and a then browse by category to find and select them for import.

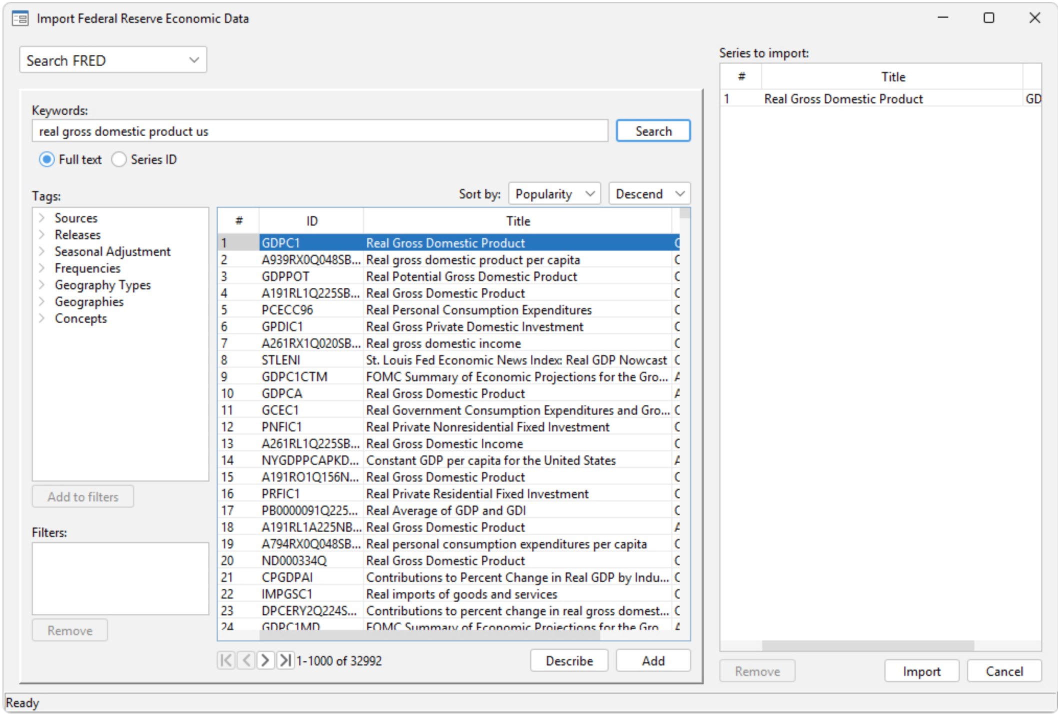
After selecting

File > Import > Federal Reserve Economic Data (FRED)

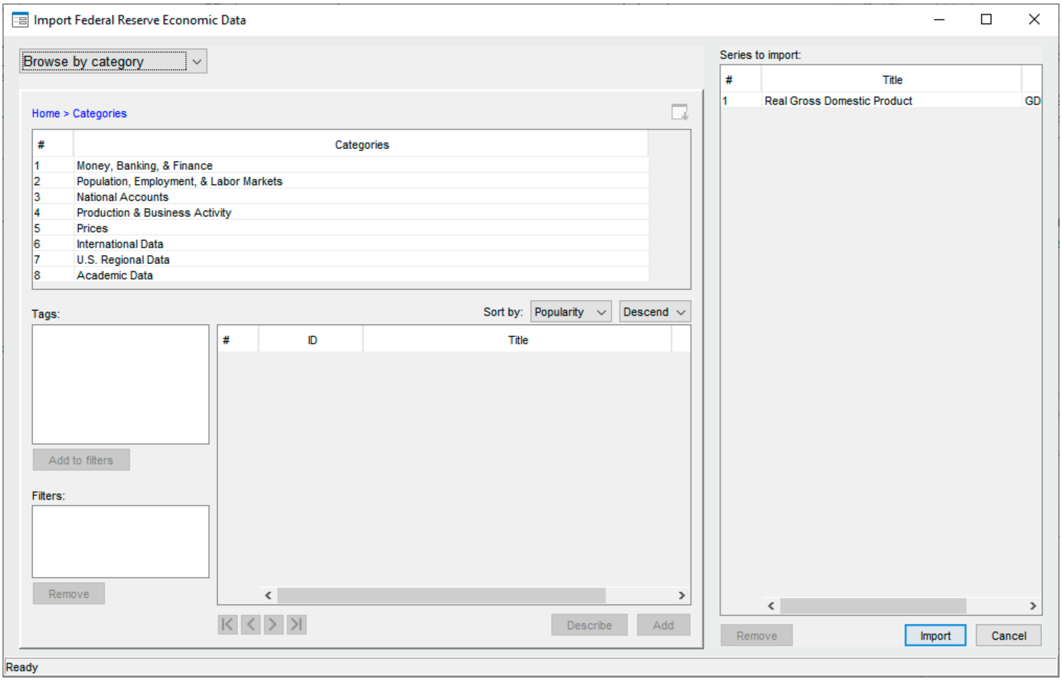
to open the control panel, we type `real gross domestic product us` in the *Keywords* field and click on the **Search** button, which produces



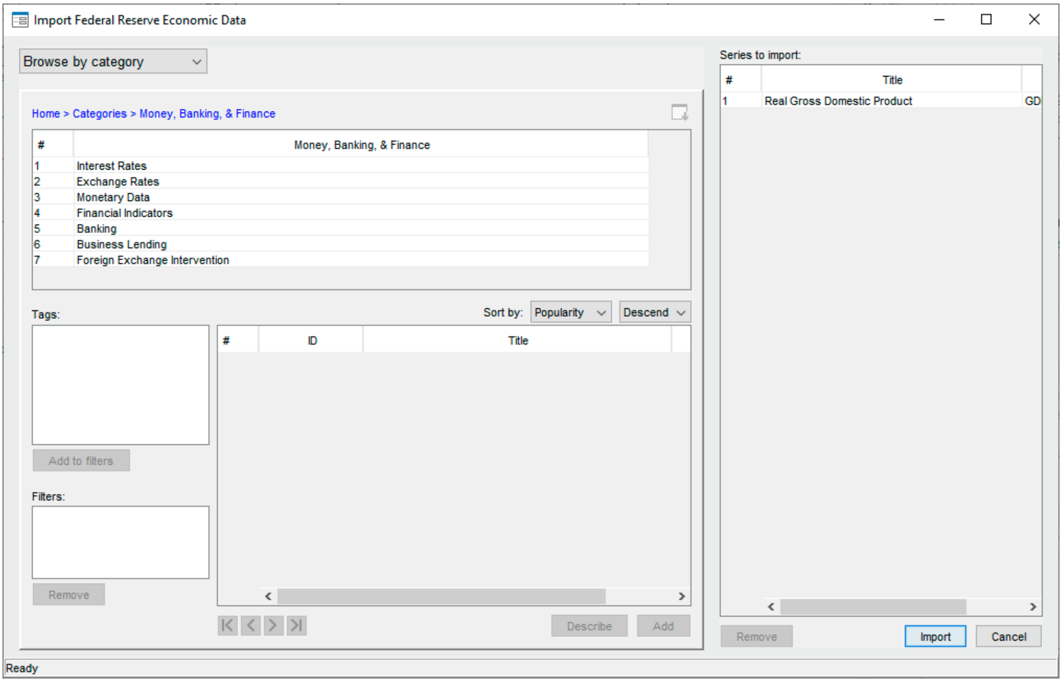
Clicking on GDPC1 and then on the **Add** button adds GDPC1 to list of series to import.



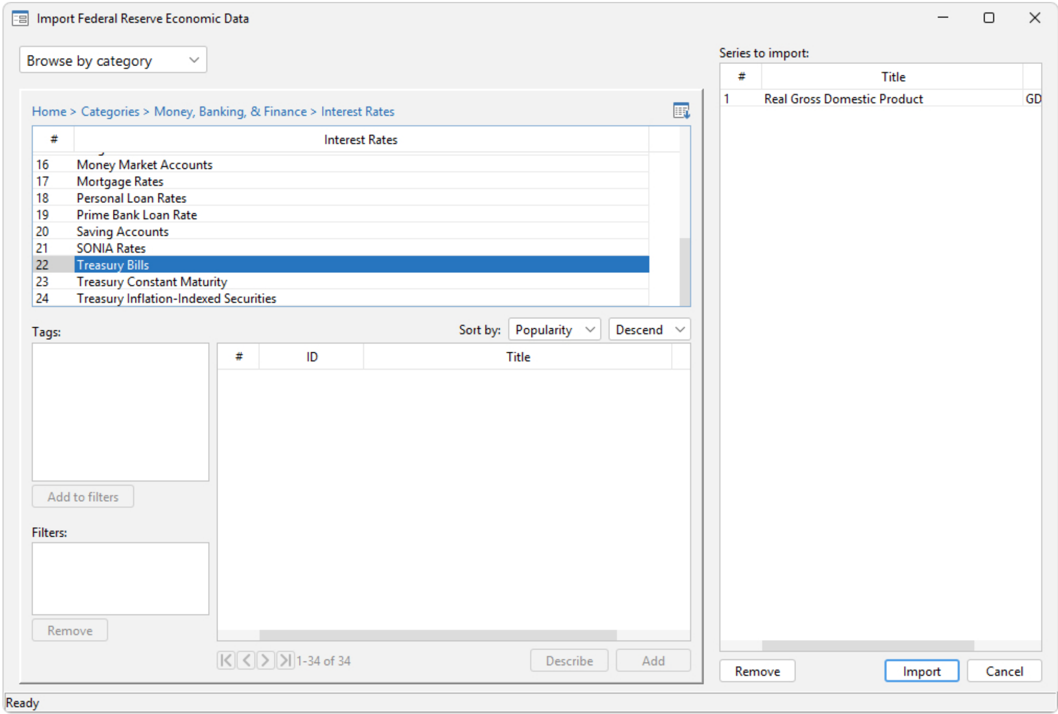
Now, we want to add the interest rate series. We select `Browse by category` from the drop-down menu in the top left-hand corner.



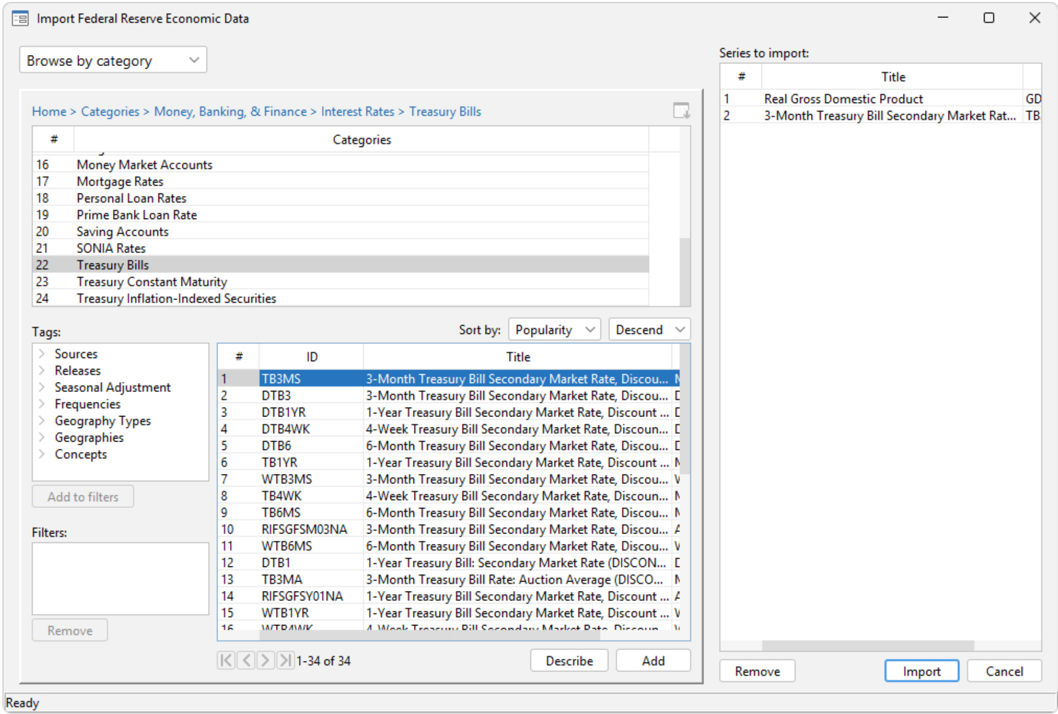
We double-click on `Money, Banking, & Finance` to get a list of subcategories.



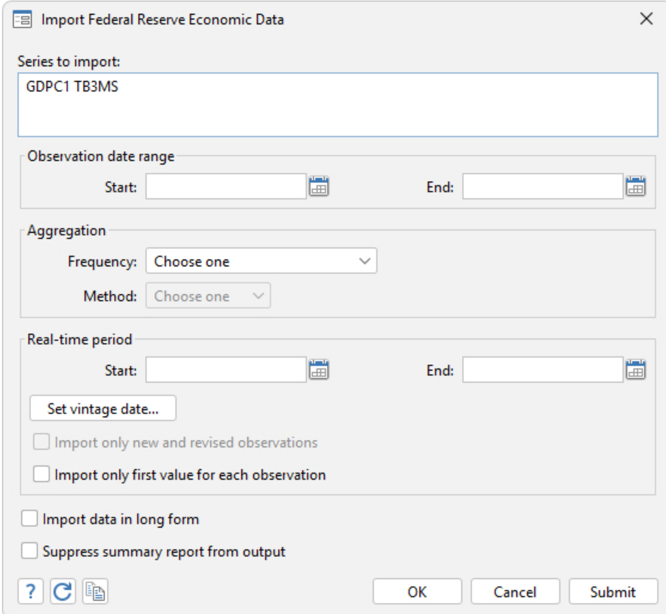
Next, we double-click on `Interest Rates` to get a list of interest-rate categories. Scrolling down, we find `Treasury Bills`.



We double-click on `Treasury Bills` to produce a list of interest-rate series. We click on `TB3MS` and then on the **Add** button to add it the list of series to be imported.



Clicking on `import` brings up a dialog box that allows us to restrict the imported observations.



We click **OK** to import all available observations.

The output from the command issued by the control panel was

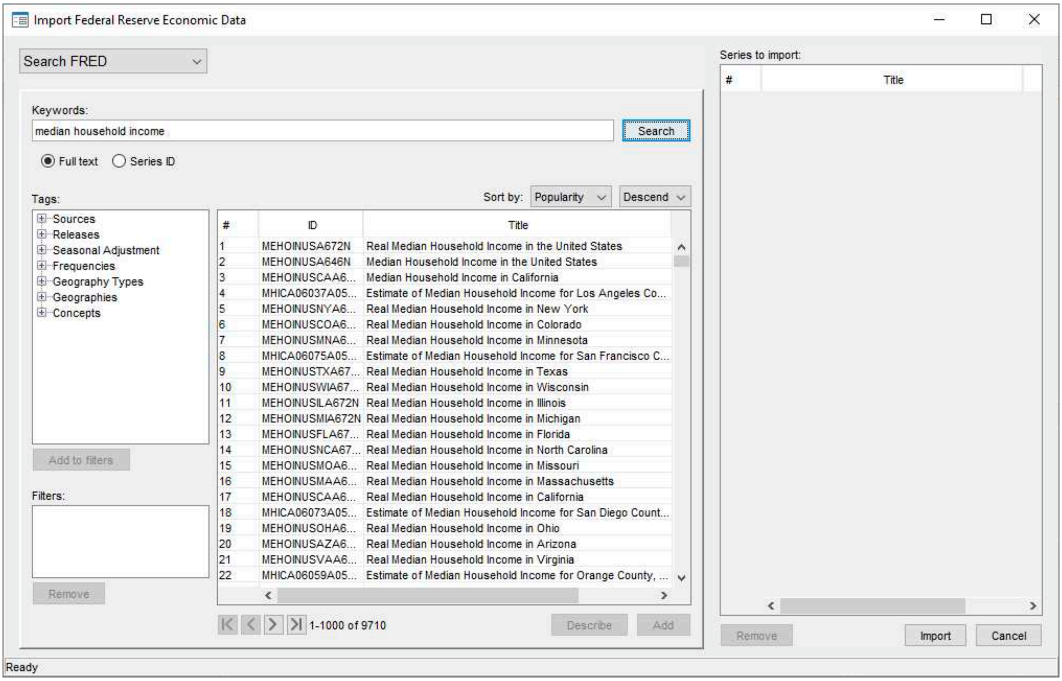
```
. import fred GDPC1 TB3MS
Summary
─────────────────────────────────────────────────────────────────────────────────
Series ID                      Nobs    Date range                 Frequency
─────────────────────────────────────────────────────────────────────────────────
GDPC1                          312     1947-01-01 to 2024-10-01   Quarterly
TB3MS                          1094    1934-01-01 to 2025-02-01   Monthly
─────────────────────────────────────────────────────────────────────────────────
# of series imported: 2
   highest frequency: Monthly
    lowest frequency: Quarterly
```

The number of observations and the date ranges will differ when you follow these same steps using the FRED interface, because more data have been made available.

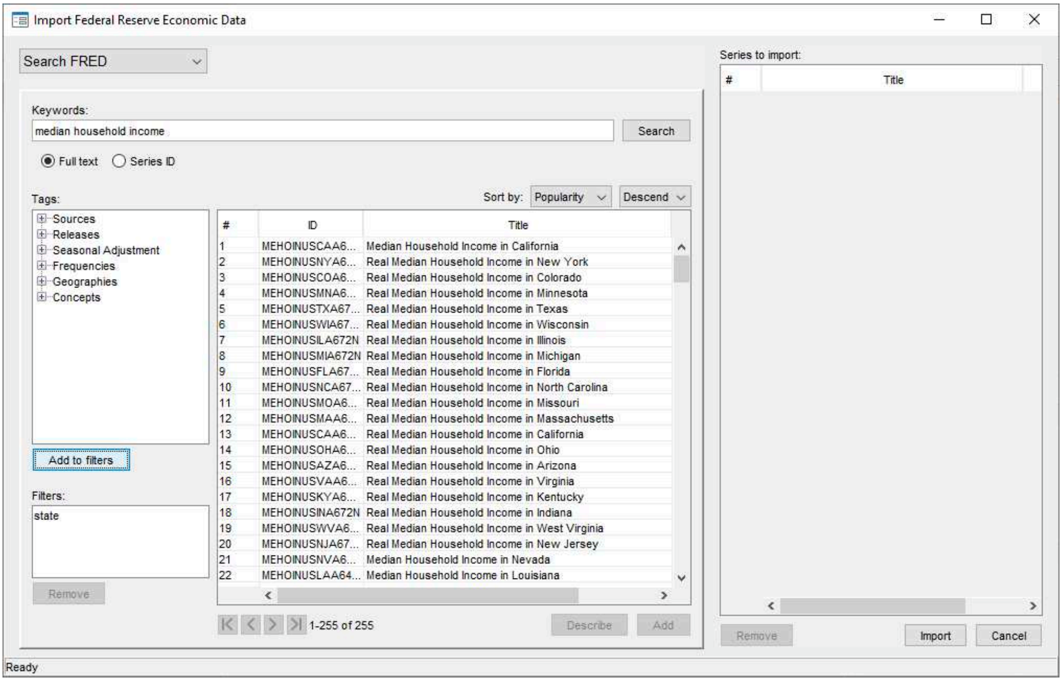
◁

▷ Example 3: Refining a search using tags

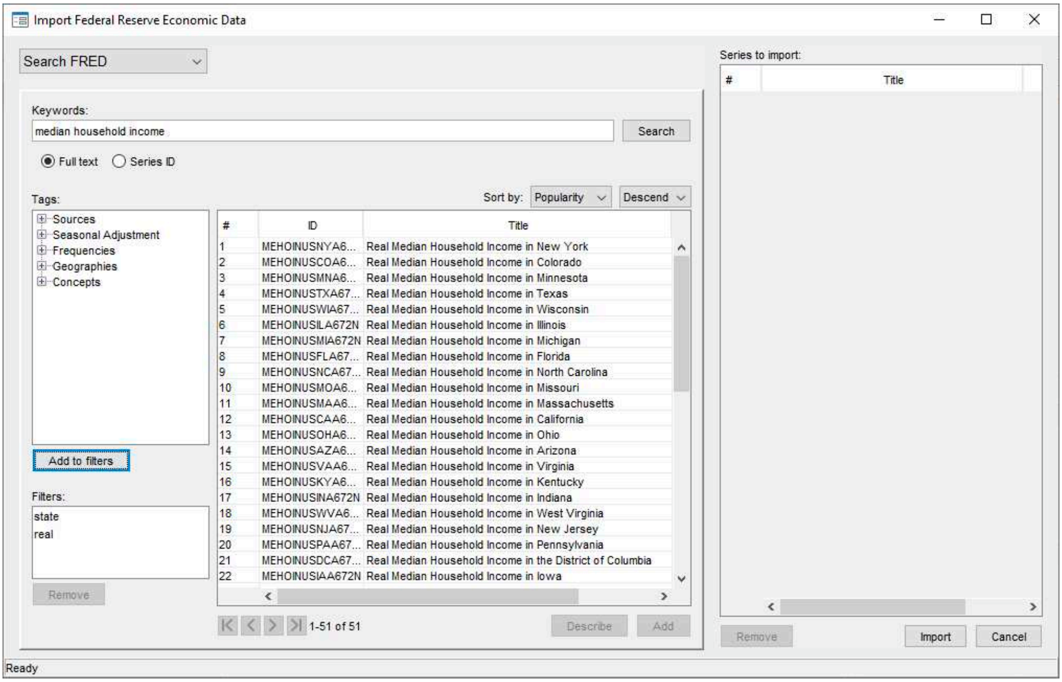
Suppose that we want to find and import data on the median income in each US state and the District of Columbia for each available year. After opening the control panel, typing `median household income` in the *Keywords* box, and clicking on the **Search** button, we see



This keyword search finds thousands more series than the 51 we want. To filter the found series by the tag `state`, we expand the `Geography Types` category, click on `state`, and then click on the **Add to filters** button, which produces



There are still too many series. To filter the series by the tag `real`, we expand the `Concepts` category, click on `real`, and then click on the **Add to filters** button, which produces the desired 51 series.



After selecting the 51 series, we add them to the import list by clicking on the **Add** button. We could now import them by clicking on the **Import** button.

◁

Advanced imports using the import fred command

FRED data users commonly import series of different frequencies.

▷ Example 4: Importing series with different frequencies

Suppose we wish to import current data on US real GDP, the price level, and the interest rate. These data are stored in FRED with the series IDs “GDPC1”, “GDPDEF”, and “FEDFUNDS”, so we supply those names to `import fred`.

```
. import fred GDPC1 GDPDEF FEDFUNDS
Summary
─────────────────────────────────────────────────────────────────────────────
Series ID                   Nobs    Date range                 Frequency
─────────────────────────────────────────────────────────────────────────────
GDPC1                       312     1947-01-01 to 2024-10-01   Quarterly
GDPDEF                      312     1947-01-01 to 2024-10-01   Quarterly
FEDFUNDS                    848     1954-07-01 to 2025-02-01   Monthly
─────────────────────────────────────────────────────────────────────────────
# of series imported: 3
   highest frequency: Monthly
    lowest frequency: Quarterly
```

`FEDFUNDS` is a monthly series, while `GDPC1` and `GDPDEF` are quarterly series. To further illustrate, we list the observations on each variable from 1959 using the `list` command.

```
. list if year(daten)==1959, separator(3)
```

	datestr	daten	GDPC1	GDPDEF	FEDFUNDS
85.	1959-01-01	01jan1959	3352.129	15.224	2.48
86.	1959-02-01	01feb1959	.	.	2.43
87.	1959-03-01	01mar1959	.	.	2.8
88.	1959-04-01	01apr1959	3427.667	15.248	2.96
89.	1959-05-01	01may1959	.	.	2.9
90.	1959-06-01	01jun1959	.	.	3.39
91.	1959-07-01	01jul1959	3430.057	15.307	3.47
92.	1959-08-01	01aug1959	.	.	3.5
93.	1959-09-01	01sep1959	.	.	3.76
94.	1959-10-01	01oct1959	3439.832	15.367	3.98
95.	1959-11-01	01nov1959	.	.	4
96.	1959-12-01	01dec1959	.	.	3.99

FRED provides all series in daily date format, and each observation is recorded as existing on the first day of the period. For example, a monthly series records the observation in 1959 January as existing on 01Jan1959; a quarterly series records the observation in 1959 Q1 as existing on 01Jan1959. When importing series of different frequencies, the lower-frequency series will appear to contain gaps; these gaps are filled with missing values.

◁

▷ Example 5: Importing series at a desired frequency

Continuing with example 4, at times you may wish to import a high-frequency series at a particular lower frequency. This is accomplished with the `aggregate()` option. There are three aggregation methods available: you may take the within-period average, the sum, or the end-of-period value. The default is to take the within-period average.

```
. import fred GDPC1 GDPDEF FEDFUNDS, aggregate(quarterly) clear
Summary
```

Series ID	Nobs	Date range	Frequency
GDPC1	312	1947-01-01 to 2024-10-01	Quarterly
GDPDEF	312	1947-01-01 to 2024-10-01	Quarterly
FEDFUNDS	282	1954-07-01 to 2024-10-01	Quarterly

```
# of series imported: 3
   highest frequency: Quarterly
    lowest frequency: Quarterly
. list if year(daten)==1959, separator(4)
```

	datestr	daten	GDPC1	GDPDEF	FEDFUNDS
49.	1959-01-01	01jan1959	3352.129	15.224	2.57
50.	1959-04-01	01apr1959	3427.667	15.248	3.08
51.	1959-07-01	01jul1959	3430.057	15.307	3.58
52.	1959-10-01	01oct1959	3439.832	15.367	3.99

The monthly series FEDFUNDS has been reduced to quarterly frequency. The value of FEDFUNDS for the first quarter of 1959, 2.57, is the average of its values for the three months in that quarter. The date variable `daten` now stores the first date of each quarter.

◁

▷ Example 6: Importing a subset of observations

The `daterange()` option causes `import fred` to restrict importing of data to only observations within the specified beginning and ending dates. `daterange()` takes two arguments, both of which must be either daily dates or missing (`.`). If a missing value is used for the first date, then all observations from the beginning up to the end date are imported. If a missing value is used for the second date, then all observations from the first date through the most current are imported.

Returning to example 4, we may wish to import only data between 1984 and 2005 for GDPC1, GDPDEF, and FEDFUNDS.

```
. import fred GDPC1 GDPDEF FEDFUNDS, daterange(1984-01-15 2005-12-31) clear
Summary
─────────────────────────────────────────────────────────────────────────────────
Series ID                    Nobs    Date range                Frequency
─────────────────────────────────────────────────────────────────────────────────
GDPC1                        88      1984-01-01 to 2005-10-01  Quarterly
GDPDEF                       88      1984-01-01 to 2005-10-01  Quarterly
FEDFUNDS                     264     1984-01-01 to 2005-12-01  Monthly
─────────────────────────────────────────────────────────────────────────────────
# of series imported: 3
   highest frequency: Monthly
    lowest frequency: Quarterly
```

Note that GDPC1 and GDPDEF now have 88 observations rather than 278; similarly, FEDFUNDS has 264 observations rather than 745.

◁

Importing historical vintage data

In example 1, we imported monthly data on the exchange rate between the US Dollar and the Japanese Yen. The observations on EXJPUS listed in that example were observed end-of-day values. In contrast, the values in many FRED series, like the US real gross domestic product series (`GDPC1`), are estimates. The values of observed series do not change over time. The values of estimated series change over time because the rules that define them change over time. A set of rules is known as a vintage.

FRED contains the most recent vintage of a given series. At times, you may wish to import prior vintages or to view the series as it would have been seen on a particular date in history. ALFRED contains prior vintages of economic data and allows you to import data as they were seen on a particular date in history. For example, you may import the real GDP series that you would have had access to on October 15, 2008.

By default, `import fred` imports data from the current vintage. The `vintage()` and `realtime()` options allow you to import data from prior vintages. You can request a single date, multiple dates, all vintages between two dates in history, or the complete revision history.

▷ Example 7: Importing vintages by date

We wish to import the gross national product (GNP) series as it would have been available on September 16, 2008 and September 16, 2009, so we specify these dates in the `vintage()` option. We also use the `daterange()` option to import only observations since 2006:

```
. import fred GNPC96, vintage(2008-09-16 2009-09-16) daterange(2006-01-01 .)
> clear
Summary
─────────────────────────────────────────────────────────────────────────────────
Series ID                    Nobs    Date range                  Frequency
─────────────────────────────────────────────────────────────────────────────────
GNPC96_20080916              10      2006-01-01 to 2008-04-01   Quarterly
GNPC96_20090916              14      2006-01-01 to 2009-04-01   Quarterly
─────────────────────────────────────────────────────────────────────────────────
# of series imported: 2
   highest frequency: Quarterly
    lowest frequency: Quarterly
. list, separator(4) abbreviate(16)
```

	datestr	daten	GNPC96_20080916	GNPC96_20090916
1.	2006-01-01	01jan2006	11286.5	12994.2
2.	2006-04-01	01apr2006	11365.1	13035.4
3.	2006-07-01	01jul2006	11370.8	13025.1
4.	2006-10-01	01oct2006	11426.5	13129.5
5.	2007-01-01	01jan2007	11419.1	13160.5
6.	2007-04-01	01apr2007	11541.7	13275.9
7.	2007-07-01	01jul2007	11719.9	13451.5
8.	2007-10-01	01oct2007	11758.3	13563.3
9.	2008-01-01	01jan2008	11760.9	13525.4
10.	2008-04-01	01apr2008	11835.9	13533.7
11.	2008-07-01	01jul2008	.	13470.7
12.	2008-10-01	01oct2008	.	13240.5
13.	2009-01-01	01jan2009	.	13018.1
14.	2009-04-01	01apr2009	.	12991.6

We specified one series and two vintage dates, so we have imported two series. Each vintage is named with the series requested and the date that it was requested. For example, the series GNPC96_20080916 reports real GNP as it was available on 16 September 2008. Note that the series is appended with the date requested, not the date the vintage was released.

These two vintages of GNPC96 differ dramatically because they are on different scales. The output also illustrates that, as of 16 September 2008, data on GNPC96 were only available through 1 April 2008.
◁

▷ Example 8: Importing vintages by real-time period

You may also wish to obtain the complete vintage history of a series between two dates. For example, we import all the vintages of real GNP from December 2007 through July 2010 by specifying this date range in the `realtime()` option.

```
. import fred GNPC96, realtime(2007-12-01 2010-07-31) clear
Summary
--------------------------------------------------------------------------------
Series ID                    Nobs    Date range                Frequency
--------------------------------------------------------------------------------
GNPC96_20071201              243     1947-01-01 to 2007-07-01  Quarterly
GNPC96_20071220              243     1947-01-01 to 2007-07-01  Quarterly
GNPC96_20080327              244     1947-01-01 to 2007-10-01  Quarterly
GNPC96_20080529              245     1947-01-01 to 2008-01-01  Quarterly
GNPC96_20080626              245     1947-01-01 to 2008-01-01  Quarterly
GNPC96_20080731              245     1947-01-01 to 2008-01-01  Quarterly
GNPC96_20080828              246     1947-01-01 to 2008-04-01  Quarterly
GNPC96_20080926              246     1947-01-01 to 2008-04-01  Quarterly
GNPC96_20081125              247     1947-01-01 to 2008-07-01  Quarterly
GNPC96_20081223              247     1947-01-01 to 2008-07-01  Quarterly
GNPC96_20090326              248     1947-01-01 to 2008-10-01  Quarterly
GNPC96_20090529              249     1947-01-01 to 2009-01-01  Quarterly
GNPC96_20090625              249     1947-01-01 to 2009-01-01  Quarterly
GNPC96_20090731              249     1947-01-01 to 2009-01-01  Quarterly
GNPC96_20090817              249     1947-01-01 to 2009-01-01  Quarterly
GNPC96_20090827              250     1947-01-01 to 2009-04-01  Quarterly
GNPC96_20090930              250     1947-01-01 to 2009-04-01  Quarterly
GNPC96_20091124              251     1947-01-01 to 2009-07-01  Quarterly
GNPC96_20091222              251     1947-01-01 to 2009-07-01  Quarterly
GNPC96_20100326              252     1947-01-01 to 2009-10-01  Quarterly
GNPC96_20100527              253     1947-01-01 to 2010-01-01  Quarterly
GNPC96_20100625              253     1947-01-01 to 2010-01-01  Quarterly
GNPC96_20100730              253     1947-01-01 to 2010-01-01  Quarterly
GNPC96_20100731              253     1947-01-01 to 2010-01-01  Quarterly
--------------------------------------------------------------------------------
# of series imported: 24
   highest frequency: Quarterly
    lowest frequency: Quarterly
```

Each series contains the data from a vintage, and each series' name is appended with the date that the vintage was released.

◁

Different vintages of a series may not be directly comparable. For example, the units of a series may change over time. The different vintages must be converted to a common unit before they are analyzed, and it is crucial that you be aware of the units of the vintages you are analyzing.

Note that there is slightly different behavior depending on whether you specify vintage dates or import all vintages within a real-time period. If you specify a list of dates, then each vintage will be named `series_date`. On the other hand, if you import every vintage between two dates using the `realtime()` option, then each vintage will be named `series_vintage_date`. This behavior follows FRED's behavior when handling vintages.

Searching, saving, and retrieving series information

`fredsearch` finds series that match keywords or tags. Around 5,000 tags are supplied by FRED. You can also search by keywords, which will search for the keyword anywhere in the metadata of a series.

You can save the names of the series found by a search to a file and then import these series. The following example uses tags in combination with keywords to import median income per capita for states in the United States.

▷ Example 9: Using the search engine

Suppose we wish to import median income per capita for each state. This requires us to identify 51 series, one for each state and the District of Columbia. The series IDs may follow some pattern, but it is not immediately obvious what those IDs are. We could use the FRED interface, as in example 3, or we could use `fredsearch` to search for the relevant series, save the IDs to a file, and use that file to load the correct series. This example takes the latter approach.

The `fredsearch` command invokes the search engine. `fredsearch` *keywords* allows you to search for *keywords* anywhere in the series metadata. The `tags()` option allows you to filter the search results using some of FRED's 5,000 designated tags.

```
. fredsearch median household income, tags(state real)

Series ID          Title                  Data range                Frequency

MEHOINUSNYA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSCAA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSTXA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSMIA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSFLA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSMNA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSDCA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSAZA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSMAA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSUTA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSPAA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSALA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSOHA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSINA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSILA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSNJA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSCTA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSCOA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSVAA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSKYA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSOKA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSNCA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSMOA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSWIA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSRIA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSWAA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSHIA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSGAA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSMSA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSARA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSIAA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSWVA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSSCA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSNEA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
MEHOINUSNHA672N    Real Median Househ...  1984-01-01 to 2023-01-01  Annual
  (output omitted)

Total: 51
```

In the above search command, we searched FRED for all series containing "median", "household", and "income" somewhere in their metadata, and restricted the search to series with the tags "state" (for states) and "real" (for inflation-adjusted series). The result is 51 series, one for each state and the District of Columbia.

`fredsearch` provides information about series but does not import them. We can save the search results to a file, then import all series that matched our search results:

```
. fredsearch median household income, tags(state real) saving(myfile.dta)
(51 series added to myfile.dta)
. import fred, serieslist(myfile.dta) clear
Summary
```

Series ID	Nobs	Date range	Frequency
MEHOINUSNYA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSCAA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSTXA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSMIA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSFLA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSMNA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSDCA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSAZA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSMAA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSUTA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSPAA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSALA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSOHA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSINA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSILA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSNJA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSCTA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSCOA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSVAA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSKYA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSOKA672N	40	1984-01-01 to 2023-01-01	Annual
MEHOINUSNCA672N	40	1984-01-01 to 2023-01-01	Annual
(output omitted)			

```
# of series imported: 51
   highest frequency: Annual
    lowest frequency: Annual
```

This example showed how to quickly import 51 series for median household income by state. A similar procedure can quickly isolate and import the roughly 200 series that report data on infant mortality by country or the roughly 200 series that report the investment share of GDP by country.

◁

Describing series

`freddescribe` provides facilities to describe series based on their metadata. `freddescribe` *series_list* provides a brief summary of *series_list*. The series are only described, not imported.

With the `detail` option, detailed series metadata are displayed, including the full title of the series, the source agency, the source data release, seasonal adjustment, date range for which observations exist, frequency of observations, units, date and time that the series was last updated, and notes, which contain FRED's notes about the series. Finally, the full metadata includes a list of all vintage dates associated with the series.

Specifying the `realtime(`*start end*`)` option on `freddescribe` provides information about a series by a real-time period. This option allows you to see how a series' units have changed over time. `freddescribe` will display the series description for each vintage between the specified start and end dates.

`freddescribe, realtime(.` *end*`)` describes all vintages from the first available vintage up to that of *end*. Similarly, `freddescribe,realtime(`*start* `.)` describes all vintages from *start* up through the most current vintage available.

▷ Example 10: Describing series

Suppose we wish to know what vintages are available for real GDP, whose FRED series name is `GDPC1`. We use `freddescribe` with the `detail` option to list all the vintages.

```
. freddescribe GDPC1, detail
--------------------------------------------------------------------------------
GDPC1
--------------------------------------------------------------------------------
Title:                 Real Gross Domestic Product
Source:                U.S. Bureau of Economic Analysis
Release:               Gross Domestic Product
Seasonal adjustment:   Seasonally Adjusted Annual Rate
Date range:            1947-01-01 to 2024-10-01
Frequency:             Quarterly
Units:                 Billions of Chained 2017 Dollars
Last updated:          2025-03-27 08:03:25-05
Notes:                 BEA Account Code: A191RX  Real gross domestic product i...
Vintage dates:         1991-12-04  1991-12-20  1992-01-29  1992-02-28  1992-03-26
                       1992-04-28  1992-05-29  1992-06-25  1992-07-30  1992-08-27
                       1992-09-24  1992-10-27  1992-11-25  1992-12-22  1993-01-28
                       1993-02-26  1993-03-26  1993-04-29  1993-05-28  1993-06-23
                       1993-07-29  1993-08-31  1993-09-29  1993-10-28  1993-12-01
                       1993-12-22  1994-01-28  1994-03-01  1994-03-31  1994-04-28
                       1994-05-27  1994-06-29  1994-07-29  1994-08-26  1994-09-29
                       1994-10-28  1994-11-30  1994-12-22  1995-01-27  1995-03-01
                       1995-03-31  1995-04-28  1995-05-31  1995-06-30  1995-07-28
                       1995-08-30  1995-09-29  1995-10-27  1996-01-19  1996-02-23
       (output omitted)
--------------------------------------------------------------------------------
Total: 1
```

Vintages since 1991 are available for download. If we had not specified `detail`, only the series name, start and end date, and frequency would have been displayed.

◁

▷ Example 11: Obtaining historical descriptions

Information for real GNP in the United States is contained in FRED series GNPC96. Real GNP is expressed in the units of some base year, and over time the base year changes. In this example, we will examine how the units for GNPC96 have changed over time by requesting a description of all vintages up through December 31, 2015 using the realtime() option.

```
. freddescribe GNPC96, realtime(. 2015-12-31)
─────────────────────────────────────────────────────────────────────────────────────

Series ID          Real time                  Units
─────────────────────────────────────────────────────────────────────────────────────

GNPC96             1958-12-21 to 1959-02-18  Billions of 1957 Dollars
GNPC96             1959-02-19 to 1965-08-18  Billions of 1954 Dollars
GNPC96             1965-08-19 to 1976-01-15  Billions of 1958 Dollars
GNPC96             1976-01-16 to 1985-12-19  Billions of 1972 Dollars
GNPC96             1985-12-20 to 1991-12-03  Billions of 1982 Dollars
GNPC96             1991-12-04 to 1996-01-18  Billions of 1987 Dollars
GNPC96             1996-01-19 to 1999-10-28  Billions of Chained 1992 Dollars
GNPC96             1999-10-29 to 2003-12-09  Billions of Chained 1996 Dollars
GNPC96             2003-12-10 to 2009-07-30  Billions of Chained 2000 Dollars
GNPC96             2009-07-31 to 2013-07-30  Billions of Chained 2005 Dollars
GNPC96             2013-07-31 to 2015-12-31  Billions of Chained 2009 Dollars
─────────────────────────────────────────────────────────────────────────────────────
Total: 11
```

Vintages for this series begin in 1958. A new row signifies a change in units. There are 11 total changes in units in GNPC96. Every vintage of GNPC96 between 2009-07-31 and 2013-07-30, for example, is in the units "Billions of chained 2005 dollars". Meanwhile, vintages since 2013-07-30 are in units "Billions of chained 2009 dollars". Real GNP vintages from 2010 and 2014 will not be immediately comparable due to the difference in units; they should be converted into a common unit before analysis.

Additional information by real-time period can be obtained by specifying the `detail` option. We can inspect the details of vintages since 2008:

```
. freddescribe GNPC96, detail realtime(2007-12-31 2013-01-15)
--------------------------------------------------------------------------------
GNPC96                                               2007-12-31 to 2009-07-30
--------------------------------------------------------------------------------
Title:                  Real Gross National Product
Source:                 U.S. Bureau of Economic Analysis
Release:                Gross Domestic Product
Seasonal adjustment:    Seasonally Adjusted Annual Rate
Date range:             1947-01-01 to 2009-01-01
Frequency:              Quarterly
Units:                  Billions of Chained 2000 Dollars
Last updated:           2009-06-25 10:47:06-05
Notes:                  BEA Account Code: A001RX1  A Guide to the National Inco...
Vintage dates:          2008-03-27  2008-05-29  2008-06-26  2008-07-31  2008-08-28
                        2008-09-26  2008-11-25  2008-12-23  2009-03-26  2009-05-29
                        2009-06-25
--------------------------------------------------------------------------------
GNPC96                                               2009-07-31 to 2013-01-15
--------------------------------------------------------------------------------
Title:                  Real Gross National Product
Source:                 U.S. Bureau of Economic Analysis
Release:                Gross Domestic Product
Seasonal adjustment:    Seasonally Adjusted Annual Rate
Date range:             1947-01-01 to 2012-07-01
Frequency:              Quarterly
Units:                  Billions of Chained 2005 Dollars
Last updated:           2012-12-20 08:17:16-06
Notes:                  BEA Account Code: A001RX1  A Guide to the National Inco...
Vintage dates:          2009-07-31  2009-08-17  2009-08-27  2009-09-30  2009-11-24
                        2009-12-22  2010-03-26  2010-05-27  2010-06-25  2010-07-30
                        2010-08-27  2010-09-30  2010-11-23  2010-12-22  2011-03-25
                        2011-05-26  2011-06-24  2011-07-29  2011-08-26  2011-09-29
                        2011-11-22  2011-12-22  2012-03-29  2012-05-31  2012-06-28
                        2012-07-27  2012-08-29  2012-09-27  2012-11-29  2012-12-20
--------------------------------------------------------------------------------
Total: 2
```

The `detail` option provides much of the same information as it did without `realtime()`, but now a new `detail` block is provided for each vintage where the details themselves change. Most of the details remain constant across vintages, but in this example, “Units” and “Date range” are different for each block.

The vintage list is now separated, with each vintage falling into the appropriate `describe` block. For example, all vintages of GNPC96 in 2010 have metainformation corresponding to the block that describes vintages from 2009-07-31 to 2013-01-15.

◁

Stored results

`fredsearch` stores the following in `r()`:

Scalars

`r(series_ids)`	list of series IDs contained in the search results

References

Drukker, D. M. 2006. Importing Federal Reserve economic data. *Stata Journal* 6: 384–386.

Schenck, D. 2017. Importing data with import fred. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2017/08/08/importing-data-with-import-fred/.

Also see

[D] **import** — Overview of importing data into Stata

[D] **import delimited** — Import and export delimited text data

[D] **import haver** — Import data from Haver Analytics databases

[D] **odbc** — Load, write, or view data from ODBC sources

[TS] **tsset** — Declare data to be time-series data

import haver — Import data from Haver Analytics databases

Description | Quick start | Menu | Syntax
Options | Remarks and examples | Stored results | Also see

Description

Haver Analytics (https://www.haver.com) provides economic and financial databases to which you can purchase access. The `import haver` command allows you to use those databases with Stata. The `import haver` command is provided only with Stata for Windows.

`import haver` *seriesdblist* loads data from one or more Haver databases into Stata's memory.

`import haver` *seriesdblist*`, describe` describes the contents of one or more Haver databases.

If a database is specified without a suffix, then the suffix `.dat` is assumed.

`import haver` accesses Haver Analytics databases that reside on your local network. For accessing Haver Analytics cloud databases, see [D] **import haverdirect**. The two commands employ a near-identical syntax.

Quick start

Describe available time span, frequency of measurement, and source of series E for net fixed assets and consumer durables from the Haver Analytics CAPSTOCK database

```
import haver E@CAPSTOCK, describe
```

Load all available observations for quarterly series ASACX and ASAHS from the US1PLUS database

```
import haver (ASACX ASAHS)@US1PLUS
```

Same as above, but restrict data to the first quarter of 2000 through the fourth quarter of 2010

```
import haver (ASACX ASAHS)@US1PLUS, fin(2000q1,2010q4)
```

Menu

File > Import > Haver Analytics database

Syntax

Load Haver data

import haver *seriesdblist* [, *load_options*]

Load Haver data using a dataset of Haver series descriptions stored in memory

import haver, frommemory [*load_options*]

Describe contents of Haver database

import haver *seriesdblist*, describe [*describe_options*]

Specify the directory where the Haver databases are stored

set haverdir "*path*" [, permanently]

load_options	Description
fin([*datestring*], [*datestring*])	load data within specified date range
fwithin([*datestring*], [*datestring*])	same as fin() but exclude the endpoints of range
tvar(*varname*)	create time variable *varname*
case(lower | upper)	read variable names as lowercase or uppercase
hmissing(*misval*)	record missing values as *misval*
aggmethod(strict | relaxed | force)	set how temporal aggregation calculations deal with missing data
frommemory	load data using file in memory
clear	clear data in memory before loading Haver database

frommemory and clear do not appear in the dialog box.

describe_options	Description
* describe	describe contents of *seriesdblist*
detail	list full-series information table for each series
saving(*filename* [, verbose replace])	save series information to *filename*.dta
frame(*framename* [, verbose replace])	save series information to *framename*

*describe is required.

collect is allowed with import haver; see **[U] 11.1.10 Prefix commands**.

seriesdblist is one or more of the following:

dbfile

series@*dbfile*

(*series series* ...)@*dbfile*

dbfile is the name of a Haver Analytics database and *series* contains a Haver Analytics series. Wildcards `?` and `*` are allowed in *series*. *series* and *dbfile* are not case sensitive.

Example: `import haver gdp@usecon`
Import series GDP from the USECON database.

Example: `import haver gdp@usecon c1*@ifs`
Import series GDP from the USECON database, and import any series that starts with `c1` from the IFS database.

Note: You must specify a path to the database if you did not use the `set haverdir` command.

Example: `import haver gdp@"C:\data\usecon" c1*@"C:\data\ifs"`

If you do not specify a path to the database and you did not `set haverdir`, then `import haver` will look in the current working directory for the database.

Options

Options are presented under the following headings:

Options for import haver
Options for import haver, describe
Option for set haverdir

Options for import haver

`fin(`[*datestring*]`,` [*datestring*]`)` specifies the date range of the data to be loaded. *datestring* must adhere to the Stata default for the different frequencies. See [D] **Datetime display formats**. Examples are 23mar2012 (daily and weekly), 2000m1 (monthly), 2003q4 (quarterly), and 1998 (annually). `fin(1jan1999, 31dec1999)` would mean from and including 1 January 1999 through 31 December 1999. Note that weekly data must be specified as daily data because Haver-week data are conceptually different from Stata-week data.

`fin()` also determines the aggregation frequency. If you want to retrieve data in a frequency that is lower than the one in which the data are stored, specify the dates in option `fin()` accordingly. For example, to retrieve series that are stored in quarterly frequency into an annual dataset, you can type `fin(1980,2010)`.

If the first *datestring* is not specified, the first date in the series is used as the start of the date range. If the second *datestring* is not specified, the last date in the series is used as the end of the date range.

`fwithin(`[*datestring*]`,` [*datestring*]`)` functions the same as `fin()`, except that the endpoints of the range will be excluded in the loaded data.

`tvar(`*varname*`)` specifies the name of the time variable Stata will create. The default is `tvar(time)`. The `tvar()` variable is the name of the variable that you would use to `tsset` the data after loading, although doing so is unnecessary because `import haver` automatically `tsset`s the data for you.

`case(lower | upper)` specifies the case of the variable names after import. The default is `case(lower)`.

`hmissing(`*misval*`)` specifies which of Stata's 27 missing values (`.`, `.a`, ..., `.z`) to record when there are missing values in the Haver database.

Two kinds of missing values can be distinguished. The first occurs when Haver has recorded a Haver missing value within the time span covered by a series; by default, these are stored as `.` by Stata, but you can use `hmissing()` to specify that a different extended missing-value code be used. The second occurs when nothing is recorded because the data do not span the entire range; these missing values are always stored as `.` by Stata. The `hmissing()` option does not apply to these observations.

See [U] 12.2.1 Missing values for more information on extended missing values.

`aggmethod(strict|relaxed|force)` specifies a method of temporal aggregation in the presence of missing observations. `aggmethod(strict)` is the default aggregation method.

Most Haver series of higher-than-annual frequency have an aggregation type that determines how data can be aggregated. The three aggregation types are average (AVG), sum (SUM), and end of period (EOP). Each aggregation method behaves differently for each aggregation type.

An aggregated span is a time period expressed in the original frequency. The goal is to aggregate the data in an aggregation span to a single observation in the (lower) target frequency. For example, 1973m1–1973m3 is an aggregated span for quarterly aggregation to 1973q1.

`strict` aggregation method:

1) (Average) The aggregated value is the average value if no observation in the aggregated span is missing; otherwise, the aggregated value is missing.
2) (Sum) The aggregated value is the sum if no observation in the aggregated span is missing; otherwise, the aggregated value is missing.
3) (End of period) The aggregated value is the series value in the last period in the aggregated span, be it missing or not.

`relaxed` aggregation method:

1) (Average) The aggregated value is the average value as long as there is one nonmissing data point in the aggregated span; otherwise, the aggregated value is missing.
2) (Sum) The aggregated value is the sum if no observation in the aggregated span is missing; otherwise, the aggregated value is missing.
3) (End of period) The aggregated value is the last available nonmissing data point in the aggregated span; otherwise, the aggregated value is missing. For the last aggregated span of the series, the `strict` aggregation method is applied.

`force` aggregation method:

1) (Average) The aggregated value is the average value as long as there is one nonmissing data point in the aggregated span; otherwise, the aggregated value is missing.
2) (Sum) The aggregated value is the sum if there is at least one nonmissing data point in the aggregated span; otherwise, the aggregated value is missing.
3) (End of period) The aggregated value is the last available nonmissing data point in the aggregated span; otherwise, the aggregated value is missing. This rule is also applied to the last aggregated span of the series.

The following options are available with `import haver` but are not shown in the dialog box:

`frommemory` specifies that each observation of the dataset in memory specify the information for a Haver series to be imported. The dataset in memory must contain variables named `path`, `file`, and `series`. The observations in `path` specify paths to Haver databases, the observations in `file` specify Haver databases, and the observations in `series` specify the series to import.

`clear` clears the data in memory before loading the Haver database.

Options for import haver, describe

`describe` describes the contents of one or more Haver databases.

`detail` specifies that a detailed report of all the information available on the variables be presented.

`saving(`*filename*[`, verbose replace`]`)` saves the series meta-information to a Stata dataset. By default, the series meta-information is not displayed to the Results window, but you can use the `verbose` suboption to display it. `replace` specifies that *filename* be overwritten if it exists.

`saving()` saves a Stata dataset that can subsequently be used with the `frommemory` option.

`frame(`*framename*[`, verbose replace`]`)` stores the series meta-information to a Stata frame. By default, the series meta-information is not displayed to the Results window, but you can use the `verbose` suboption to display it. `replace` specifies that *framename* be overwritten if it exists.

`frame()` stores a Stata frame that can subsequently be used with the `frommemory` option. You must `frame change` to the specified *framename* before using `import haver` with the `frommemory` option to load the data.

Option for set haverdir

`permanently` specifies that in addition to making the change right now, the `haverdir` setting be remembered and become the default setting when you invoke Stata.

Remarks and examples

Remarks are presented under the following headings:

Installation

Haver Analytics (https://www.haver.com) provides more than 200 economic and financial databases in the form of `.dat` files to which you can purchase access. The `import haver` command provides easy access to those databases from Stata. `import haver` is provided only with Stata for Windows.

Setting the path to Haver databases

If you want to retrieve data from Haver Analytics databases, you must discover the directory in which the databases are stored. This will most likely be a network location. If you do not know the directory, contact your technical support staff or Haver Analytics (https://www.haver.com). Once you have determined the directory location—for example, `H:\haver_files`—you can save it by using the command

```
. set haverdir "H:\haver_files\", permanently
```

Using the `permanently` option will preserve the Haver directory information between Stata sessions. Once the Haver directory is set, you can start retrieving data. For example, if you are subscribing to the USECON database, you can type

```
. import haver gdp@usecon
```

to load the GDP series into Stata. If you did not use `set haverdir`, you would type

```
. import haver gdp@"H:\haver_files\usecon"
```

The directory path passed to `set haverdir` is saved in the `creturn` value `c(haverdir)`. You can view it by typing

```
. display "`c(haverdir)'"
```

Download example Haver databases

There are three example Haver databases you can download to your working directory. Run the `copy` commands below to download HAVERD, HAVERW, and HAVERMQA.

```
. copy https://www.stata.com/haver/HAVERD.DAT haverd.dat
. copy https://www.stata.com/haver/HAVERD.IDX haverd.idx
. copy https://www.stata.com/haver/HAVERW.DAT haverw.dat
. copy https://www.stata.com/haver/HAVERW.IDX haverw.idx
. copy https://www.stata.com/haver/HAVERMQA.DAT havermqa.dat
. copy https://www.stata.com/haver/HAVERMQA.IDX havermqa.idx
```

To use these files, you need to make sure your Haver directory is not set:

```
. set haverdir ""
```

Determining the contents of a Haver database

`import haver` *seriesdblist*`, describe` displays the contents of a Haver database. If no series is specified, then all series are described. Below, we describe the Haver database `haverd.dat`, which we already have on our computer and in our current directory.

```
. import haver haverd, describe
Dataset: haverd
─────────────────────────────────────────────────────────────────────────────────
Variable    Description                 Time span              Frequency Source
─────────────────────────────────────────────────────────────────────────────────
FXTWB       Nominal Broad Trade-W..     03jan2005-02mar2012    Daily     FRB
FXTWM       Nominal Trade-Weighte..     03jan2005-02mar2012    Daily     FRB
FXTWOTP     Nominal Trade-Weighte..     03jan2005-02mar2012    Daily     FRB
─────────────────────────────────────────────────────────────────────────────────
Summary
─────────────────────────────────────────────────────────────────────────────────
    Number of series described: 3
              Series not found: 0
```

By default, each line of the output corresponds to one Haver series. Specifying `detail` displays more information about each series, and specifying *seriesname*`@` allows us to restrict the output to the series that interests us:

```
. import haver FXTWB@haverd, describe detail
─────────────────────────────────────────────────────────────────────────────────
FXTWB          Nominal Broad Trade-Weighted Exchange Value of the US$ (1/97=100)
─────────────────────────────────────────────────────────────────────────────────
    Frequency: Daily                     Time span: 03jan2005-02mar2012
    Number of observations: 1870         Date modified: 07mar2012 11:27:33
    Aggregation type: AVG                Decimal precision: 4
    Difference type: 0                   Magnitude: 0
    Data type: INDEX                     Group: R03
    Primary geography code: 111          Secondary geography code:
    Source: FRB                          Source description: Federal Reserv..
Summary
─────────────────────────────────────────────────────────────────────────────────
    Number of series described: 1
              Series not found: 0
```

You can describe multiple Haver databases with one command:

```
. import haver haverd haverw, describe
```
(*output omitted*)

To restrict the output to the series that interest us for each database, you could type

```
. import haver (FXTWB FXTWOTP)@haverd FARVSN@haverw, describe
```
(*output omitted*)

Loading a Haver database

`import haver` *seriesdblist* loads Haver databases. If no series is specified, then all series are loaded.

```
. import haver haverd, clear
Summary
─────────────────────────────────────────────────────────────────────────────
      Haver data retrieval: 10 Jul 2024 11:59:42
 Number of series requested: 3
 Number of database(s) used: 1 (HAVERD)
      All series have been successfully retrieved.
Frequency
─────────────────────────────────────────────────────────────────────────────
    Highest Haver frequency: Daily
     Lowest Haver frequency: Daily
 Frequency of Stata dataset: Daily
```

The table produced by `import haver` *seriesdblist* displays a summary of the loaded data and frequency information about the loaded data. For other queries, there may be additional output about query errors and query notes; this is shown only if needed.

The dataset now contains a time variable and three variables retrieved from the HAVERD database:

```
. describe
Contains data
 Observations:         1,870
    Variables:             4
─────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
─────────────────────────────────────────────────────────────────────────────
time            double   %td
fxtwb_haverd    double   %10.0g               Nominal Broad Trade-Weighted
                                                Exchange Value of the US$
                                                (1/97=100)
fxtwm_haverd    double   %10.0g               Nominal Trade-Weighted Exch Value
                                                of US$ vs Major Currencies
                                                (3/73=100)
fxtwotp_haverd  double   %10.0g               Nominal Trade-Weighted Exchange
                                                Value of US$ vs OITP (1/97=100)
─────────────────────────────────────────────────────────────────────────────
Sorted by: time
     Note: Dataset has changed since last saved.
```

Haver databases include the following meta-information about each variable, although the information available will vary depending on the series:

HaverDB	database name
Series	series name
DateTimeMod	date and time the series was last modified
Frequency	frequency of series (from daily to annual) as it is stored in the Haver database
Magnitude	magnitude of the data
DecPrecision	number of decimals to which the variable is recorded
DifType	relevant within Haver software only: if equal to 1, percentage calculations are not allowed
AggType	temporal aggregation type (one of AVG, SUM, or EOP; or, if not defined, one of NA or NA_ANNUAL)
DataType	type of data (for example, ratio, index, US$, or percentage)
Group	Haver series group to which the variable belongs
Geography1	primary geography code
Geography2	secondary geography code (missing if not applicable)
StartDate	start date for data as it is stored in the Haver database
EndDate	end date for data as it is stored in the Haver database
Source	Haver code associated with the source for the data
SourceDescription	description of Haver code associated with the source for the data

When a variable is loaded, this meta-information is stored in variable characteristics (see [P] **char**). Those characteristics can be viewed using `char list`:

```
. char list fxtwb_haverd[]
  fxtwb_haverd[HaverDB]:      HAVERD
  fxtwb_haverd[Series]:       FXTWB
  fxtwb_haverd[DateTimeMod]:  07mar2012 11:27:33
  fxtwb_haverd[Frequency]:    Daily
  fxtwb_haverd[Magnitude]:    0
  fxtwb_haverd[DecPrecision]: 4
  fxtwb_haverd[DifType]:      0
  fxtwb_haverd[AggType]:      AVG
  fxtwb_haverd[DataType]:     INDEX
  fxtwb_haverd[Group]:        R03
  fxtwb_haverd[Geography1]:   111
  fxtwb_haverd[StartDate]:    03jan2005
  fxtwb_haverd[EndDate]:      02mar2012
  fxtwb_haverd[Source]:       FRB
  fxtwb_haverd[SourceDescription]:
                              Federal Reserve Board
```

You can load multiple Haver databases/series with one command. To load the series FXTWB and FXTWOTP from the HAVERD database and all series that start with V from the HAVERMQA database, you would type

```
. import haver (FXTWB FXTWOTP)@haverd V*@havermqa, clear
  (output omitted)
```

`import haver` automatically `tsset`s the data for you. You can issue `tsset` to see how the data are currently set.

Loading a Haver database from a describe file

You often need to search through the series information of a Haver database or databases to see which series you would like to load. You can do this by saving the output of `import haver, describe` to a Stata dataset with the `saving(`*filename*`)` option. The dataset created can be used by `import haver, frommemory` to load data from the described Haver databases. For example, here we search through the series information of database HAVERMQA.

```
. import haver havermqa, describe saving(my_desc_file)
  (output omitted)
. use my_desc_file, clear
. describe
Contains data from my_desc_file.dta
 Observations:           161
    Variables:             8                  10 Jul 2024 11:59
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
path            str1    %-9s                  Path to Haver file
file            str8    %-9s                  Haver filename
series          str7    %-9s                  Series name
description     str80   %-80s                 Series description
startdate       str7    %-9s                  Start date
enddate         str7    %-9s                  End date
frequency       str9    %-9s                  Frequency
source          str3    %-9s                  Source
--------------------------------------------------------------------------------
Sorted by:
```

The resulting dataset contains information on the 164 series in HAVERMQA. Suppose that we want to retrieve all monthly series whose description includes the word "Yield". We need to keep only the observations from our dataset where the frequency variable equals "Monthly" and where the description variable contains "Yield".

```
. keep if frequency=="Monthly" & strpos(description,"Yield")
(152 observations deleted)
```

To load the selected series into Stata, we type

```
. import haver, frommemory clear
```

Note: We must `clear` the described data in memory to load the selected series. If you do not want to lose the changes you made to the description dataset, you must save it before using `import haver, frommemory`.

The `frame(`*framename*`)` option works similarly to the `saving(`*filename*`)` option, but instead of saving a file to disk, `frame()` stores the metadata in a frame. See [D] **frames** for more information on data frames.

Temporal aggregation

If you request series with different frequencies, the higher-frequency data will be aggregated to the lowest frequency. For example, if you request a monthly and a quarterly series, the monthly series will be aggregated. In rare cases, a series cannot be aggregated to a lower frequency and so will not be retrieved. A list of these series will be stored in `r(noaggtype)`.

The options `fin()` and `fwithin()` are useful for aggregating series by hand.

Daily and weekly data

Daily and weekly queries require additional explanations because these frequencies are implemented differently in Haver databases than in Stata datasets. A Haver daily series refers to a business daily frequency, which is five days per week and counts only Monday through Friday as observations. An exact match for Haver daily is Stata's business daily frequency (`%tb`), which uses a business-day calendar that excludes weekends and includes all weekdays throughout the year. Stata's daily frequency (`%td`), by contrast, counts all seven days of a week. This frequency is called 7-daily in Haver databases.

The implementations of the weekly frequency also differ between Haver and Stata. Haver's implementation counts one week after another, without any reference to the calendar year, thereby allowing for years that mostly have 52 observations but sometimes have 53 observations. Each Haver weekly data series has a value set for its controlling-day-of-week (CDOW) property. This is typically the weekday on which the data are released by the source. This information is preserved in a Stata characteristic called `cdow`. For example, the `cdow` characteristic for series `SP100@WEEKLY` is Friday.

Stata's `%tw` frequency counts weeks from the beginning of the year and caps the week number at 52. There are two ways in which Haver's weekly frequency can be exactly matched in Stata: either in Stata's daily frequency (`%td`) in combination with a delta of seven days (see [TS] **tsset**) or in a datetime business calendar (`%tb`), which here should count only one particular weekday as a valid business day.

The above discrepancies in frequency implementations are resolved in `import haver` in the following way: any query that exclusively consists of one or more of Haver 7-daily, Haver daily, or Haver weekly series results in a Stata dataset of Stata daily frequencies (`%td`). In that dataset,

> Haver 7-daily series receive rows for all seven days of the week covered by their span.
>
> Haver daily series receive rows for five days of the week (Monday through Friday) covered by their span.

Haver weekly series are assigned dates that correspond to their CDOW. For example, series `SP100@WEEKLY` has a CDOW of Friday and, at the time of writing, covers the time span 06jan1989–31may2024. Thus, in the Stata dataset, `SP100@WEEKLY` receives rows with dates 06jan1989, 13jan1989, ..., 24may2024, 31may2024 (these are all Fridays).

Note that if a query combines Haver 7-daily series and Haver daily series with one or more Haver weekly series, aggregation to weekly values is performed. For Haver 7-daily series, the values Monday through Sunday are aggregated to a single value, and the resulting (Haver weekly) series receives a CDOW of Sunday, with corresponding (Sunday) rows in the dataset. Similarly, for Haver daily series, the values Monday through Friday are aggregated to a single value, and the resulting (Haver weekly) series receives a CDOW of Friday, with corresponding (Friday) rows in the dataset.

Once you have queried your daily and weekly series, you may want to use Stata's `tsset` or business calendar features to further tailor the dataset toward your needs. Several ways for you to do this were indicated above.

When you aggregate Haver daily and Haver weekly series to lower frequencies (for example, monthly), the above considerations are not relevant. Another issue with these data is Haver aggregation modes. Haver daily and Haver weekly series often contain missing values due to events such as national holidays. When you aggregate to a lower frequency under the default aggregation mode `strict`, such missing values then result in aggregated values that are also set to missing. In such cases, you may want to consider using aggregation modes `relaxed` or `force`. See option `aggmethod()` for more details.

Stored results

import haver stores the following in r():

Scalars	
r(k_requested)	number of series requested
r(k_noaggtype)	number of series dropped because of invalid aggregation type
r(k_nodisagg)	number of series dropped because their frequency is lower than that of the output dataset
r(k_notinrange)	number of series dropped because data were out of the date range specified in fwithin() or fin()
r(k_notfound)	number of series not found in the database
Macros	
r(dbnamelist)	list of Haver databases used in command
r(noaggtype)	list of series dropped because of invalid aggregation type
r(nodisagg)	list of series dropped because their frequency is lower than that of the output dataset
r(notinrange)	list of series dropped because data were out of the date range specified in fwithin() or fin()
r(notfound)	list of series not found in the database

import haver, describe stores the following in r():

Scalars	
r(k_described)	number of series described
r(k_notfound)	number of series not found in the database
Macros	
r(notfound)	list of series not found in the database

Also see

[D] **import** — Overview of importing data into Stata

[D] **import delimited** — Import and export delimited text data

[D] **import fred** — Import data from Federal Reserve Economic Data

[D] **import haverdirect** — Import data from Haver Analytics cloud servers

[D] **jdbc** — Load, write, or view data from a database with a Java API

[D] **odbc** — Load, write, or view data from ODBC sources

[TS] **tsset** — Declare data to be time-series data

import haverdirect — Import data from Haver Analytics cloud servers

Description

Haver Analytics (https://www.haver.com) provides economic and financial databases to which you can purchase access. The `import haverdirect` command allows you to use those databases with Stata from Haver Analytics cloud servers. The `import haverdirect` command is provided only with Stata for Windows.

`import haverdirect` *seriesdblist* loads data from one or more Haver databases into Stata's memory.

`import haverdirect` *seriesdblist*`, describe` describes the contents of one or more Haver databases.

`import haverdirect` accesses Haver Analytics cloud databases. For accessing locally stored databases, see [D] **import haver**. The two commands employ a near-identical syntax.

Quick start

Describe available time span, frequency of measurement, and source for all foreign exchange rates from the Haver Analytics FXRATES database

```
import haverdirect FXRATES, describe
```

Load all available observations for quarterly series YCP and YCTL from the USECON database

```
import haverdirect (YCP YCTL)@USECON
```

Same as above, but restrict data to the first quarter of 2020 through the fourth quarter of 2023

```
import haverdirect (YCP YCTL)@USECON, fin(2020q1,2023q4)
```

Syntax

Authenticate with Haver Analytics cloud servers

`import haverdirect, authenticate`

Load Haver data

`import haverdirect` *seriesdblist* [, *load_options*]

Load Haver data using a dataset of Haver series descriptions stored in memory

`import haverdirect, frommemory` [*load_options*]

Describe contents of Haver database

`import haverdirect` *seriesdblist*`, describe` [*describe_options*]

load_options	Description
`fin(`[*datestring*]`,` [*datestring*]`)`	load data within specified date range
`fwithin(`[*datestring*]`,` [*datestring*]`)`	same as `fin()` but exclude the endpoints of range
`tvar(`*varname*`)`	create time variable *varname*
`case(lower`|`upper)`	read variable names as lowercase or uppercase
`hmissing(`*misval*`)`	record missing values as *misval*
`aggmethod(strict`|`relaxed`|`force)`	set how temporal aggregation calculations deal with missing data
`frommemory`	load data using file in memory
`clear`	clear data in memory before loading Haver database

describe_options	Description
* `describe`	describe contents of *seriesdblist*
`detail`	list full-series information table for each series
`saving(`*filename*[`, verbose replace`]`)`	save series information to *filename*`.dta`
`frame(`*framename*[`, verbose replace`]`)`	save series information to *framename*

*`describe` is required.

`collect` is allowed with `import haverdirect`; see **[U] 11.1.10 Prefix commands**.

seriesdblist is one or more of the following:

dbfile
series`@`*dbfile*
`(`*series series* ...`)@`*dbfile*

dbfile is the name of a Haver Analytics database and *series* contains a Haver Analytics series. Wildcards `?` and `*` are allowed in *series*. *series* and *dbfile* are not case sensitive.

Example: `import haverdirect gdp@usecon`
Import series GDP from the USECON database.

Example: `import haverdirect gdp@usecon c1*@ifs`
Import series GDP from the USECON database, and import any series that starts with `c1` from the IFS database.

Options

Options are presented under the following headings:

Options for import haverdirect
Options for import haverdirect, describe

Options for import haverdirect

`fin(`[*datestring*]`,` [*datestring*]`)` specifies the date range of the data to be loaded. *datestring* must adhere to the Stata default for the different frequencies. See [D] **Datetime display formats**. Examples are 23mar2012 (daily and weekly), 2000m1 (monthly), 2003q4 (quarterly), and 1998 (annually). `fin(1jan1999, 31dec1999)` would mean from and including 1 January 1999 through 31 December 1999. Note that weekly data must be specified as daily data because Haver-week data are conceptually different from Stata-week data.

`fin()` also determines the aggregation frequency. If you want to retrieve data in a frequency that is lower than the one in which the data are stored, specify the dates in option `fin()` accordingly. For example, to retrieve series that are stored in quarterly frequency into an annual dataset, you can type `fin(1980,2010)`.

If the first *datestring* is not specified, the first date in the series is used as the start of the date range. If the second *datestring* is not specified, the last date in the series is used as the end of the date range.

`fwithin(`[*datestring*]`,` [*datestring*]`)` functions the same as `fin()`, except that the endpoints of the range will be excluded in the loaded data.

`tvar(`*varname*`)` specifies the name of the time variable Stata will create. The default is `tvar(time)`. The `tvar()` variable is the name of the variable that you would use to `tsset` the data after loading, although doing so is unnecessary because `import haverdirect` automatically `tsset`s the data for you.

`case(lower | upper)` specifies the case of the variable names after import. The default is `case(lower)`.

`hmissing(`*misval*`)` specifies which of Stata's 27 missing values (`.`, `.a`, ..., `.z`) to record when there are missing values in the Haver database.

Two kinds of missing values can be distinguished. The first occurs when Haver has recorded a Haver missing value within the time span covered by a series; by default, these are stored as `.` by Stata, but you can use `hmissing()` to specify that a different extended missing-value code be used. The second occurs when nothing is recorded because the data do not span the entire range; these missing values are always stored as `.` by Stata. The `hmissing()` option does not apply to these observations.

See [U] **12.2.1 Missing values** for more information on extended missing values.

aggmethod(strict | relaxed | force) specifies a method of temporal aggregation in the presence of missing observations. aggmethod(strict) is the default aggregation method.

Most Haver series of higher-than-annual frequency have an aggregation type that determines how data can be aggregated. The three aggregation types are average (AVG), sum (SUM), and end of period (EOP). Each aggregation method behaves differently for each aggregation type.

An aggregated span is a time period expressed in the original frequency. The goal is to aggregate the data in an aggregation span to a single observation in the (lower) target frequency. For example, 1973m1–1973m3 is an aggregated span for quarterly aggregation to 1973q1.

strict aggregation method:

1) (Average) The aggregated value is the average value if no observation in the aggregated span is missing; otherwise, the aggregated value is missing.
2) (Sum) The aggregated value is the sum if no observation in the aggregated span is missing; otherwise, the aggregated value is missing.
3) (End of period) The aggregated value is the series value in the last period in the aggregated span, be it missing or not.

relaxed aggregation method:

1) (Average) The aggregated value is the average value as long as there is one nonmissing data point in the aggregated span; otherwise, the aggregated value is missing.
2) (Sum) The aggregated value is the sum if no observation in the aggregated span is missing; otherwise, the aggregated value is missing.
3) (End of period) The aggregated value is the last available nonmissing data point in the aggregated span; otherwise, the aggregated value is missing. For the last aggregated span of the series, the strict aggregation method is applied.

force aggregation method:

1) (Average) The aggregated value is the average value as long as there is one nonmissing data point in the aggregated span; otherwise, the aggregated value is missing.
2) (Sum) The aggregated value is the sum if there is at least one nonmissing data point in the aggregated span; otherwise, the aggregated value is missing.
3) (End of period) The aggregated value is the last available nonmissing data point in the aggregated span; otherwise, the aggregated value is missing. This rule is also applied to the last aggregated span of the series.

frommemory specifies that each observation of the dataset in memory specify the information for a Haver series to be imported. The dataset in memory must contain variables named database and series. The observations in database specify Haver databases, and the observations in series specify the series to import.

clear clears the data in memory before loading the Haver database.

Options for import haverdirect, describe

describe describes the contents of one or more Haver databases.

detail specifies that a detailed report of all the information available on the variables be presented.

`saving(`*filename*[`, verbose replace`]`)` saves the series meta-information to a Stata dataset. By default, the series meta-information is not displayed to the Results window, but you can use the `verbose` suboption to display it. `replace` specifies that *filename* be overwritten if it exists.

`saving()` saves a Stata dataset that can subsequently be used with the `frommemory` option.

`frame(`*framename*[`, verbose replace`]`)` stores the series meta-information to a Stata frame. By default, the series meta-information is not displayed to the Results window, but you can use the `verbose` suboption to display it. `replace` specifies that *framename* be overwritten if it exists.

`frame()` stores a Stata frame that can subsequently be used with the `frommemory` option. You must `frame change` to the specified *framename* before using `import haverdirect` with the `frommemory` option to load the data.

Remarks and examples

Remarks are presented under the following headings:

Installation

Haver Analytics (https://www.haver.com) provides more than 200 economic and financial databases. The `import haverdirect` command provides easy access to those databases from Stata. To use this command, you must subscribe to Haver Analytics services to access Haver Analytics cloud servers. Also, Haver Analytics DLXVG3 Direct software must be installed on your system for authentication with Haver Analytics cloud servers.

`import haverdirect` is provided only for Stata for Windows.

Authentication

If you want to retrieve data from Haver Analytics cloud servers, you must authenticate with the cloud servers. `import haverdirect` requires that the Haver Analytics DLXVG3 Direct client software be installed on your system for authentication when accessing Haver Analytics cloud servers.

By default, `import haverdirect` will try to authenticate using the DLXVG3 Direct client software. If you do not have an authentication token, you will be prompted for a email and password to receive an emailed login code. Once you have completed authentication using DLXVG3 Direct software, you can use `import haverdirect`. There might be cases where your authentication token expires while Stata is open. In these rare cases, type

```
import haverdirect, authenticate
```

For more information on the authentication process, please contact Haver Analytics.

Determining the contents of a Haver database

`import haverdirect` *seriesdblist*`, describe` displays the contents of a Haver database. If no series is specified, then all series are described. Below, we describe the Haver database `FXRATES`.

```
. import haverdirect FXRATES, describe
Dataset: FXRATES
──────────────────────────────────────────────────────────────────────────────

Variable   Description                Time span             Frequency Source
──────────────────────────────────────────────────────────────────────────────

A023       Synthetic Euro calcul..    1980m1-2024m6         Monthly   FRB
A112       Foreign Exchange Rate..    1947m1-2024m6         Monthly   FRB
A122       Synthetic Euro calcul..    1980m1-2024m6         Monthly   FRB
A124       Synthetic Euro calcul..    1980m1-2024m6         Monthly   FRB
  (output omitted)
```

By default, each line of the output corresponds to one Haver series. Specifying `detail` displays more information about each series, and specifying *seriesname*`@` allows us to restrict the output to the series that interests us:

```
. import haverdirect A228@FXRATES, describe detail
──────────────────────────────────────────────────────────────────────────────

A228                     Chile: Exchange Rate: Market or Par (Average, Peso/US$)
──────────────────────────────────────────────────────────────────────────────

    Frequency: Monthly                     Time span: 1957m4-2024m6
    Number of observations: 807            Date modified: 28jun2024 15:01:00
    Aggregation type: AVG                  Decimal precision: 3
    Difference type: 0                     Magnitude: 0
    Data type: LC/US$                      Group: N29
    Primary geography code: 228            Secondary geography code: 111
    Source: IMF                            Source description: International ..

Summary
──────────────────────────────────────────────────────────────────────────────

    Number of series described: 1
              Series not found: 0
```

Data are regularly added to Haver databases, so output such as the endpoint of the time span may differ when you run this command.

You can describe multiple Haver databases with one command:

```
. import haverdirect USARC23 FXRATES, describe
  (output omitted)
```

To restrict the output to the series that interest us for each database, you could type

```
. import haverdirect (A223 A228)@FXRATES ZDLAM@USECON, describe
  (output omitted)
```

Note: Whether you have access to the USARC23 or USECON database depends on your subscription with Haver Analytics.

Loading a Haver database

`import haverdirect` *seriesdblist* loads Haver databases. If no series is specified, then all series are loaded.

```
. import haverdirect (A223 A228)@FXRATES, clear
Summary
────────────────────────────────────────────────────────────────────────────────
       Haver data retrieval: 10 Jul 2024 11:59:52
 Number of series requested: 2
 Number of database(s) used: 1 (FXRATES)
       All series have been successfully retrieved.
Frequency
────────────────────────────────────────────────────────────────────────────────
    Highest Haver frequency: Monthly
     Lowest Haver frequency: Monthly
 Frequency of Stata dataset: Monthly
```

The table produced by `import haverdirect` *seriesdblist* displays a summary of the loaded data and frequency information about the loaded data. For other queries, there may be additional output about query errors and query notes; this is shown only if needed.

The dataset now contains a time variable and two variables retrieved from the FXRATES database:

```
. describe
Contains data
 Observations:           807
    Variables:             3
────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
────────────────────────────────────────────────────────────────────────────────
time            double  %tm
a223_fxrates    double  %10.0g                Foreign Exchange Rate:  Brazil
                                                (Real/US$)
a228_fxrates    double  %10.0g                Chile: Exchange Rate: Market or
                                                Par (Average, Peso/US$)
────────────────────────────────────────────────────────────────────────────────
Sorted by: time
     Note: Dataset has changed since last saved.
```

Haver databases include the following meta-information about each variable, although the information available will vary depending on the series:

`HaverDB`	database name
`Series`	series name
`Path`	DLX Direct software
`DateTimeMod`	date and time the series was last modified
`Frequency`	frequency of series (from daily to annual) as it is stored in the Haver database
`Magnitude`	magnitude of the data (for example, `0` for an index, `6` for millions)
`DecPrecision`	number of decimals to which the variable is recorded
`DifType`	relevant within Haver software only: if equal to `1`, percentage calculations are not allowed
`AggType`	temporal aggregation type (one of `AVG`, `SUM`, or `EOP`; or, if not defined, one of `NA` or `NA_ANNUAL`)
`DataType`	type of data (for example, ratio, index, US$, or percentage)
`Group`	Haver series group to which the variable belongs
`Geography1`	primary geography code
`Geography2`	secondary geography code (missing if not applicable)
`StartDate`	start date for data as it is stored in the Haver database
`EndDate`	end date for data as it is stored in the Haver database
`Source`	Haver code associated with the source for the data
`SourceDescription`	description of Haver code associated with the source for the data

When a variable is loaded, this meta-information is stored in variable characteristics (see [P] **char**). Those characteristics can be viewed using `char list`.

You can load multiple Haver databases and series with one command. To load the series UYMSPT and UYOEE from the USARC23 database and all series that start with A22 from the FXRATES database, you would type

```
. import haverdirect (UYMSPT UYOEE)@USARC23 A22*@FXRATES, clear
```
(*output omitted*)

`import haverdirect` automatically `tsset`s the data for you. You can issue `tsset` to see how the data are currently set.

Loading a Haver database from a describe file

You often need to search through the series information of a Haver database or databases to see which series you would like to load. You can do this by saving the output of `import haverdirect, describe` to a Stata dataset with the `saving(`*filename*`)` option. The dataset created can be used by `import haverdirect, frommemory` to load data from the described Haver databases. For example, here we search through the series information of database USARC23. Because the database contains more than 20,000 series, fetching its metadata may take up to a minute.

```
. import haverdirect USARC23, describe saving(my_desc_file)
  (output omitted)
. use my_desc_file, clear
. describe
Contains data from my_desc_file.dta
 Observations:        21,409
    Variables:             8                  10 Jul 2024 12:00
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
path            str19   %-19s                 Path to Haver file
file            str7    %-9s                  Haver filename
series          str8    %-9s                  Series name
description     str80   %-80s                 Series description
startdate       str9    %-9s                  Start date
enddate         str9    %-9s                  End date
frequency       str9    %-9s                  Frequency
source          str8    %-9s                  Source
-------------------------------------------------------------------------------
Sorted by:
```

The resulting dataset contains information on the 21,409 series in USARC23. Suppose that we want to retrieve all quarterly series whose description includes the word “Goods”. We need to keep only the observations from our dataset where the frequency variable equals “Quarterly” and where the description variable contains “Goods”.

```
. keep if frequency=="Quarterly" & strpos(description,"Goods")
(21,059 observations deleted)
```

To load the selected series into Stata, we type

```
. import haverdirect, frommemory clear
```

Note: We must `clear` the described data in memory to load the selected series. If you do not want to lose the changes you made to the description dataset, you must save it before using `import haverdirect, frommemory`.

The `frame(`*framename*`)` option works similarly to the `saving(`*filename*`)` option, but instead of saving a file to disk, `frame()` stores the metadata in a frame. See [D] **frames** for more information on data frames.

Temporal aggregation

If you request series with different frequencies, the higher-frequency data will be aggregated to the lowest frequency. For example, if you request a monthly and a quarterly series, the monthly series will be aggregated. In rare cases, a series cannot be aggregated to a lower frequency and so will not be retrieved. A list of these series will be stored in `r(noaggtype)`.

The options `fin()` and `fwithin()` are useful for aggregating series by hand.

Daily and weekly data

Daily and weekly queries require additional explanations because these frequencies are implemented differently in Haver databases than in Stata datasets. A Haver daily series refers to a business daily frequency, which is five days per week and counts only Monday through Friday as observations. An exact match for Haver daily is Stata's business daily frequency (`%tb`), which uses a business-day calendar that excludes weekends and includes all weekdays throughout the year. Stata's daily frequency (`%td`), by contrast, counts all seven days of a week. This frequency is called 7-daily in Haver databases.

The implementations of the weekly frequency also differ between Haver and Stata. Haver's implementation counts one week after another, without any reference to the calendar year, thereby allowing for years that mostly have 52 observations but sometimes have 53 observations. Each Haver weekly data series has a value set for its controlling-day-of-week (CDOW) property. This is typically the weekday on which the data are released by the source. This information is preserved in a Stata characteristic called `cdow`. For example, the `cdow` characteristic for series `SP100@WEEKLY` is Friday.

Stata's `%tw` frequency counts weeks from the beginning of the year and caps the week number at 52. There are two ways in which Haver's weekly frequency can be exactly matched in Stata: either in Stata's daily frequency (`%td`) in combination with a delta of seven days (see [TS] **tsset**) or in a datetime business calendar (`%tb`), which here should count only one particular weekday as a valid business day.

The above discrepancies in frequency implementations are resolved in `import haverdirect` in the following way: any query that exclusively consists of one or more of Haver 7-daily, Haver daily, or Haver weekly series results in a Stata dataset of Stata daily frequencies (`%td`). In that dataset,

> Haver 7-daily series receive rows for all seven days of the week covered by their span.
>
> Haver daily series receive rows for five days of the week (Monday through Friday) covered by their span.

Haver weekly series are assigned dates that correspond to their CDOW. For example, series `SP100@WEEKLY` has a CDOW of Friday and, at the time of writing, covers the time span 06jan1989–31may2024. Thus, in the Stata dataset, `SP100@WEEKLY` receives rows with dates 06jan1989, 13jan1989, ..., 24may2024, 31may2024 (these are all Fridays).

Note that if a query combines Haver 7-daily series and Haver daily series with one or more Haver weekly series, aggregation to weekly values is performed. For Haver 7-daily series, the values Monday through Sunday are aggregated to a single value, and the resulting (Haver weekly) series receives a CDOW of Sunday, with corresponding (Sunday) rows in the dataset. Similarly, for Haver daily series, the values Monday through Friday are aggregated to a single value, and the resulting (Haver weekly) series receives a CDOW of Friday, with corresponding (Friday) rows in the dataset.

Once you have queried your daily and weekly series, you may want to use Stata's `tsset` or business calendar features to further tailor the dataset toward your needs. Several ways for you to do this were indicated above.

When you aggregate Haver daily and Haver weekly series to lower frequencies (for example, monthly), the above considerations are not relevant. Another issue with these data is Haver aggregation modes. Haver daily and Haver weekly series often contain missing values due to events such as national holidays. When you aggregate to a lower frequency under the default aggregation mode `strict`, such missing values then result in aggregated values that are also set to missing. In such cases, you may want to consider using aggregation modes `relaxed` or `force`. See option `aggmethod()` for more details.

Stored results

`import haverdirect` stores the following in `r()`:

Scalars

`r(k_requested)`	number of series requested
`r(k_noaggtype)`	number of series dropped because of invalid aggregation type
`r(k_nodisagg)`	number of series dropped because their frequency is lower than that of the output dataset
`r(k_notinrange)`	number of series dropped because data were out of the date range specified in `fwithin()` or `fin()`
`r(k_notfound)`	number of series not found in the database

Macros

`r(dbnamelist)`	list of Haver databases used in command
`r(noaggtype)`	list of series dropped because of invalid aggregation type
`r(nodisagg)`	list of series dropped because their frequency is lower than that of the output dataset
`r(notinrange)`	list of series dropped because data were out of the date range specified in `fwithin()` or `fin()`
`r(notfound)`	list of series not found in the database

`import haverdirect, describe` stores the following in `r()`:

Scalars

`r(k_described)`	number of series described
`r(k_notfound)`	number of series not found in the database

Macros

`r(notfound)`	list of series not found in the database

Also see

[D] **import** — Overview of importing data into Stata

[D] **import delimited** — Import and export delimited text data

[D] **import fred** — Import data from Federal Reserve Economic Data

[D] **import haver** — Import data from Haver Analytics databases

[D] **jdbc** — Load, write, or view data from a database with a Java API

[D] **odbc** — Load, write, or view data from ODBC sources

[TS] **tsset** — Declare data to be time-series data

import sas — Import SAS files

Description | Quick start | Menu | Syntax
Options | Remarks and examples | Stored results | Also see

Description

`import sas` reads into memory a version 7 or higher SAS (`.sas7bdat`) file. It can also import SAS value labels from a `.sas7bcat` file. `import sas` can import up to 32,766 variables at one time (up to 2,048 variables in Stata/BE). If your SAS file contains more variables than this, you can break up the SAS file into multiple Stata datasets. You can also import SAS value labels from a `.sas7bcat` file.

Quick start

Import the SAS file `myfile.sas7bdat` into Stata

```
import sas myfile
```

Same as above, but replace the data in memory

```
import sas myfile, clear
```

Same as above, but import only variables `x1` and `x2`

```
import sas x1 x2 using myfile, clear
```

Import data from SAS file `myfile` and value labels from file `labels.sas7bcat`

```
import sas myfile, bcat(labels)
```

Menu

File > Import > SAS data (*.sas7bdat)

Syntax

Load a SAS file (.sas7bdat)*

`import sas` [`using`] *filename* [, *options*]

Load a subset of a SAS file (.sas7bdat)*

`import sas` [*namelist*] [*if*] [*in*] `using` *filename* [, *options*]

If *filename* is specified without an extension, `.sas7bdat` is assumed. If *filename* contains embedded spaces, enclose it in double quotes.

namelist specifies SAS variable names to be imported.

options	Description
`bcat(`*filename*$_{vl}$`)`	load value labels defined in *filename*$_{vl}$ into memory
`case(lower|upper|preserve)`	read variable names as lowercase or uppercase; the default is to preserve the case
`clear`	replace data in memory
`encoding("`*encoding*`")`	specify the file encoding; see `help encodings`

`collect` is allowed; see **[U] 11.1.10 Prefix commands**.

`encoding()` does not appear in the dialog box.

Options

`bcat(`*filename*$_{vl}$`)` specifies that the value labels defined in *filename*$_{vl}$ be loaded into memory along with the dataset. If *filename*$_{vl}$ is specified without an extension, `.sas7bcat` is assumed. If *filename*$_{vl}$ contains embedded spaces, enclose it in double quotes.

SAS does not assign value labels to variables; therefore, you must use the `label values` command to assign the value labels to specific variables after importing them.

`case(lower|upper|preserve)` specifies the case of the variable names after import. The default is `case(preserve)`.

`clear` specifies that it is okay to replace the data in memory, even though the current data have not been saved to disk.

The following option is available with `import sas` but is not shown in the dialog box:

`encoding("`*encoding*`")` specifies the encoding of the file. If your file has an incorrect encoding specified in the file header, you can use this option to specify the correct encoding. See `help encodings` for details.

Remarks and examples

`import sas` reads into memory version 7 or higher SAS (`.sas7bdat`) files. If a SAS variable name from the file does not conform to a Stata variable name, a generic `v#` name will be assigned, and the original variable name will be stored as a characteristic for the variable. If a SAS variable label is too long, it will be truncated to 80 characters. The original variable label will be stored as a variable characteristic. If a SAS data label is too long, it will be truncated to 80 characters, and the original label will be stored as a data characteristic.

▷ Example 1: Importing a SAS file into Stata

We can import SAS files into Stata, either by selecting the entire file or by selecting subsets of the data, with `import sas`. For example, we have the SAS file `auto.sas7bdat`, which contains data on automobiles, and we have value labels for these data stored in `formats.sas7bcat`. Below, we demonstrate how to import these data into Stata. To follow along, download these files to your working directory by typing the `copy` commands below:

```
. copy https://www.stata.com/sampledata/auto.sas7bdat auto.sas7bdat
. copy https://www.stata.com/sampledata/formats.sas7bcat formats.sas7bcat
```

To load the file `auto.sas7bdat` into Stata's memory, we type

```
. import sas auto.sas7bdat
(12 vars, 74 obs)
```

We can instead import only the variables `make`, `weight`, and `foreign` from `auto.sas7bdat`. We use the `bcat()` option to add the value labels defined in the `formats.sas7bcat` file and the `clear` option to replace the data in memory without saving them.

```
. import sas make weight foreign using auto, bcat(formats) clear
(3 vars, 74 obs)
. list in 1/5
```

	make	weight	foreign
1.	AMC Concord	2930	0
2.	AMC Pacer	3350	0
3.	AMC Spirit	2640	0
4.	Buick Century	3250	0
5.	Buick Electra	4080	0

We list the value labels that we imported using `label list`

```
. label list
ORIGIN:
           0 Domestic
           1 Foreign
```

`ORIGIN` contains value labels for the variable `foreign`. We need to use the `label values` command to apply this label to `foreign`. Then, we `save` the data with these labels attached.

```
. label values foreign ORIGIN
. list in 1/5
```

	make	weight	foreign
1.	AMC Concord	2930	Domestic
2.	AMC Pacer	3350	Domestic
3.	AMC Spirit	2640	Domestic
4.	Buick Century	3250	Domestic
5.	Buick Electra	4080	Domestic

```
. save myauto
file myauto.dta saved
```

◁

Stored results

`import sas` stores the following in `r()`:

Scalars

`r(N)`	number of observations imported
`r(k)`	number of variables imported

Also see

[D] **import sasxport5** — Import and export data in SAS XPORT Version 5 format

[D] **import sasxport8** — Import and export data in SAS XPORT Version 8 format

[D] **import** — Overview of importing data into Stata

import sasxport5 — Import and export data in SAS XPORT Version 5 format

Description

`import sasxport5` and `export sasxport5` convert data from and to SAS XPORT Version 5 Transport format. The US Food and Drug Administration uses this SAS XPORT Transport format as the format for datasets submitted with new drug and new device applications (NDAs).

`export sasxport5` saves the data in memory as a SAS XPORT Transport (`.xpt`) file. If needed, this command also creates `formats.xpf`—an additional XPORT file—containing the value-label definitions. These files can be easily read into SAS.

`import sasxport5` reads into memory data from a SAS XPORT Transport (`.xpt`) file. When available, this command also reads the value-label definitions stored in `formats.xpf` or `FORMATS.xpf`.

`import sasxport5, describe` describes the contents of a SAS XPORT Version 5 Transport file.

Quick start

Describe the contents of SAS XPORT Version 5 Transport file `mydata.xpt`

```
import sasxport5 mydata, describe
```

Load the contents of `mydata.xpt` into memory

```
import sasxport5 mydata
```

Same as above, and ignore the accompanying SAS formats file `formats.xpf`

```
import sasxport5 mydata, novallabels
```

Save data in memory to `mydata.xpt`

```
export sasxport5 mydata
```

Same as above, but rename variables to meet SAS XPORT restrictions

```
export sasxport5 mydata, rename
```

Same as above, and do not save value labels

```
export sasxport5 mydata, rename replace vallabfile(none)
```

Save `v1`, `v2`, and `v3` to `mydata.xpt`, where time variable `tvar` is equal to 2010

```
export sasxport5 v1 v2 v3 using mydata if tvar==2010
```

Menu

import sasxport5

File > Import > SAS XPORT Version 5 (*.xpt)

export sasxport5

File > Export > SAS XPORT Version 5 (*.xpt)

Syntax

Import SAS XPORT Version 5 Transport file into Stata

`import sasxport5` *filename* [, *import_options*]

Describe contents of SAS XPORT Version 5 Transport file

`import sasxport5` *filename* , `describe` [`member(`*mbrname*`)`]

Export data in memory to a SAS XPORT Version 5 Transport file

`export sasxport5` *filename* [*if*] [*in*] [, *export_options*]

`export sasxport5` *varlist* `using` *filename* [*if*] [*in*] [, *export_options*]

If *filename* is specified without an extension, `.xpt` is assumed. If *filename* contains embedded spaces, enclose it in double quotes.

import_options	Description
`clear`	replace data in memory
`novallabels`	ignore accompanying `formats.xpf` file if it exists
`member(`*mbrname*`)`	member to use; seldom used

`collect` is allowed with `import sasxport5`; see **[U] 11.1.10 Prefix commands**.

export_options	Description
Main	
`rename`	rename variables and value labels to meet SAS XPORT restrictions
`replace`	overwrite files if they already exist
`vallabfile(xpf)`	save value labels in `formats.xpf`
`vallabfile(sascode)`	save value labels in SAS command file
`vallabfile(both)`	save value labels in `formats.xpf` and in a SAS command file
`vallabfile(none)`	do not save value labels

Options for import sasxport5

`describe` describes the contents of the SAS XPORT Version 5 Transport file. This option can be combined only with `member()`.

`clear` specifies that it is okay to replace the data in memory, even though the current data have not been saved to disk.

`novallabels` specifies that value-label definitions stored in `formats.xpf` or `FORMATS.xpf` not be looked for or loaded. By default, if variables are labeled in *filename*`.xpt`, then `import sasxport5` looks for `formats.xpf` to obtain and load the value-label definitions. If the file is not found, Stata looks for `FORMATS.xpf`. If that file is not found, a warning message is issued.

`import sasxport5` can use only a `formats.xpf` or `FORMATS.xpf` file to obtain value-label definitions. `import sasxport5` cannot understand value-label definitions from a SAS command file.

`member(`*mbrname*`)` specifies a member of the `.xpt` file. Although no longer often used, the original XPORT definition allowed multiple datasets to be placed in one file. The `member()` option allows you to read these old files, selecting only specific datasets (*members*) to be used by `import sasxport5`. You can obtain a list of member names by using `import sasxport5, describe`. By default, only the first member is used, unless `describe` is specified, in which case all members are described. Because it is rare for an XPORT file to have more than one member, this option is seldom used.

Options for export sasxport5

Main

`rename` specifies that `export sasxport5` may rename variables and value labels to attempt to meet the SAS XPORT restrictions, which are that names be no more than eight bytes long and that there be no distinction between uppercase and lowercase letters. Note that `rename` does not remove characters beyond the normal ASCII range, such as most Unicode characters and all extended ASCII characters. SAS may or may not support such characters in variable labels and value labels.

We recommend specifying the `rename` option. If this option is specified, any name violating the restrictions is changed to a different but related name in the file. The name changes are listed. The new names are used only in the file; the names of the variables and value labels in memory remain unchanged.

If `rename` is not specified and one or more names violate the XPORT restrictions, an error message will be issued and no file will be saved. The alternative to the `rename` option is that you can rename variables yourself with the `rename` command:

```
. rename mylongvariablename myname
```

See [D] **rename**. Renaming value labels yourself is more difficult. The easiest way to rename value labels is to use `label save`, edit the resulting file to change the name, execute the file by using `do`, and reassign the new value label to the appropriate variables by using `label values`:

```
. label save mylongvaluelabel using myfile.do
. doedit myfile.do    (change mylongvaluelabel to, say, mlvlab)
. do myfile.do
. label values myvar mlvlab
```

See [D] **label** and [R] **do** for more information about renaming value labels.

`replace` permits `export sasxport5` to overwrite existing *filename*`.xpt`, `formats.xpf`, and *filename*`.sas` files.

`vallabfile(xpf | sascode | both | none)` specifies whether and how value labels are to be stored. SAS XPORT Transport files do not really have value labels. Value-label definitions can be preserved in one of two ways:

1. In an additional SAS XPORT Version 5 Transport file whose data contain the value-label definitions
2. In a SAS command file that will create the value labels

`export sasxport5` can create either or both of these files.

`vallabfile(xpf)`, the default, specifies that value labels be written into a separate SAS XPORT Transport file named `formats.xpf`. Thus, `export sasxport5` creates two files: *filename*`.xpt`, containing the data, and `formats.xpf`, containing the value labels. No `formats.xpf` file is created if there are no value labels.

SAS users can easily use the resulting `.xpt` and `.xpf` XPORT files.
See https://www.sas.com/govedu/fda/macro.html, and click on the *FDA Submission Standards* tab. Then, click on the *Processing Data Sets Code* tab that appears below the "FDA and SAS Technology" text for SAS-provided macros for reading the XPORT files. The SAS macro `fromexp()` reads the XPORT files into SAS. The SAS macro `toexp()` creates XPORT files. When obtaining the macros, remember to save the macros at SAS's webpage as a plain text file and to remove the examples at the bottom.

If the SAS macro file is saved as `C:\project\macros.mac` and the files `mydat.xpt` and `formats.xpf` created by `export sasxport5` are in `C:\project\`, the following SAS commands would create the corresponding SAS dataset and format library and list the data:

SAS commands

```
%include "C:\project\macros.mac" ;
%fromexp(C:\project, C:\project) ;
libname library 'C:\project' ;
data _null_ ; set library.mydat ; put _all_ ; run ;
proc print data = library.mydat ;
quit ;
```

`vallabfile(sascode)` specifies that the value labels be written into a SAS command file, *filename*`.sas`, containing SAS `proc format` and related commands. Thus, `export sasxport5` creates two files: *filename*`.xpt`, containing the data, and *filename*`.sas`, containing the value labels. SAS users may wish to edit the resulting *filename*`.sas` file to change the "libname datapath" and "libname xptfile xport" lines at the top to correspond to the location that they desire. `export sasxport5` sets the location to the current working directory at the time `export sasxport5` was issued. No `.sas` file will be created if there are no value labels.

`vallabfile(both)` specifies that both the actions described above be taken and that three files be created: *filename*`.xpt`, containing the data; `formats.xpf`, containing the value labels in XPORT format; and *filename*`.sas`, containing the value labels in SAS command-file format.

`vallabfile(none)` specifies that value-label definitions not be saved. Only one file is created: *filename*`.xpt`, which contains the data.

Remarks and examples

All users, of course, may use these commands to transfer data between SAS and Stata, but there are limitations in the SAS XPORT Transport format, such as the eight-character limit on the names of variables (specifying `export sasxport5`'s `rename` option works around that). For a complete listing of limitations and issues concerning the SAS XPORT Transport format and an explanation of how `export sasxport5` and `import sasxport5` work around these limitations, see *Technical appendix* below.

Remarks are presented under the following headings:

Saving XPORT files for transferring to SAS
Determining the contents of XPORT files received from SAS
Using XPORT files received from SAS

Saving XPORT files for transferring to SAS

▷ Example 1: Exporting data to XPORT files

To demonstrate, we first load `auto.dta`. To save only variables `make`, `mpg`, and `weight` in `auto_sub.xpt`, we type

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. export sasxport5 make mpg weight using auto_sub
file auto_sub.xpt saved
```

We can save all the variables in the data to `auto.xpt` and save the value labels in `formats.xpf`. We specify the `rename` option to rename variable names and value labels that are too long or are case sensitive.

```
. export sasxport5 auto, rename
the following variable(s) were renamed in the output file:

                    displacement -> DISPLACE
                      gear_ratio -> GEAR_RAT

file auto.xpt saved
file formats.xpf saved
```

Alternatively, we can save the data in `auto.xpt` and save the value labels to a `formats.xpf` file and in a SAS command file `auto.sas`. We include the `replace` option to allow replacement of the files we created with our previous command.

```
. export sasxport5 auto, rename replace vallabfile(both)
the following variable(s) were renamed in the output file:

                    displacement -> DISPLACE
                      gear_ratio -> GEAR_RAT

file auto.xpt saved
file auto.sas saved
file formats.xpf saved
```

If we instead wanted to save the value labels only in the SAS command file, we could have typed

```
. export sasxport5 auto, rename replace vallabfile(sas)
```

If we did not want to save the value labels at all, thus creating only `auto.xpt`, we could have typed

```
. export sasxport5 typed, rename replace vallabfile(none)
```

◁

Determining the contents of XPORT files received from SAS

▷ Example 2: Describing XPORT files

To investigate the contents of the auto.xpt file we created above, we can type

```
. import sasxport5 auto, describe

data from auto.xpt, member(auto)
  obs:              74            28mar25:19:45:21
 vars:              12            (date shown exactly as recorded in file)
 size:           8,140
----------------------------------------------------------------------------

variable    variable     value
  name        type       label      variable label
----------------------------------------------------------------------------

make        str18                   Make and model
price       numeric                 Price
mpg         numeric                 Mileage (mpg)
rep78       numeric                 Repair record 1978
headroom    numeric                 Headroom (in.)
trunk       numeric                 Trunk space (cu. ft.)
weight      numeric                 Weight (lbs.)
length      numeric                 Length (in.)
turn        numeric                 Turn circle (ft.)
displace    numeric                 Displacement (cu. in.)
gear_rat    numeric                 Gear ratio
foreign     numeric     origin      Car origin
----------------------------------------------------------------------------
```

◁

Using XPORT files received from SAS

▷ Example 3: Importing XPORT files

To read data from auto.xpt and obtain value labels from formats.xpf, we can type

```
. import sasxport5 auto, clear
```

◁

Stored results

import sasxport5, describe stores the following in r():

Scalars

r(N)	number of observations
r(k)	number of variables
r(size)	size of data
r(n_members)	number of members

Macros

r(members)	names of members

Technical appendix

Technical details concerning the SAS XPORT Version 5 Transport format and how `export sasxport5` and `import sasxport5` handle issues regarding the format are presented under the following headings:

A1. Overview of SAS XPORT Transport format

A SAS XPORT Transport file may contain one or more separate datasets, known as members. It is rare for a SAS XPORT Transport file to contain more than one member. See https://support.sas.com/techsup/technote/ts140.pdf for the SAS technical document describing the layout of the SAS XPORT Transport file.

A SAS XPORT dataset (member) is subject to certain restrictions:

1. The dataset may contain only 9,999 variables.
2. The names of the variables and value labels may not be longer than eight characters and are case insensitive; for example, `myvar`, `Myvar`, `MyVar`, and `MYVAR` are all the same name.
3. Variable labels may not be longer than 40 characters.
4. The contents of a variable may be numeric or string:
   a. Numeric variables may be integer or floating but may not be smaller than 5.398e–79 or greater than 9.046e+74, absolutely. Numeric variables may contain missing, which may be `.`, `._`, `.a`, `.b`, ..., `.z`.
   b. String variables may not exceed 200 characters. String variables are recorded in a "padded" format, meaning that, when variables are read, it cannot be determined whether the variable had trailing blanks.
5. Value labels are *not* written in the XPORT dataset. Suppose that you have variable `sex` in the data with values 0 and 1 and that the values are labeled for gender (0 = male, and 1 = female). When the dataset is written in SAS XPORT Transport format, you can record that the variable label `gender` is associated with the `sex` variable, but you cannot record the association with the value labels male and female.

   Value-label definitions are typically stored in a second XPORT dataset or in a text file containing SAS commands. You can use the `vallabfile()` option of `export sasxport5` to produce these datasets or files.

Value labels and formats are recorded in the same position in an XPORT file, meaning that names corresponding to formats used in SAS cannot be used. Thus, value labels may not be named

> best, binary, comma, commax, d, date, datetime, dateampm, day, ddmmyy, dollar, dollarx, downame, e, eurdfdd, eurdfde, eurdfdn, eurdfdt, eurdfdwn, eurdfmn, eurdfmy, eurdfwdx, eurdfwkx, float, fract, hex, hhmm, hour, ib, ibr, ieee, julday, julian, percent, minguo, mmddyy, mmss, mmyy, monname, month, monyy, negparen, nengo, numx, octal, pd, pdjulg, pdjuli, pib, pibr, pk, pvalue, qtr, qtrr, rb, roman, s370ff, s370fib, s370fibu, s370fpd, s370fpdu, s370fpib, s370frb, s370fzd, s370fzdl, s370fzds, s370fzdt, s370fzdu, ssn, time, timeampm, tod, weekdate, weekdatx, weekday, worddate, worddatx, wordf, words, year, yen, yymm, yymmdd, yymon, yyq, yyqr, z, zd, or any uppercase variation of these.

We refer to this as the "Known Reserved Word List" in this documentation. Other words may also be reserved by SAS; the technical documentation for the SAS XPORT Transport format provides no guidelines. This list was created by examining the formats defined in *SAS Language Reference: Dictionary, Version 8*. If SAS adds new formats, the list will grow.

6. A flaw in the XPORT design can make it impossible, in rare instances, to determine the exact number of observations in a dataset. This problem can occur only if 1) all variables in the dataset are string and 2) the sum of the lengths of all the string variables is less than 80. Actually, the above is the restriction, assuming that the code for reading the dataset is written well. If it is not, the flaw could occur if 1) the last variable or variables in the dataset are string and 2) the sum of the lengths of all variables is less than 80.

   To prevent stumbling over this flaw, make sure that the last variable in the dataset is not a string variable. This is always sufficient to avoid the problem.

7. There is no provision for saving the Stata concepts `notes` and `characteristics`.

A2. Implications for writing XPORT datasets from Stata

Stata datasets for the most part fit well into the SAS XPORT Transport format. With the same numbering scheme as above,

1. Stata refuses to write the dataset if it contains more than 9,999 variables.
2. Stata issues an error message if any variable or label name violates the naming restrictions, or if the `rename` option is specified, Stata fixes any names that violate the restrictions.

   Whether or not `rename` is specified, names will be recorded without regard to case: you do not have to name all your variables with all lowercase or all uppercase letters. Stata verifies that ignoring case does not lead to problems, complaining or, if option `rename` is specified, fixing them.
3. Stata truncates variable labels to 40 characters to fit within the XPORT limit.
4. Stata treats variable contents as follows:
   a. If a numeric variable records a value greater than 9.046e+74 in absolute value, Stata issues an error message. If a variable records a value less than 5.398e–79 in absolute value, 0 is written.

b. If you have string variables longer than 200 characters, Stata issues an error message. Also, if any string variable has trailing blanks, Stata issues an error message. To remove trailing blanks from string variable s, you can type

```
. replace s = rtrim(s)
```

To remove leading and trailing blanks, type

```
. replace s = trim(s)
```

5. Value-label names are written in the XPORT dataset. The contents of the value label are not written in the same XPORT dataset. By default, formats.xpf, a second XPORT dataset, is created containing the value-label definitions.

   SAS recommends creating a formats.xpf file containing the value-label definitions (what SAS calls format definitions). They have provided SAS macros, making the reading of .xpt and formats.xpf files easy. See https://www.sas.com/govedu/fda/macro.html for details.

   Alternatively, a SAS command file containing the value-label definitions can be produced. The vallabfile() option of export sasxport5 is used to indicate which, if any, of the formats to use for recording the value-label definitions.

   If a value-label name matches a name on the Known Reserved Word List, and the rename option is not specified, Stata issues an error message.

   If a variable has no value label, the following format information is recorded:

Stata format	SAS format
%td...	MMDDYY10.
%-td...	MMDDYY10.
%#s	$CHAR#.
%-#s	$CHAR#.
% #s	$CHAR#.
all other	BEST12.

6. If you have a dataset that could provoke the XPORT design flaw, a warning message is issued. Remember, the best way to avoid this flaw is to ensure that the last variable in the dataset is numeric. This is easily done. You could, for instance, type

```
. generate ignoreme = 0
. export sasxport ...
```

7. Because the XPORT file format does not support notes and characteristics, Stata ignores them when it creates the XPORT file. You may wish to incorporate important notes into the documentation that you provide to the user of your XPORT file.

A3. Implications for reading XPORT datasets into Stata

Reading SAS XPORT Version 5 Transport format files into Stata is easy, but sometimes there are issues to consider:

1. If there are too many variables, Stata issues an error message. If you are using Stata/MP or Stata/SE, you can increase the maximum number of variables with the `set maxvar` command; see [D] **memory**.
2. The XPORT variable-naming restrictions are more restrictive than those of Stata, so no problems should arise. However, Stata reserves the following names:

   `_all`, `_b`, `byte`, `_coef`, `_cons`, `double`, `float`, `if`, `in`, `int`, `long`, `_n`, `_N`, `_pi`, `_pred`, `_rc`, `_skip`, `str#`, `strL`, `using`, `with`

   If the XPORT file contains variables with any of these names, Stata issues an error message. Also, the error message

   ```
   . import sasxport5 ...
   ________ already defined
   r(110);
   ```

   indicates that the XPORT file was incorrectly prepared by some other software and that two or more variables share the same name.
3. The XPORT variable-label-length limit is more restrictive than that of Stata, so no problems can arise.
4. Variable contents may cause problems:
   a. The range of numeric variables in an XPORT dataset is a subset of that allowed by Stata, so no problems can arise. All variables are brought back as `double`s; we recommend that you run `compress` after loading the dataset:

      ```
      . import sasxport5 ...
      . compress
      ```

      See [D] **compress**.

      Stata has no missing-value code corresponding to `._`. If any value records `._`, then `.u` is stored.
   b. String variables are brought back as recorded but with all trailing blanks stripped.
5. Value-label names are read directly from the XPORT dataset. Any value-label definitions are obtained from a separate XPORT dataset, if available. If a value-label name matches any in the Known Reserved Word List, no value-label name is recorded, and instead, the variable display format is set to `%9.0g`, `%10.0g`, or `%td`.

   The `%td` Stata format is used when the following SAS formats are encountered:

   `DATE`, `EURDFDN`, `JULDAY`, `MONTH`, `QTRR`, `YEAR`, `DAY`, `EURDFDWN`, `JULIAN`, `MONYY`, `WEEKDATE`, `YYMM`, `DDMMYY`, `EURDFMN`, `MINGUO`, `NENGO`, `WEEKDATX`, `YYMMDD`, `DOWNAME`, `EURDFMY`, `MMDDYY`, `PDJULG`, `WEEKDAY`, `YYMON`, `EURDFDD`, `EURDFWDX`, `MMYY`, `PDJULI`, `WORDDATE`, `YYQ`, `EURDFDE`, `EURDFWKX`, `MONNAME`, `QTR`, `WORDDATX`, `YYQR`

   If the XPORT file indicates that one or more variables have value labels, `import sasxport5` looks for the value-label definitions in `formats.xpf`, another XPORT file. If it does not find this file, it looks for `FORMATS.xpf`. If this file is not found, `import sasxport5` issues a warning message unless the `novallabels` option is specified.

Stata does not allow value-label ranges or string variables with value labels. If the `.xpt` file or `formats.xpf` file contains any of these, an error message is issued. The `novallabels` option allows you to read the data, ignoring all value labels.

6. If a dataset is read that provokes the all-strings XPORT design flaw, the dataset with the minimum number of possible observations is returned, and a warning message is issued. This duplicates the behavior of SAS.
7. SAS XPORT format does not allow notes or characteristics, so no issues can arise.

Also see

[D] **import sas** — Import SAS files

[D] **import sasxport8** — Import and export data in SAS XPORT Version 8 format

[D] **export** — Overview of exporting data from Stata

[D] **import** — Overview of importing data into Stata

import sasxport8 — Import and export data in SAS XPORT Version 8 format

Description

`import sasxport8` and `export sasxport8` import and export data from and to SAS XPORT Version 8 Transport format.

To import and export datasets from and to SAS XPORT Version 5 Transport format, see [D] **import sasxport5**.

Quick start

Load the contents of `mydata.v8xpt` into memory, replacing the data in memory

    import sasxport8 mydata, clear

Same as above, but read variable names as lowercase

    import sasxport8 mydata, clear case(lower)

Save data in memory to `mydata.v8xpt`, replacing the existing file

    export sasxport8 mydata, replace

Save `v1` and `v2` to `mydata.v8xpt`, and save their corresponding value labels in a SAS command file, `mydata.sas`

    export sasxport8 v1 v2 using mydata, replace vallabfile

Menu

import sasxport8

File > Import > SAS XPORT Version 8 (*.v8xpt)

export sasxport8

File > Export > SAS XPORT Version 8 (*.v8xpt)

Syntax

Import SAS XPORT Version 8 Transport file into Stata

`import sasxport8` *filename* [, *import_options*]

Export data in memory to a SAS XPORT Version 8 Transport file

`export sasxport8` *filename* [*if*] [*in*] [, *export_options*]

`export sasxport8` *varlist* `using` *filename* [*if*] [*in*] [, *export_options*]

If *filename* is specified without an extension, `.v8xpt` is assumed. If *filename* contains embedded spaces, enclose it in double quotes.

import_options	Description
`case(lower|upper|preserve)`	read variable names as lowercase or uppercase; the default is to preserve the case
`clear`	replace data in memory

`collect` is allowed with `import sasxport8`; see **[U] 11.1.10 Prefix commands**.

export_options	Description
Main	
`replace`	overwrite files if they already exist
`vallabfile`	save value labels in SAS command file

Options for import sasxport8

`case(lower|upper|preserve)` specifies the case of the variable names after import. The default is `case(preserve)`.

`clear` specifies that it is okay to replace the data in memory, even though the current data have not been saved to disk.

Options for export sasxport8

Main

`replace` permits `export sasxport8` to overwrite the existing *filename*`.v8xpt`.

`vallabfile` specifies that the value labels be written into a SAS command file, *filename*`.sas`, containing SAS `proc format` and related commands. Thus, `export sasxport8` creates two files: *filename*`.v8xpt`, containing the data, and *filename*`.sas`, containing the value labels. SAS users may wish to edit the resulting *filename*`.sas` file to change the "libname datapath" and "libname xptfile xport" lines at the top to correspond to the location that they desire. `export sasxport8` sets the location to the current working directory at the time `export sasxport8` was issued. No `.sas` file will be created if there are no value labels.

Remarks and examples

To save the data in memory as a SAS XPORT Version 8 Transport file, type

```
. export sasxport8 filename
```

To read a SAS XPORT Version 8 Transport file into Stata, type

```
. import sasxport8 filename
```

Stata will read into memory the XPORT file *filename*.v8xpt containing the data.

To demonstrate the use of `export sasxport8` and `import sasxport8`, we will first load `auto.dta` and export these data to a SAS V8XPORT named `auto.v8xpt`:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. export sasxport8 auto
file auto.v8xpt saved
```

We can export a subset of the data that includes only the variables `make`, `mpg`, and `weight` to a file named `auto_sub.v8xpt`.

```
. export sasxport8 make mpg weight using auto_sub
file auto_sub.v8xpt saved
```

Now, we import the data from `auto_sub.v8xpt` that we just created.

```
. import sasxport8 auto_sub, clear
(3 vars, 74 obs)

. describe

Contains data
 Observations:            74                  1978 automobile data
    Variables:             3
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
make            str17   %17s                  Make and model
mpg             byte    %10.0g                Mileage (mpg)
weight          int     %15.4g                Weight (lbs.)
-------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

Stored results

`import sasxport8` stores the following in `r()`:

Scalars

`r(N)`	number of observations imported
`r(k)`	number of variables imported

Also see

[D] **import sas** — Import SAS files

[D] **import sasxport5** — Import and export data in SAS XPORT Version 5 format

[D] **export** — Overview of exporting data from Stata

[D] **import** — Overview of importing data into Stata

import spss — Import and export SPSS files

Description

`import spss` reads into memory a version 16 or higher IBM SPSS Statistics (`.sav`) file or a version 21 or higher compressed IBM SPSS Statistics (`.zsav`) file. `import spss` can import up to 32,766 variables at one time (up to 2,048 in Stata/BE). If your SPSS file contains more variables than this, you can break up the SPSS file into multiple Stata datasets.

`export spss` writes Stata's data to an IBM SPSS Statistics (`.sav`) file.

Quick start

Import the IBM SPSS Statistics file `myfile.sav` into Stata

```
import spss myfile
```

Same as above, but replace the data in memory

```
import spss myfile, clear
```

Same as above, but import only variables `x1` and `x4`

```
import spss x1 x4 using myfile, clear
```

Import the compressed IBM SPSS Statistics file `compfile.zsav` into Stata

```
import spss compfile, zsav
```

Same as above, but read variable names as lowercase

```
import spss compfile, zsav case(lower)
```

Export data in memory to `mydata.sav`

```
export spss mydata
```

Same as above, but export only variables `v1` and `v2`

```
export spss v1 v2 using mydata
```

Menu

import spss

File > Import > SPSS data (*.sav)

export spss

File > Export > SPSS data (*.sav)

Syntax

Load an IBM SPSS Statistics file (.sav)*

import spss [using] *filename* [, *options*]

Load a compressed IBM SPSS Statistics file (.zsav)*

import spss [using] *filename*, zsav [*options*]

Load a subset of an IBM SPSS Statistics file (.sav)*

import spss [*namelist*] [*if*] [*in*] using *filename* [, *options*]

Load a subset of a compressed IBM SPSS Statistics file (.zsav)*

import spss [*namelist*] [*if*] [*in*] using *filename*, zsav [*options*]

Save data in memory to an IBM SPSS Statistics file (.sav)*

export spss [using] *filename* [*if*] [*in*] [, replace]

Save subset of variables in memory to an IBM SPSS Statistics file (.sav)*

export spss [*varlist*] using *filename* [*if*] [*in*] [, replace]

If *filename* is specified without an extension, .sav is assumed unless you specify the zsav option, in which case extension .zsav is assumed. If *filename* contains embedded spaces, enclose it in double quotes.

namelist specifies SPSS variable names to be imported.

options	Description
case(lower | upper | preserve)	read variable names as lowercase or uppercase; the default is to preserve the case
clear	replace data in memory
encoding("*encoding*")	specify the file encoding; see help encodings

collect is allowed with import spss; see **[U] 11.1.10 Prefix commands**.

encoding() does not appear in the dialog box.

Options for import spss

zsav indicates the file to load is a compressed IBM SPSS Statistics file.

case(lower | upper | preserve) specifies the case of the variable names after import. The default is case(preserve).

clear specifies that it is okay to replace the data in memory, even though the current data have not been saved to disk.

The following option is available with import spss but is not shown in the dialog box:

encoding("*encoding*") specifies the encoding of the file. If your file has an incorrect encoding specified in the file header, you can use this option to specify the correct encoding. See help encodings for details.

Option for export spss

replace specifies that *filename* be replaced if it already exists.

Remarks and examples

import spss reads into memory a version 16 or higher IBM SPSS Statistics (.sav) file or a version 21 or higher compressed IBM SPSS Statistics (.zsav) file. If an SPSS variable name from the file does not conform to a Stata variable name, a generic v# name will be assigned, and the original variable name will be stored as a characteristic for the variable. If an SPSS variable label is too long, it will be truncated to 80 characters, and the original variable label will be stored as a variable characteristic. All value labels for string variables will be ignored. Value labels for numeric variables will be named labels# and attached to the corresponding variable.

export spss exports the Stata dataset in memory, or a subset of the dataset, to an IBM SPSS Statistics (.sav) file.

▷ Example 1: Importing an SPSS file into Stata

We can import SPSS files into Stata, either by selecting the entire file or by selecting subsets of the data, with `import spss`. For example, we have the SPSS file `auto.sav`, which contains data on automobiles. Below, we demonstrate how to import these data into Stata. To follow along, download this file to your working directory by typing the `copy` command below:

```
. copy https://www.stata.com/sampledata/auto.sav auto.sav
```

We first load the entire `auto.sav` file into Stata by typing

```
. import spss auto
(12 vars, 74 obs)

. describe

Contains data
 Observations:            74
    Variables:            12
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
make            str17   %17s
price           int     %5.0f
mpg             byte    %2.0f
rep78           byte    %1.0f
headroom        double  %3.1f
trunk           byte    %2.0f
weight          int     %4.0f
length          int     %3.0f
turn            byte    %2.0f
displacement    int     %3.0f
gear_ratio      double  %4.2f
foreign         byte    %1.0f
-------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

We can instead import only variables make and weight into memory from auto.sav. We include the clear option to replace the data in memory without saving them.

```
. import spss make weight using auto, clear
(2 vars, 74 obs)

. describe

Contains data
 Observations:            74
    Variables:             2
───────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
───────────────────────────────────────────────────────────────────────────────
make            str17   %17s
weight          int     %4.0f
───────────────────────────────────────────────────────────────────────────────
Sorted by:
     Note: Dataset has changed since last saved.
```

◁

▷ Example 2: Export all Stata data to an SPSS file

We have a data on food consumption. The data is currently in the Stata .dta format. We would like to export the data to an IBM SPSS Statistics file. We first load the Stata dataset and then export the data to a file named food_consumption.sav:

```
. use https://www.stata-press.com/data/r19/food_consumption, clear
(Food consumption)

. export spss food_consumption
file food_consumption.sav saved
```

◁

Stored results

import spss stores the following in r():

Scalars

r(N)	number of observations imported
r(k)	number of variables imported

Also see

[D] **import** — Overview of importing data into Stata

[D] **export** — Overview of exporting data from Stata

Description Quick start Menu Syntax
Options Remarks and examples Also see

Description

`infile using` reads a dataset that is stored in text form. `infile using` does this by first reading *dfilename*—a "dictionary" that describes the format of the data file—and then reads the file containing the data. The dictionary is a file you create with the Do-file Editor or an editor outside Stata.

Strings containing plain ASCII or UTF-8 are imported correctly. Strings containing extended ASCII will not be imported (that is, displayed) correctly; you can use Stata's `replace` command with the `ustrfrom()` function to convert extended ASCII to UTF-8. If `ebcdic` is specified, the data will be converted from EBCDIC to ASCII as they are imported. The dictionary in all cases must be ASCII.

If `using` *filename* is not specified, the data are assumed to begin on the line following the closing brace. If `using` *filename* is specified, the data are assumed to be located in *filename*.

The data may be in the same file as the dictionary or in another file. `infile` with a dictionary can import both numeric and string data. Individual strings may be up to 100,000 bytes long. Strings longer than 2,045 bytes are imported as `strL`s (see **[U] 12.4.8 strL**).

Another variation on `infile` omits the intermediate dictionary; see **[D] infile (free format)**. This variation is easier to use but will not read fixed-format files. On the other hand, although `infile` with a dictionary will read free-format files, `infile` without a dictionary is even better at it.

An alternative to `infile using` for reading fixed-format files is `infix`; see **[D] infix (fixed format)**. `infix` provides fewer features than `infile using` but is easier to use.

Stata has other commands for reading data. If you are not certain that `infile using` will do what you are looking for, see **[D] import** and **[U] 22 Entering and importing data**.

Quick start

For dictionary file `mydata.dct` that reads `int`-type `v1` and `str10`-type `v2`

```
dictionary {
  int   v1
  str10  v2
}
```

Import data from `mydata.raw` with instructions for reading the data contained in dictionary file `mydata.dct`

```
infile using mydata.dct, using(mydata.raw)
```

Same as above

```
infile using mydata, using(mydata)
```

Same as above, but import data from `mydata.txt`

```
infile using mydata, using(mydata.txt)
```

Same as above, but read only the first 10 observations

```
infile using mydata in 1/10, using(mydata.txt)
```

Read only observations where `catvar` is equal to 4 or 5

```
infile using mydata if catvar==4 | catvar==5, using(mydata.txt)
```

Menu

File > Import > Text data in fixed format with a dictionary

Syntax

`infile using` *dfilename* [*if*] [*in*] [, *options*]

If *dfilename* is specified without an extension, `.dct` is assumed. If *dfilename* contains embedded spaces, remember to enclose it in double quotes.

options	Description
Main	
`using(`*filename*`)`	text dataset filename
`clear`	replace data in memory
Options	
`automatic`	create value labels from nonnumeric data
`ebcdic`	treat text dataset as EBCDIC

A dictionary is a text file that is created with the Do-file Editor or an editor outside Stata. This file specifies how Stata should read fixed-format data from a text file. The syntax for a dictionary is

begin dictionary file

```
[infile] dictionary [using filename] {

        * comments may be included freely
        _lrecl(#)
        _firstlineoffile(#)
        _lines(#)

        _line(#)
        _newline[(#)]

        _column(#)

        _skip[(#)]
        [type] varname [:lblname] [% infmt] ["variable label"]
}
(your data might appear here)
```

end dictionary file

where % *infmt* is { %[#[.#]]{f|g|e} | %[#]s | %[#]S }

Options

Main

`using(`*filename*`)` specifies the name of a file containing the data. If `using()` is not specified, the data are assumed to follow the dictionary in *dfilename*, or if the dictionary specifies the name of some other file, that file is assumed to contain the data. If `using(`*filename*`)` is specified, *filename* is used to obtain the data, even if the dictionary says otherwise. If *filename* is specified without an extension, `.raw` is assumed.

If *filename* contains embedded spaces, remember to enclose it in double quotes.

`clear` specifies that it is okay for the new data to replace what is currently in memory. To ensure that you do not lose something important, `infile using` will refuse to read new data if other data are already in memory. `clear` allows `infile using` to replace the data in memory. You can also drop the data yourself by typing `drop _all` before reading new data.

Options

`automatic` causes Stata to create value labels from the nonnumeric data it reads. It also automatically widens the display format to fit the longest label.

`ebcdic` specifies that the data be stored using EBCDIC character encoding rather than the default ASCII encoding and that the data be converted from EBCDIC to ASCII as they are imported.

Dictionary directives

`*` marks comment lines. Wherever you wish to place a comment, begin the line with a `*`. Comments can appear many times in the same dictionary.

`_lrecl(#)` is used only for reading datasets that do not have end-of-line delimiters (carriage return, line feed, or some combination of these). Such files are often produced by mainframe computers and are either coded in EBCDIC or have been translated from EBCDIC into ASCII. `_lrecl()` specifies the logical record length. `_lrecl()` requests that `infile` act as if a line ends every # bytes.

`_lrecl()` appears only once, and typically not at all, in a dictionary.

`_firstlineoffile(#)` (abbreviation `_first()`) is also rarely specified. It states the line of the file where the data begin. You do not need to specify `_first()` when the data follow the dictionary; Stata can figure that out for itself. However, you might specify `_first()` when reading data from another file in which the first line does not contain data because of headers or other markers.

`_first()` appears only once, and typically not at all, in a dictionary.

`_lines(#)` states the number of lines per observation in the file. Simple datasets typically have `_lines(1)`. Large datasets often have many lines (sometimes called records) per observation. `_lines()` is optional, even when there is more than one line per observation because `infile` can sometimes figure it out for itself. Still, if `_lines(1)` is not right for your data, it is best to specify the correct number through `_lines(#)`.

`_lines()` appears only once in a dictionary.

`_line(#)` tells `infile` to jump to line # of the observation. `_line()` is not the same as `_lines()`. Consider a file with `_lines(4)`, meaning four lines per observation. `_line(2)` says to jump to the second line of the observation. `_line(4)` says to jump to the fourth line of the observation. You may jump forward or backward. `infile` does not care, and there is no inefficiency in going forward to `_line(3)`, reading a few variables, jumping back to `_line(1)`, reading another variable, and jumping forward again to `_line(3)`.

You need not ensure that, at the end of your dictionary, you are on the last line of the observation. `infile` knows how to get to the next observation because it knows where you are and it knows `_lines()`, the total number of lines per observation.

`_line()` may appear many times in a dictionary.

`_newline`[`(`#`)`] is an alternative to `_line()`. `_newline(1)`, which may be abbreviated `_newline`, goes forward one line. `_newline(2)` goes forward two lines. We do not recommend using `_newline()` because `_line()` is better. If you are currently on line 2 of an observation and want to get to line 6, you could type `_newline(4)`, but your meaning is clearer if you type `_line(6)`.

`_newline()` may appear many times in a dictionary.

`_column(`#`)` jumps to column # (in bytes) of the current line. You may jump forward or backward within a line. `_column()` may appear many times in a dictionary.

`_skip`[`(`#`)`] jumps forward # columns on the current line. `_skip()` is just an alternative to `_column()`. `_skip()` may appear many times in a dictionary.

[*type*] *varname* [`:`*lblname*] [`%` *infmt*] [`"`*variable label*`"`] instructs `infile` to read a variable. The simplest form of this instruction is the variable name itself: *varname*.

At all times, `infile` is on some column of some line of an observation. `infile` starts on column 1 of line 1, so pretend that is where we are. Given the simplest directive, '*varname*', `infile` goes through the following logic:

If the current column is blank, it skips forward until there is a nonblank column (or until the end of the line). If it just skipped all the way to the end of the line, it stores a missing value in *varname*. If it skipped to a nonblank column, it begins collecting what is there until it comes to a blank column or the end of the line. These are the data for *varname*. Then it sets the current column to wherever it is.

The logic is a bit more complicated. For instance, when skipping forward to find the data, `infile` might encounter a quote. If so, it then collects the characters for the data by skipping forward until it finds the matching quote. If you specified a `%` *infmt*, then `infile` skips the skipping-forward step and simply collects the specified number of bytes. If you specified a `%S` *infmt*, then `infile` does not skip leading or trailing blanks. Nevertheless, the general logic is (optionally) skip, collect, and reset.

Remarks and examples

Remarks are presented under the following headings:

Introduction

`infile using` follows a two-step process to read your data. You type something like `infile using descript`, and

1. `infile using` reads the file `descript.dct`, which tells `infile` about the format of the data; and
2. `infile using` then reads the data according to the instructions recorded in `descript.dct`.

`descript.dct` (the file could be named anything) is called a dictionary, and `descript.dct` is just a text file that you create with the Do-file Editor or an editor outside Stata.

As for the data, they can be in the same file as the dictionary or in a different file. It does not matter.

Reading free-format files

Another variation of `infile` for reading free-format files is described in [D] **infile (free format)**. We will refer to this variation as `infile` without a dictionary. The distinction between the two variations is in the treatment of line breaks. `infile` without a dictionary does not consider them significant. `infile` with a dictionary does.

A line, also known as a record, physical record, or physical line (as opposed to observations, logical records, or logical lines), is a string of characters followed by the line terminator. If you were to type the file, a line is what would appear on your screen if your screen were infinitely wide. Your screen would have to be infinitely wide so that there would be no possibility that one line could take more than one line of your screen, thus fooling you into thinking that there are multiple lines when there is only one.

A logical line, on the other hand, is a sequence of one or more physical lines that represent one observation of your data. `infile` with a dictionary does not spontaneously go to new physical lines; it goes to a new line only between observations and when you tell it to. `infile` without a dictionary, on the other hand, goes to a new line whenever it needs to, which can be right in the middle of an observation. Thus consider the following little bit of data, which is for three variables:

```
5 4
1 9 3
2
```

How do you interpret these data?

Here is one interpretation: There are 3 observations. The first is 5, 4, and missing. The second is 1, 9, and 3. The third is 2, missing, and missing. That is the interpretation that `infile` with a dictionary makes.

Here is another interpretation: There are 2 observations. The first is 5, 4, and 1. The second is 9, 3, and 2. That is the interpretation that `infile` without a dictionary makes.

Which is right? You would have to ask the person who entered these data. The question is, are the line breaks significant? Do they mean anything? If the line breaks are significant, you use `infile` with a dictionary. If the line breaks are not significant, you use `infile` without a dictionary.

The other distinction between the two `infile`s is that `infile` with a dictionary does not process comma-separated–value format. If your data are comma-separated, tab-separated, or otherwise delimited, see [D] **import delimited** or [D] **infile (free format)**.

▷ Example 1: A simple dictionary with data

Outside Stata, we have typed into the file `highway.dct` information on the accident rate per million vehicle miles along a stretch of highway, the speed limit on that highway, and the number of access points (on-ramps and off-ramps) per mile. Our file contains

begin highway.dct, example 1

```
infile dictionary {
        acc_rate  spdlimit acc_pts
}
4.58 55 4.6
2.86  60 4.4
1.61 . 2.2
3.02 60 4.7
```

end highway.dct, example 1

This file can be read by typing the commands below. Stata displays the dictionary and reads the data:

```
. infile using highway
infile dictionary {
        acc_rate  spdlimit acc_pts
}
(4 observations read)
. list
```

	acc_rate	spdlimit	acc_pts
1.	4.58	55	4.6
2.	2.86	60	4.4
3.	1.61	.	2.2
4.	3.02	60	4.7

◁

▷ Example 2: Specifying variable labels

We can include variable labels in a dictionary so that after we `infile` the data, the data will be fully labeled. We could change `highway.dct` to read

begin highway.dct, example 2

```
infile dictionary {
* This is a comment and will be ignored by Stata
* You might type the source of the data here.
        acc_rate  "Acc. Rate/Million Miles"
        spdlimit  "Speed Limit (mph)"
        acc_pts   "Access Pts/Mile"
}
4.58 55 4.6
2.86  60 4.4
1.61 . 2.2
3.02 60 4.7
```

end highway.dct, example 2

Now when we type `infile using highway`, Stata not only reads the data but also labels the variables.

◁

▷ Example 3: Specifying variable storage types

We can indicate the variable types in the dictionary. For instance, if we wanted to store `acc_rate` as a `double` and `spdlimit` as a `byte`, we could change `highway.dct` to read begin highway.dct, example 3

```
infile dictionary {
* This is a comment and will be ignored by Stata
* You might type the source of the data here.
 double acc_rate  "Acc. Rate/Million Miles"
 byte   spdlimit  "Speed Limit (mph)"
        acc_pts   "Access Pts/Mile"
}
4.58 55 4.6
2.86  60 4.4
1.61 . 2.2
3.02 60 4.7
```

end highway.dct, example 3

Because we do not indicate the variable type for `acc_pts`, it is given the default variable type `float` (or the type specified by the `set type` command).

◁

▷ Example 4: Reading string variables

By specifying the types, we can read string variables as well as numeric variables. For instance,

begin emp.dct

```
infile dictionary {
* data on employees
  str20 name         "Name"
        age          "Age"
    int sex          "Sex coded 0 male 1 female"
}
"Lisa Gilmore" 25 1
Branton 32 1
'Bill Ross' 27 0
```

end emp.dct

The strings can be delimited by single or double quotes, and quotes may be omitted altogether if the string contains no blanks or other special characters.

◁

▷ Example 5: Specifying value labels

You may attach value labels to variables in the dictionary by using the colon notation:

begin emp2.dct

```
infile dictionary {
* data on name, sex, and age
  str16 name         "Name"
        sex:sexlbl   "Sex"
    int age          "Age"
}
"Arthur Doyle" Male 22
"Mary Hope" Female 37
"Guy Fawkes" Male 48
"Karen Cain" Female 25
```

end emp2.dct

If you want the value labels to be created automatically, you must specify the `automatic` option on the `infile` command. These data could be read by typing `infile using emp2, automatic`, assuming the dictionary and data are stored in the file `emp2.dct`.

◁

▷ Example 6: Separate the dictionary and data files

The data need not be in the same file as the dictionary. We might leave the highway data in `highway.raw` and write a dictionary called `highway.dct` describing the data:

begin highway.dct, example 4

```
infile dictionary using highway {
* This dictionary reads the file highway.raw.  If the
* file were called highway.txt, the first line would
* read "dictionary using highway.txt"
        acc_rate   "Acc. Rate/Million Miles"
        spdlimit   "Speed Limit (mph)"
        acc_pts    "Access Pts/Mile"
}
```

end highway.dct, example 4

◁

▷ Example 7: Ignoring the top of a file

The `firstlineoffile()` directive allows us to ignore lines at the top of the file. Consider the following raw dataset:

begin mydata.raw

```
The following data were entered by Marsha Martinez.  It was checked by
Helen Troy.
id income educ sex age
1024 25000 HS Male 28
1025 27000 C Female 24
```

end mydata.raw

Our dictionary might read

begin mydata.dct

```
infile dictionary using mydata {
        _first(4)
        int id "Identification Number"
        income "Annual income"
        str2 educ "Highest educ level"
        str6 sex
        byte age
}
```

end mydata.dct

◁

▷ Example 8: Data spread across multiple lines

The `_line()` and `_lines()` directives tell Stata how to read our data when there are multiple records per observation. We have the following in `mydata2.raw`:

begin mydata2.raw
```
id income educ sex age
1024 25000 HS
Male
28
1025 27000 C
Female
24
1035 26000 HS
Male
32
1036 25000 C
Female
25
```
end mydata2.raw

We can read this with a dictionary `mydata2.dct`, which we will just let Stata list as it simultaneously reads the data:

```
. infile using mydata2, clear
infile dictionary using mydata2 {
    _first(2)                        * Begin reading on line 2
    _lines(3)                        * Each observation takes 3 lines.
    int id "Identification Number"   * Since _line is not specified, Stata
    income "Annual income"           * assumes that it is 1.
    str2 educ "Highest educ level"
    _line(2)                         * Go to line 2 of the observation.
    str6 sex                         * (values for sex are located on line 2)
    _line(3)                         * Go to line 3 of the observation.
    int age                          * (values for age are located on line 3)
}
(4 observations read)
. list
```

	id	income	educ	sex	age
1.	1024	25000	HS	Male	28
2.	1025	27000	C	Female	24
3.	1035	26000	HS	Male	32
4.	1036	25000	C	Female	25

Here is the really good part: we read these variables in order, but that was not necessary. We could just as well have used the dictionary:

begin mydata2p.dct
```
infile dictionary using mydata2 {
        _first(2)
        _lines(3)
        _line(1)   int   id     "Identification number"
                         income "Annual income"
                   str2  educ   "Highest educ level"
        _line(3)   int   age
        _line(2)   str6  sex
}
```
end mydata2p.dct

We would have obtained the same results just as quickly, the only difference being that our variables in the final dataset would be in the order specified: `id`, `income`, `educ`, `age`, and `sex`.

◁

❑ Technical note

You can use `_newline` to specify where breaks occur, if you prefer:

begin highway.dct, example 5

```
infile dictionary {
         acc_rate  "Acc. Rate/Million Miles"
         spdlimit  "Speed Limit (mph)"
_newline acc_pts   "Access Pts/Mile"
}
4.58 55
4.6
2.86  60
 4.4
1.61 .
2.2
3.02 60
 4.7
```

end highway.dct, example 5

The line reading '`1.61 .`' could have been read `1.61` (without the period), and the results would have been unchanged. Because dictionaries do not go to new lines automatically, a missing value is assumed for all values not found in the record.

❑

Reading fixed-format files

Values in formatted data are sometimes packed one against the other with no intervening blanks. For instance, the highway data might appear as

begin highway.raw, example 6

```
4.58554.6
2.86604.4
1.61  2.2
3.02604.7
```

end highway.raw, example 6

The first four columns of each record represent the accident rate; the next two columns, the speed limit; and the last three columns, the number of access points per mile.

To read these data, you must specify the `%`*infmt* in the dictionary. Numeric `%`*infmt*s are denoted by a leading percent sign (`%`) followed optionally by a string of the form w or $w.d$, where w and d stand for two integers. The first integer, w, specifies the width of the format. The second integer, d, specifies the number of digits that are to follow the decimal point. d must be less than or equal to w. Finally, a character denoting the format type (`f`, `g`, or `e`) is appended. For example, `%9.2f` specifies an `f` format that is nine characters wide and has two digits following the decimal point.

Numeric formats

The `f` format indicates that `infile` is to attempt to read the data as a number. When you do not specify the `%`*infmt* in the dictionary, `infile` assumes the `%f` format. The width, w, being missing means that `infile` is to attempt to read the data in free format.

As it starts reading each observation, `infile` reads a record into its buffer and sets a column pointer to 1, indicating that it is currently on the first column. When `infile` processes a `%f` format, it moves the column pointer forward through white space. It then collects the characters up to the next occurrence of white space and attempts to interpret those characters as a number. The column pointer is left at the first occurrence of white space following those characters. If the next variable is also free format, the logic repeats.

When you explicitly specify the field width w, as in `%wf`, `infile` does not skip leading white space. Instead, it collects the next w characters starting at the column pointer and attempts to interpret the result as a number. The column pointer is left at the old value of the column pointer plus w, that is, on the first character following the specified field.

▷ Example 9: Specifying the width of fields

If the data above were stored in `highway.raw`, we could create the following dictionary to read the data:

begin `highway.dct`, example 6

```
infile dictionary using highway {
        acc_rate    %4f   "Acc. Rate/Million Miles"
        spdlimit    %2f   "Speed Limit (mph)"
        acc_pts     %3f   "Access Pts/Mile
}
```

end `highway.dct`, example 6

When we explicitly indicate the field width, `infile` does not skip intervening characters. The first four columns are used for the variable `acc_rate`, the next two for `spdlimit`, and the last three for `acc_pts`.

◁

❏ Technical note

The d specification in the `%w.df` indicates the number of *implied* decimal places in the data. For instance, the string 212 read in a `%3.2f` format represents the number 2.12. Do *not* specify d unless your data have elements of this form. The w alone is sufficient to tell `infile` how to read data in which the decimal point is explicitly indicated.

When you specify d, Stata takes it only as a suggestion. If the decimal point is explicitly indicated in the data, that decimal point always overrides the d specification. Decimal points are also not implied if the data contain an `E`, `e`, `D`, or `d`, indicating scientific notation.

Fields are right-justified before implying decimal points. Thus '`2  `', '` 2 `', and '`  2`' are all read as 0.2 by the `%3.1f` format.

❏

❏ Technical note

The `g` and `e` formats are the same as the `f` format. You can specify any of these letters interchangeably. The letters `g` and `e` are included as a convenience to those familiar with Fortran, in which the `e` format indicates scientific notation. For example, the number 250 could be indicated as `2.5E+02` or `2.5D+02`. Fortran programmers would refer to this as an `E7.5` format, and in Stata, this format would be indicated as `%7.5e`. In Stata, however, you need specify only the field width w, so you could read this number by using `%7f`, `%7g`, or `%7e`.

The `g` format is really a Fortran output format that indicates a freer format than `f`. In Stata, the two formats are identical.

Throughout this section, you may freely substitute the `g` or `e` formats for the `f` format.

❏

❑ Technical note

Be careful to distinguish between *%fmts* and *%infmts*. *%fmts* are also known as *display* formats—they describe how a variable is to look when it is displayed; see **[U] 12.5 Formats: Controlling how data are displayed**. *%infmts* are also known as *input* formats—they describe how a variable looks when you input it. For instance, there is an output date format, `%td`, but there is no corresponding input format. (See **[U] 25 Working with dates and times** for recommendations on how to read dates.) For the other formats, we have attempted to make the input and output definitions as similar as possible. Thus we include `g`, `e`, and `f` *%infmts*, even though they all mean the same thing, because `g`, `e`, and `f` are also *%fmts*.

❑

String formats

The `s` and `S` formats are used for reading strings. The syntax is `%`*w*`s` or `%`*w*`S`, where the *w* is optional. If you do not specify the field width, your strings must either be enclosed in quotes (single or double) or not contain any characters other than letters, numbers, and "`_`".

This may surprise you, but the `s` format can be used for reading numeric variables, and the `f` format can be used for reading string variables! When you specify the field width, *w*, in the `%`*w*`f` format, all embedded blanks in the field are removed before the result is interpreted. They are not removed by the `%`*w*`s` format.

For instance, the `%3f` format would read "`- 2`", "`-2 `", or "` -2`" as the number −2. The `%3s` format would not be able to read "`- 2`" as a number, because the sign is separated from the digit, but it could read "` -2`" or "`-2 `". The `%`*w*`f` format removes blanks; datasets written by some Fortran programs separate the sign from the number.

There are, however, some side effects of this practice. The string "`2 2`" will be read as 22 by a `%3f` format. Most Fortran compilers would read this number as 202. The `%3s` format would issue a warning and store a *missing* value.

Now consider reading the string "`a b`" into a string variable. Using a `%3s` format, Stata will store it as it appears: `a b`. Using a `%3f` format, however, it will be stored as `ab`—the middle blank will be removed.

`%`*w*`S` is a special case of `%`*w*`s`. A string read with `%`*w*`s` will have leading and trailing blanks removed, but a string read with `%`*w*`S` will not have them removed.

Examples using the `%s` format are provided below, after we discuss specifying column and line numbers.

Specifying column and line numbers

`_column()` jumps to the specified column. For instance, the documentation of some dataset indicates that the variable `age` is recorded as a two-digit number in column 47. You could read this by coding

```
_column(47) age %2f
```

After typing this, you are now at column 49, so if immediately following `age` there were a one-digit number recording `sex` as 0 or 1, you could code

```
_column(47) age %2f
            sex %1f
```

or, if you wanted to be explicit about it, you could instead code

```
_column(47) age %2f
_column(49) sex %1f
```

It makes no difference. If at column 50 there were a one-digit code for `race` and you wanted to read it but skip reading the `sex` code, you could code

```
_column(47) age %2f
_column(50) race %1f
```

You could equivalently skip forward using `_skip()`:

```
_column(47) age %2f
_skip(1)    race %1f
```

One advantage of `column()` over `_skip` is that it lets you jump forward or backward in a record. If you wanted to read `race` and then `age`, you could code

```
_column(50) race %1f
_column(47) age %2f
```

If the data you are reading have multiple lines per observation (sometimes said as multiple records per observation), you can tell `infile` how many lines per record there are by using `_lines()`:

```
_lines(4)
```

`_lines()` appears only once in a dictionary. Good style says that it should be placed near the top of the dictionary, but Stata does not care.

When you want to go to a particular line, include the `_line()` directive. In our example, let's assume that `race`, `sex`, and `age` are recorded on the second line of each observation:

```
_lines(4)

_line(2)
    _column(47) age %2f
    _column(50) race %1f
```

Let's assume that `id` is recorded on line 1.

```
_lines(4)

_line(1)
    _column(1)  id  %4f
_line(2)
    _column(47) age %2f
    _column(50) race %1f
```

`_line()` works like `_column()` in that you can jump forward or backward, so these data could just as well be read by

```
_lines(4)

_line(2)
    _column(47) age %2f
    _column(50) race %1f
_line(1)
    _column(1)  id  %4f
```

Remember that this dataset has four lines per observation, and yet we have never referred to `line(3)` or `line(4)`. That is okay. Also, at the end of our dictionary, we are on line 1, not line 4. That is okay, too. `infile` will still get to the next observation correctly.

❑ Technical note

Another way to move between records is `_newline()`. `_newline()` is to `_line()` as `_skip()` is to `_column()`, which is to say, `_newline()` can only go forward. There is one difference: `_skip()` has its uses, whereas `_newline()` is useful only for backward capability with older versions of Stata.

`_skip()` has its uses because sometimes we think in columns and sometimes we think in widths. Some data documentation might include the sentence, "At column 54 are recorded the answers to the 25 questions, with one column allotted to each." If we want to read the answers to questions 1 and 5, it would indeed be natural to code

```
_column(54) q1 %1f
_skip(3)
            q5 %1f
```

Nobody has ever read data documentation with the statement, "Demographics are recorded on record 2, and two records after that are the income values." The documentation would instead say, "Record 2 contains the demographic information and record 4, income." The `_newline()` way of thinking is based on what is convenient for the computer, which does, after all, have to move past a certain number of records. That, however, is no reason for making you think that way.

Before that thought occurred to us, Stata users specified `_newline()` to go forward a number of records. They still can, so their old dictionaries will work. When you use `_newline()` and do not specify `_lines()`, you must move past the correct number of records so that, at the end of the dictionary, you are on the last record. In this mode, when Stata reexecutes the dictionary to process the next observation, it goes forward one record.

❑

Examples of reading fixed-format files

▷ Example 10: A file with two lines per observation

In this example, each observation occupies two lines. The first 2 observations in the dataset are

```
John Dunbar                     10001   101 North 42nd Street
1010111111
Sam K. Newey Jr.                10002   15663 Roustabout Boulevard
0101000000
```

The first observation tells us that the name of the respondent is John Dunbar; that his ID is 10001; that his address is 101 North 42nd Street; and that his answers to questions 1–10 were yes, no, yes, no, yes, yes, yes, yes, yes, and yes.

The second observation tells us that the name of the respondent is Sam K. Newey Jr.; that his ID is 10002; that his address is 15663 Roustabout Boulevard; and that his answers to questions 1–10 were no, yes, no, yes, no, no, no, no, no, and no.

To see the layout within the file, we can temporarily add two rulers to show the appropriate columns:

```
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8
John Dunbar                     10001   101 North 42nd Street
1010111111
Sam K. Newey Jr.                10002   15663 Roustabout Boulevard
0101000000
----+----1----+----2----+----3----+----4----+----5----+----6----+----7----+----8
```

Each observation in the data appears in two physical lines within our text file. We had to check in our editor to be sure that there really were new-line characters (for example, "hard returns") after the address. This is important because some programs will wrap output for you so that one line may appear as many lines. The two seemingly identical files will differ in that one has a hard return and the other has a soft return added only for display purposes.

In our data, the name occupies columns 1–32; a person identifier occupies columns 33–37; and the address occupies columns 40–80. Our worksheet revealed that the widest address ended in column 80.

The text file containing these data is called `fname.txt`. Our dictionary file looks like this:

begin fname.dct

```
infile dictionary using fname.txt {
*
* Example reading in data where observations extend across more
* than one line.  The next line tells infile there are 2 lines/obs:
*
_lines(2)
*
               str50   name    %32s       "Name of respondent"
_column(33)    long    id      %5f        "Person id"
_skip(2)       str50   addr    %41s       "Address"
_line(2)
_column(1)     byte    q1      %1f        "Question 1"
               byte    q2      %1f        "Question 2"
               byte    q3      %1f        "Question 3"
               byte    q4      %1f        "Question 4"
               byte    q5      %1f        "Question 5"
               byte    q6      %1f        "Question 6"
               byte    q7      %1f        "Question 7"
               byte    q8      %1f        "Question 8"
               byte    q9      %1f        "Question 9"
               byte    q10     %1f        "Question 10"
}
```

end fname.dct

Up to five pieces of information may be supplied in the dictionary for each variable: the location of the data, the storage type of the variable, the name of the variable, the input format, and the variable label.

Thus the `str50` line says that the first variable is to be given a storage type of `str50`, called `name`, and is to have the variable label "Name of respondent". The `%32s` is the input format, which tells Stata how to read the data. The `s` tells Stata not to remove any embedded blanks; the `32` tells Stata to go across 32 columns when reading the data.

The next line says that the second variable is to be assigned a storage type of `long`, named `id`, and be labeled "Person id". Stata should start reading the information for this variable in column 33. The `f` tells Stata to remove any embedded blanks, and the `5` says to read across five columns.

The third variable is to be given a storage type of `str50`, called `addr`, and be labeled "Address". The `_skip(2)` directs Stata to skip two columns before beginning to read the data for this variable, and the `%41s` instructs Stata to read across 41 columns and not to remove embedded blanks.

`line(2)` instructs Stata to go to line 2 of the observation.

The remainder of the data is 0/1 coded, indicating the answers to the questions. It would be convenient if we could use a shorthand to specify this portion of the dictionary, but we must supply explicit directives.

◁

❏ Technical note

In the preceding example, there were two pieces of information about location: where the data begin for each variable (the `_column()`, `_skip()`, `_line()`) and how many columns the data span (the `%32s`, `%5f`, `%41s`, `%1f`). In our dictionary, some of this information was redundant. After reading `name`, Stata had finished with 32 columns of information. Unless instructed otherwise, Stata would proceed to the next column—column 33—to begin reading information about `id`. The `_column(33)` was unnecessary.

The `_skip(2)` was necessary, however. Stata had read 37 columns of information and was ready to look at column 38. Although the address information does not begin until column 40, columns 38 and 39 contain blanks. Because these are leading blanks instead of embedded blanks, Stata would just ignore them without any trouble. The problem is with the `%41s`. If Stata begins reading the address information from column 38 and reads 41 columns, Stata would stop reading in column 78 ($78 - 41 + 1 = 38$), but the widest address ends in column 80. We could have omitted the `_skip(2)` if we had specified an input format of `%43s`.

The `_line(2)` was necessary, although we could have read the second line by coding `_newline` instead.

The `_column(1)` could have been omitted. After the `_line()`, Stata begins in column 1.

See the next example for a dataset in which both pieces of location information are required.

❏

▷ Example 11: Manipulating the column pointer

The following file contains six variables in a variety of formats. In the dictionary, we read the variables `fifth` and `sixth` out of order by forcing the column pointer.

begin example.dct
```
infile dictionary {
                        first   %3f
                double  second  %2.1f
                        third   %6f
    _skip(2)    str4    fourth  %4s
    _column(21)         sixth %4.1f
    _column(18)         fifth %2f
}
1.2125.7e+252abcd 1 .232
1.3135.7   52efgh2    5
1.41457    52abcd 3 100.
1.5155.7D+252efgh04 1.7
16 16 .57  52abcd 5 1.71
```
end example.dct

Assuming that the above is stored in a file called `example.dct`, we can `infile` and `list` it by typing

```
. infile using example
infile dictionary {
                        first   %3f
                double  second  %2.1f
                        third   %6f
    _skip(2)    str4    fourth  %4s
    _column(21)         sixth %4.1f
    _column(18)         fifth %2f
}
(5 observations read)
```

```
. list

     +-----------------------------------------------------+
     | first   second   third   fourth   sixth   fifth     |
     |-----------------------------------------------------|
  1. |   1.2      1.2     570     abcd    .232       1     |
  2. |   1.3      1.3     5.7     efgh      .5       2     |
  3. |   1.4      1.4      57     abcd     100       3     |
  4. |   1.5      1.5     570     efgh     1.7       4     |
  5. |    16      1.6     .57     abcd    1.71       5     |
     +-----------------------------------------------------+
```

◁

Reading fixed-block files

❑ Technical note

The `_lrecl(#)` directive is used for reading datasets that do not have end-of-line delimiters (carriage return, line feed, or some combination of these). Such datasets are typical of IBM mainframes, where they are known as fixed block, or FB. The abbreviation LRECL is IBM mainframe jargon for logical record length.

In a fixed-block dataset, each # characters are to be interpreted as a record. For instance, consider the data

```
1 21
2 42
3 63
```

In fixed-block format, these data might be recorded as

begin mydata.ibm

```
1 212 423 63
```

end mydata.ibm

and you would be told, on the side, that the LRECL is 4. If you then pass along that information to `infile`, it can read the data:

begin mydata.dct

```
infile dictionary using mydata.ibm {
        _lrecl(4)
        int     id
        int     age
}
```

end mydata.dct

When you do not specify the `_lrecl(#)` directive, `infile` assumes that each line ends with the standard text EOL delimiter (which can be a line feed, a carriage return, a line feed followed by a carriage return, or a carriage return followed by a line feed). When you specify `_lrecl(#)`, `infile` reads the data in blocks of # characters and then acts as if that is a line.

A common mistake in processing fixed-block datasets is to use an incorrect LRECL value, such as 160 when it is really 80. To understand what can happen, pretend that you thought the LRECL in your data was 6 rather than 4. Taking the characters in groups of 6, the data appear as

```
1 212
423 63
```

Stata cannot verify that you have specified the correct LRECL, so if the data appear incorrect, verify that you have the correct number.

The maximum LRECL `infile` allows is 524,275.

❑

Reading EBCDIC files

In the previous section, we discussed the `_lrecl(#)` directive that is often necessary for files that originated on mainframes and do not have end-of-line delimiters.

Such files sometimes are not even plain text files. Sometimes, these files have an alternate character encoding known as extended binary coded decimal interchange code (EBCDIC). The EBCDIC encoding was created in the 1960s by IBM for its mainframes.

Because EBCDIC is a different character encoding, we cannot even show you a printed example; it would be unreadable. Nevertheless, Stata can convert EBCDIC files to ASCII (see [D] **filefilter**) and can read data from EBCDIC files.

If you have a data file encoded with EBCDIC, you undoubtedly also have a description of it from which you can create a dictionary that includes the LRECL of the file (EBCDIC files do not typically have end-of-line delimiters) and the character positions of the fields in the file. You create a dictionary for an EBCDIC file just as you would for a plain text file, using the Do-file Editor or another text editor, and being sure to use the `_lrecl()` directive in the dictionary to specify the LRECL. You then simply specify the `ebcdic` option for `infile`, and Stata will convert the characters in the file from EBCDIC to ASCII on the fly:

```
. infile using mydict, ebcdic
```

Also see

[D] **infile (free format)** — Import unformatted text data

[D] **infix (fixed format)** — Import text data in fixed format

[D] **export** — Overview of exporting data from Stata

[D] **import** — Overview of importing data into Stata

[U] 22 Entering and importing data

infile (free format) — Import unformatted text data

Description | Quick start | Menu | Syntax
Options | Remarks and examples | Also see

Description

`infile` reads into memory from a disk a dataset that is not in Stata format.

Here we discuss using `infile` to read free-format data, meaning datasets in which Stata does not need to know the formatting information. Another variation on `infile` allows reading fixed-format data; see [D] **infile (fixed format)**. Yet another alternative is `import delimited`, which is easier to use if your data are tab- or comma-separated and contain 1 observation per line. Stata has other commands for reading data, too. If you are not certain that `infile` will do what you are looking for, see [D] **import** and **[U] 22 Entering and importing data**.

After the data are read into Stata, they can be saved in a Stata-format dataset; see [D] **save**.

Quick start

Import unformatted text data from `mydata1.raw`, and name the imported `float` variables `v1`, `v2`, and `v3`

```
infile v1 v2 v3 using mydata1
```

Same as above, but skip 1 variable in the original file between `v1` and `v2`

```
infile v1 _skip(1) v2 v3 using mydata1
```

Same as above, and indicate that `v1` is a `byte` variable, `v2` is a string variable of length 30, and `v3` is a `double` variable

```
infile byte v1 _skip(1) str30 v2 double v3 using mydata1
```

Also read `v4` as a `double`

```
infile byte v1 _skip(1) str30 v2 double(v3 v4) using mydata1
```

Import unformatted text data from `mydata2.raw` where 74 observations on `v1`, `v2`, and `v3` are stored in rows instead of columns

```
infile v1 v2 v3 using mydata2, byvariable(74)
```

Same as above, but import `mydata2.csv`

```
infile v1 v2 v3 using mydata2.csv, byvariable(74)
```

Menu

File > Import > Unformatted text data

Syntax

infile *varlist* [_skip[(#)]] [*varlist* [_skip[(#)] ...]]] using *filename* [*if*] [*in*]
[, *options*]

If *filename* is specified without an extension, .raw is assumed. If *filename* contains embedded spaces, remember to enclose it in double quotes.

options	Description
Main	
clear	replace data in memory
Options	
automatic	create value labels from nonnumeric data
byvariable(#)	organize external file by variables; # is number of observations

Options

Main

clear specifies that it is okay for the new data to replace the data that are currently in memory. To ensure that you do not lose something important, infile will refuse to read new data if data are already in memory. clear allows infile to replace the data in memory. You can also drop the data yourself by typing drop _all before reading new data.

Options

automatic causes Stata to create value labels from the nonnumeric data it reads. It also automatically widens the display format to fit the longest label.

byvariable(#) specifies that the external data file is organized by variables rather than by observations. All the observations on the first variable appear, followed by all the observations on the second variable, and so on. Time-series datasets sometimes come in this format.

Remarks and examples

This section describes infile features for reading data in free or comma-separated–value format.

Remarks are presented under the following headings:

Reading free-format data

In free format, data are separated by one or more white-space characters—blanks, tabs, or new lines (carriage return, line feed, or carriage-return/line feed combinations). Thus one observation may span any number of lines.

Numeric missing values are indicated by single periods ("`.`").

▷ Example 1

In the file `highway.raw`, we have information on the accident rate per million vehicle miles along a stretch of highway, the speed limit on that highway, and the number of access points (on-ramps and off-ramps) per mile. Our file contains

begin `highway.raw`, example 1

```
4.58 55 4.6
2.86  60 4.4
1.61 . 2.2
3.02 60
4.7
```

end `highway.raw`, example 1

We can read these data by typing

```
. infile acc_rate spdlimit acc_pts using highway
(4 observations read)

. list
```

	acc_rate	spdlimit	acc_pts
1.	4.58	55	4.6
2.	2.86	60	4.4
3.	1.61	.	2.2
4.	3.02	60	4.7

The spacing of the numbers in the original file is irrelevant.

◁

❑ Technical note

Missing values need not be indicated by one period. The third observation on the speed limit is missing in example 1. The raw data file indicates this by recording one period. Let's assume, instead, that the missing value was indicated by the word `unknown`. Thus the raw data file appears as

begin `highway.raw`, example 2

```
4.58 55 4.6
2.86  60 4.4
1.61 unknown 2.2
3.02 60
4.7
```

end `highway.raw`, example 2

Here is the result of infiling these data:

```
. infile acc_rate spdlimit acc_pts using highway
'unknown' cannot be read as a number for spdlimit[3]
(4 observations read)
```

`infile` warned us that it could not read the word `unknown`, stored a *missing*, and then continued to read the rest of the dataset. Thus aside from the warning message, results are unchanged.

Because not all packages indicate missing data in the same way, this feature can be useful when reading data. Whenever `infile` sees something that it does not understand, it warns you, records a *missing*, and continues. If, on the other hand, the missing values were recorded not as `unknown` but as, say, `99`, Stata would have had no difficulty reading the number, but it would also have stored 99 rather than missing. To convert such coded missing values to true missing values, see [D] **mvencode**.

❏

Reading comma-separated data

In comma-separated–value format, data are separated by commas. You may mix comma-separated–value and free formats. Missing values are indicated either by single periods or by multiple commas that serve as placeholders, or both. As with free format, 1 observation may span any number of input lines.

▷ Example 2

We can modify the format of `highway.raw` used in example 1 without affecting `infile`'s ability to read it. The dataset can be read with the same command, and the results would be the same if the file instead contained

begin `highway.raw`, example 3

```
4.58,55 4.6
2.86, 60,4.4
1.61,,2.2
3.02,60
4.7
```

end `highway.raw`, example 3

◁

Specifying variable types

The variable names you type after the word `infile` are new variables. The syntax for a new variable is

[*type*] *new_varname*[*:label_name*]

A full discussion of this syntax can be found in [U] **11.4 varname and varlists**. As a quick review, new variables are, by default, of type `float`. This default can be overridden by preceding the variable name with a storage type (`byte`, `int`, `long`, `float`, `double`, or `str#`) or by using the `set type` command. A list of variables placed in parentheses will be given the same type. For example,

`double(`*first_var second_var* ... *last_var*`)`

causes *first_var second_var* ... *last_var* to all be of type `double`.

There is also a shorthand syntax for variable names with numeric suffixes. The varlist `var1-var4` is equivalent to specifying `var1 var2 var3 var4`.

▷ Example 3

In the highway example, we could infile the data acc_rate, spdlimit, and acc_pts and force the variable spdlimit to be of type int by typing

```
. infile acc_rate int spdlimit acc_pts using highway, clear
(4 observations read)
```

We could force all variables to be of type double by typing

```
. infile double(acc_rate spdlimit acc_pts) using highway, clear
(4 observations read)
```

We could call the three variables v1, v2, and v3 and make them all of type double by typing

```
. infile double(v1-v3) using highway, clear
(4 observations read)
```

◁

Reading string variables

By explicitly specifying the types, you can read string variables, as well as numeric variables.

▷ Example 4

Typing infile str20 name age sex using myfile would read

begin myfile.raw

```
"Sherri Holliday" 25 1
Branton 32 1
"Bill Ross" 27,0
```

end myfile.raw

or even

begin myfile.raw, variation 2

```
'Sherri Holliday' 25,1 "Branton" 32
1,'Bill Ross', 27,0
```

end myfile.raw, variation 2

The spacing is irrelevant, and either single or double quotes may be used to delimit strings. The quotes do not count when calculating the length of strings. Quotes may be omitted altogether if the string contains no blanks or other special characters (anything other than letters, numbers, or underscores).

Typing

```
. infile str20 name age sex using myfile, clear
(3 observations read)
```

makes name a str20 and age and sex floats. We might have typed

```
. infile str20 name age int sex using myfile, clear
(3 observations read)
```

to make sex an int or

```
. infile str20 name int(age sex) using myfile, clear
(3 observations read)
```

to make both age and sex ints.

◁

❑ Technical note

infile can also handle nonnumeric data by using *value labels*. We will briefly review value labels, but you should see [U] **12.6.3 Value labels** for a complete description.

A value label is a mapping from the set of integers to words. For instance, if we had a variable called sex in our data that represented the sex of the individual, we might code 0 for male and 1 for female. We could then just remember that every time we see a value of 0 for sex, that observation refers to a male, whereas 1 refers to a female.

Even better, we could inform Stata that 0 represents males and 1 represents females by typing

```
. label define sexfmt 0 "Male" 1 "Female"
```

Then we must tell Stata that this coding scheme is to be associated with the variable sex. This is typically done by typing

```
. label values sex sexfmt
```

Thereafter, Stata will print Male rather than 0 and Female rather than 1 for this variable.

Stata has the ability to turn a value label around. It can go not only from numeric codes to words such as "Male" and "Female" but also from words to numeric codes. We tell infile the value label that goes with each variable by placing a colon (:) after the variable name and typing the name of the value label. Before we do that, we use the label define command to inform Stata of the coding.

Let's assume that we wish to infile a dataset containing the words Male and Female and that we wish to store numeric codes rather than the strings themselves. This will result in considerable data compression, especially if we store the numeric code as a byte. We have a dataset named persons.raw that contains name, sex, and age:

begin persons.raw

```
"Arthur Doyle" Male 22
"Mary Hope" Female 37
"Guy Fawkes" Male 48
"Carrie House" Female 25
```

end persons.raw

Here is how we read and encode it at the same time:

```
. label define sexfmt 0 "Male" 1 "Female"

. infile str16 name sex:sexfmt age using persons
(4 observations read)

. list
```

	name	sex	age
1.	Arthur Doyle	Male	22
2.	Mary Hope	Female	37
3.	Guy Fawkes	Male	48
4.	Carrie House	Female	25

The str16 in the infile command applies only to the name variable; sex is a numeric variable, which we can prove by typing

```
. list, nolabel

     +--------------------------+
     |         name   sex   age |
     |--------------------------|
  1. | Arthur Doyle     0    22 |
  2. |    Mary Hope     1    37 |
  3. |   Guy Fawkes     0    48 |
  4. | Carrie House     1    25 |
     +--------------------------+
```

❑

❑ Technical note

When infile is directed to use a value label and it finds an entry in the file that does not match any of the codings recorded in the label, it prints a warning message and stores *missing* for the observation. By specifying the automatic option, you can instead have infile automatically add new entries to the value label.

Say that we have a dataset containing three variables. The first, region of the country, is a character string; the remaining two variables, which we will just call var1 and var2, contain numbers. We have stored the data in a file called geog.raw:

begin geog.raw

```
"NE"       31.23     87.78
'NCntrl'   29.52     98.92
South      29.62    114.69
West       28.28    218.92
NE         17.50     44.33
NCntrl     22.51     55.21
```

end geog.raw

The easiest way to read this dataset is to type

```
. infile str6 region var1 var2 using geog
```

making region a string variable. We do not want to do this, however, because we are practicing for reading a dataset like this containing 20,000 observations. If region were numerically encoded and stored as a byte, there would be a 5-byte saving per observation, reducing the size of the data by 100,000 bytes. We also do not want to bother with first creating the value label. Using the automatic option, infile creates the value label automatically as it encounters new regions.

```
. infile byte region:regfmt var1 var2 using geog, automatic clear
(6 observations read)

. list, sep(0)

     +--------------------------+
     | region    var1      var2 |
     |--------------------------|
  1. |     NE   31.23     87.78 |
  2. | NCntrl   29.52     98.92 |
  3. |  South   29.62    114.69 |
  4. |   West   28.28    218.92 |
  5. |     NE    17.5     44.33 |
  6. | NCntrl   22.51     55.21 |
     +--------------------------+
```

infile automatically created and defined a new value label called regfmt. We can use the label list command to view its contents:

```
. label list regfmt
regfmt:
           1 NE
           2 NCntrl
           3 South
           4 West
```

The value label need not be undefined before we use infile with the automatic option. If the value label regfmt had been previously defined as

```
. label define regfmt 2 "West"
```

the result of label list after the infile would have been

```
regfmt:
           2 West
           3 NE
           4 NCntrl
           5 South
```

The automatic option is convenient, but there is one reason for using it. Suppose that we had a dataset containing, among other things, information about an individual's sex. We know that the sex variable is supposed to be coded male and female. If we read the data by using the automatic option and if one of the records contains fmlae, then infile will blindly create a third sex rather than print a warning.

❑

Skipping variables

Specifying _skip instead of a variable name directs infile to ignore the variable in that location. This feature makes it possible to extract manageable subsets from large disk datasets. A number of contiguous variables can be skipped by specifying _skip(#), where # is the number of variables to ignore.

▷ Example 5

In the highway example from example 1, the data file contained three variables: acc_rate, spdlimit, and acc_pts. We can read the first two variables by typing

```
. infile acc_rate spdlimit _skip using highway
(4 observations read)
```

We can read the first and last variables by typing

```
. infile acc_rate _skip acc_pts using highway, clear
(4 observations read)
```

We can read the first variable by typing

```
. infile acc_rate _skip(2) using highway, clear
(4 observations read)
```

_skip may be specified more than once. If we had a dataset containing four variables—say, a, b, c, and d—and we wanted to read just a and c, we could type infile a _skip c _skip using *filename*.

◁

Skipping observations

Subsets of observations can be extracted by specifying `if` *exp*, which also makes it possible to extract manageable subsets from large disk datasets. Do not, however, use the _*variable* _N in *exp*. Use the `in` *range* qualifier to refer to observation numbers within the disk dataset.

▷ Example 6

Again referring to the highway example, if we type

```
. infile acc_rate spdlimit acc_pts if acc_rate>3 using highway, clear
(2 observations read)
```

only observations for which `acc_rate` is greater than 3 will be infiled. We can type

```
. infile acc_rate spdlimit acc_pts in 2/4 using highway, clear
(eof not at end of obs)
(3 observations read)
```

to read only the second, third, and fourth observations.

◁

Reading time-series data

If you are dealing with time-series data, you may receive datasets organized by variables rather than by observations. All the observations on the first variable appear, followed by all the observations on the second variable, and so on. The `byvariable(#)` option specifies that the external data file is organized in this way. You specify the number of observations in the parentheses, because `infile` needs to know that number to read the data properly. You can also mark the end of one variable's data and the beginning of another's data by placing a semicolon ("`;`") in the raw data file. You may then specify a number larger than the number of observations in the dataset and leave it to `infile` to determine the actual number of observations. This method can also be used to read unbalanced data.

▷ Example 7

We have time-series data on 4 years recorded in the file `time.raw`. The dataset contains information on year, amount, and cost, and is organized by variable:

begin `time.raw`

```
1980 1981 1982 1983
14 17 25 30
120 135 150
180
```

end `time.raw`

We can read these data by typing

```
. infile year amount cost using time, byvariable(4) clear
(4 observations read)

. list
```

	year	amount	cost
1.	1980	14	120
2.	1981	17	135
3.	1982	25	150
4.	1983	30	180

If the data instead contained semicolons marking the end of each series and had no information for amount in 1983, the raw data might appear as

```
1980 1981 1982 1983 ;
14 17 25 ;
120 135 150
180 ;
```

We could read these data by typing

```
. infile year amount cost using time, byvariable(100) clear
(4 observations read)

. list

     +----------------------+
     | year   amount   cost |
     |----------------------|
  1. | 1980       14    120 |
  2. | 1981       17    135 |
  3. | 1982       25    150 |
  4. | 1983        .    180 |
     +----------------------+
```

◁

Also see

[D] **infile (fixed format)** — Import text data in fixed format with a dictionary

[D] **export** — Overview of exporting data from Stata

[D] **import** — Overview of importing data into Stata

[U] 22 Entering and importing data

infix (fixed format) — Import text data in fixed format

Description   Quick start   Menu   Syntax   Options   Remarks and examples   Also see

Description

`infix` reads into memory from a disk dataset that is not in Stata format. `infix` requires that the data be in fixed-column format. Note that the column is byte based. The number of columns means the number of bytes in the file. The text file *filename* is treated as a stream of bytes, no encoding is assumed. If string data are encoded as ASCII or UTF-8, they will be imported correctly.

In the first syntax, if `using` $filename_2$ is not specified on the command line and `using` *filename* is not specified in the dictionary, the data are assumed to begin on the line following the closing brace. `infix` reads the data in a two-step process. You first create a disk file describing how the data are recorded. You tell `infix` to read that file—called a dictionary—and from there, `infix` reads the data. The data can be in the same file as the dictionary or in a different file.

In its second syntax, you tell `infix` how to read the data right on the command line with no intermediate file.

`infile` and `import delimited` are alternatives to `infix`. `infile` can also read data in fixed format—see [D] **infile (fixed format)**—and it can read data in free format—see [D] **infile (free format)**. Most people think that `infix` is easier to use for reading fixed-format data, but `infile` has more features. If your data are not fixed format, you can use `import delimited`; see [D] **import delimited**. `import delimited` allows you to specify the source file's encoding and then performs a conversion to UTF-8 encoding during import. If you are not certain that `infix` will do what you are looking for, see [D] **import** and [U] **22 Entering and importing data**.

Quick start

Read `v1` from columns 1 to 6 and `v2` from column 7 using `mydata.raw`

```
infix v1 1-6 v2 7 using mydata
```

Same as above, but read `v1` as a string variable

```
infix str v1 1-6 v2 7 using mydata
```

Same as above, but for 2-line records with `v2` in column 1 of the second line

```
infix 2 lines 1: v1 1-6 2: v2 1 using mydata
```

Same as above, but for `mydata.txt`

```
infix 2 lines 1: v1 1-6 2: v2 1 using mydata.txt
```

Same as above, but with data beginning on line 3

```
infix 3 firstlineoffile 2 lines 1: v1 1-6 2: v2 1 using mydata.txt
```

Same as above, but with instructions for reading the data contained in dictionary file `mydata.dct`

```
infix using mydata, using(mydata.txt)
```

Menu

File > Import > Text data in fixed format

Syntax

infix using *dfilename* [*if*] [*in*] [, using(*filename*$_2$) clear]

infix *specifications* using *filename* [*if*] [*in*] [, clear]

If *dfilename* is specified without an extension, .dct is assumed. If *dfilename* contains embedded spaces, remember to enclose it in double quotes. *dfilename*, if it exists, contains

begin dictionary file

```
infix dictionary [using filename] {
        * comments preceded by asterisk may appear freely
        specifications
}
(your data might appear here)
```

end dictionary file

If *filename* is specified without an extension, .raw is assumed. If *filename* contains embedded spaces, remember to enclose it in double quotes.

specifications is

\# firstlineoffile

\# lines

\#:

/

[byte | int | float | long | double | str] *varlist* [#:]#[-#]

Options

Main

using(*filename*$_2$) specifies the name of a file containing the data. If using() is not specified, the data are assumed to follow the dictionary in *dfilename*, or if the dictionary specifies the name of some other file, that file is assumed to contain the data. If using(*filename*$_2$) is specified, *filename*$_2$ is used to obtain the data, even if the dictionary says otherwise. If *filename*$_2$ is specified without an extension, .raw is assumed. If *filename*$_2$ contains embedded spaces, remember to enclose it in double quotes.

clear specifies that it is okay for the new data to replace what is currently in memory. To ensure that you do not lose something important, infix will refuse to read new data if data are already in memory. clear allows infix to replace the data in memory. You can also drop the data yourself by typing drop _all before reading new data.

Specifications

\# firstlineoffile (abbreviation first) is rarely specified. It states the line of the file at which the data begin. You need not specify first when the data follow the dictionary; infix can figure that out for itself. You can specify first when only the data appear in a file and the first few lines of that file contain headers or other markers.

first appears only once in the specifications.

\# `lines` states the number of lines per observation in the file. Simple datasets typically have "`1 lines`". Large datasets often have many lines (sometimes called records) per observation. `lines` is optional, even when there is more than one line per observation, because `infix` can sometimes figure it out for itself. Still, if `1 lines` is not right for your data, it is best to specify the appropriate number of lines.

`lines` appears only once in the specifications.

\#`:` tells `infix` to jump to line # of the observation. Consider a file with `4 lines`, meaning four lines per observation. `2:` says to jump to the second line of the observation. `4:` says to jump to the fourth line of the observation. You may jump forward or backward: `infix` does not care, and there is no inefficiency in going forward to `3:`, reading a few variables, jumping back to `1:`, reading another variable, and jumping back again to `3:`.

You need not ensure that, at the end of your specification, you are on the last line of the observation. `infix` knows how to get to the next observation because it knows where you are and it knows `lines`, the total number of lines per observation.

\#`:` may appear many times in the specifications.

`/` is an alternative to #`:`. `/` goes forward one line. `//` goes forward two lines. We do not recommend using `/` because #`:` is better. If you are currently on line 2 of an observation and want to get to line 6, you could type `////`, but your meaning is clearer if you type `6:`.

`/` may appear many times in the specifications.

[`byte` | `int` | `float` | `long` | `double` | `str`] *varlist* [#`:`]#[`-`#] instructs `infix` to read a variable or, sometimes, more than one.

The simplest form of this is *varname* #, such as `sex 20`. That says that variable *varname* be read from column # of the current line; that variable `sex` be read from column 20; and that here, `sex` is a one-digit number.

varname #`-`#, such as `age 21-23`, says that *varname* be read from the column range specified; that `age` be read from columns 21 through 23; and that here, `age` is a three-digit number.

You can prefix the variable with a storage type. `str name 25-44` means to read the string variable `name` from columns 25 through 44. Note that the string variable `name` consists of $44-25+1=20$ bytes. If you do not specify `str`, the variable is assumed to be numeric. You can specify the numeric subtype if you wish. If you specify `str`, `infix` will automatically assign the appropriate string variable type, `str`# or `strL`. Imported strings may be up to 100,000 bytes.

You can specify more than one variable, with or without a type. `byte q1-q5 51-55` means read variables `q1`, `q2`, `q3`, `q4`, and `q5` from columns 51 through 55 and store the five variables as `byte`s.

Finally, you can specify the line on which the variable(s) appear. `age 2:21-23` says that `age` is to be obtained from the second line, columns 21 through 23. Another way to do this is to put together the #`:` directive with the input-variable directive: `2: age 21-23`. There is a difference, but not with respect to reading the variable `age`. Let's consider two alternatives:

```
1:  str name 25-44     age 2:21-23   q1-q5 51-55
1:  str name 25-44  2: age 21-23     q1-q5 51-55
```

The difference is that the first directive says that variables `q1` through `q5` are on line 1, whereas the second says that they are on line 2.

When the colon is put in front, it indicates the line on which variables are to be found when we do not explicitly say otherwise. When the colon is put inside, it applies only to the variable under consideration.

Remarks and examples

Remarks are presented under the following headings:

Two ways to use infix

There are two ways to use `infix`. One is to type the specifications that describe how to read the fixed-format data on the command line:

```
. infix acc_rate 1-4  spdlimit 6-7  acc_pts 9-11  using highway.raw
```

The other is to type the specifications into a file,

begin highway.dct, example 1

```
infix dictionary using highway.raw {
        acc_rate 1-4
        spdlimit 6-7
        acc_pts  9-11
}
```

end highway.dct, example 1

and then, in Stata, type

```
. infix using highway.dct
```

The method you use makes no difference to Stata. The first method is more convenient if there are only a few variables, and the second method is less prone to error if you are reading a big, complicated file.

The second method allows two variations, the one we just showed—where the data are in another file—and one where the data are in the same file as the dictionary:

begin highway.dct, example 2

```
infix dictionary {
        acc_rate 1-4
        spdlimit 6-7
        acc_pts  9-11
}
4.58 55 .46
2.86 60 4.4
1.61    2.2
3.02 60 4.7
```

end highway.dct, example 2

Note that in the first example, the top line of the file read `infix dictionary using highway.raw`, whereas in the second, the line reads simply `infix dictionary`. When you do not say where the data are, Stata assumes that the data follow the dictionary.

▷ Example 1

So, let's complete the example we started. We have a dataset on the accident rate per million vehicle miles along a stretch of highway, the speed limit on that highway, and the number of access points per mile. We have created the dictionary file, `highway.dct`, which contains the dictionary and the data:

begin highway.dct, example 2

```
infix dictionary {
        acc_rate 1-4
        spdlimit 6-7
        acc_pts  9-11
}
4.58 55 .46
2.86 60 4.4
1.61    2.2
3.02 60 4.7
```

end highway.dct, example 2

We created this file outside Stata by using an editor or word processor. In Stata, we now read the data. `infix` lists the dictionary so that we will know the directives it follows:

```
. infix using highway
infix dictionary {
        acc_rate 1-4
        spdlimit 6-7
        acc_pts  9-11
}
(4 observations read)
. list
```

	acc_rate	spdlimit	acc_pts
1.	4.58	55	.46
2.	2.86	60	4.4
3.	1.61	.	2.2
4.	3.02	60	4.7

We simply typed `infix using highway` rather than `infix using highway.dct`. When we do not specify the file extension, `infix` assumes that we mean `.dct`.

◁

Reading string variables

When you do not say otherwise in your specification—either in the command line or in the dictionary—`infix` assumes that variables are numeric. You specify that a variable is a string by placing `str` in front of its name:

```
. infix id 1-6  str name 7-36  age 38-39  str sex 41  using employee.raw
```

or

begin employee.dct

```
infix dictionary using employee.raw {
        id        1-6
        str name  7-36
        age      38-39
        str sex     40
}
```

end employee.dct

Reading data with multiple lines per observation

When a dataset has multiple lines per observation—sometimes called multiple records per observation—you specify the number of lines per observation by using `lines`, and you specify the line on which the elements appear by using `#:`. For example,

```
. infix  2 lines  1: id 1-6  str name 7-36  2: age 1-2  str sex 4  using emp2.raw
```

or

begin emp2.dct

```
infix dictionary using emp2.raw {
    2 lines
    1:
        id        1-6
        str name  7-36
    2:
        age       1-2
        str sex     4
}
```

end emp2.dct

There are many different ways to do the same thing.

▷ Example 2

Consider the following raw data:

begin mydata.raw

```
id income educ / sex age / rcode, answers to questions 1-5
1024 25000 HS
     Male   28
     1 1 9 5 0 3
1025 27000 C
     Female 24
     0 2 2 1 1 3
1035 26000 HS
     Male   32
     1 1 0 3 2 1
1036 25000 C
     Female 25
     1 3 1 2 3 2
```

end mydata.raw

This dataset has three lines per observation, and the first line is just a comment. One possible method for reading these data is

begin mydata1.dct

```
infix dictionary using mydata {
    2 first
    3 lines
    1:    id       1-4
          income   6-10
          str educ 12-13
    2:    str sex  6-11
          int age  13-14
    3:    rcode    6
          q1-q5    7-16
}
```

end mydata1.dct

although we prefer

begin mydata2.dct
```
infix dictionary using mydata {
    2 first
    3 lines
          id       1: 1-4
          income   1: 6-10
          str educ 1:12-13
          str sex  2: 6-11
          age      2:13-14
          rcode    3: 6
          q1-q5    3: 7-16
}
```
end mydata2.dct

Either method will read these data, so we will use the first and then explain why we prefer the second.

```
. infix using mydata1
infix dictionary using mydata {
    2 first
    3 lines
    1:    id       1-4
          income   6-10
          str educ 12-13
    2:    str sex  6-11
          int age  13-14
    3:    rcode    6
          q1-q5    7-16
}
(4 observations read)
. list in 1/2
```

	id	income	educ	sex	age	rcode	q1	q2	q3	q4	q5
1.	1024	25000	HS	Male	28	1	1	9	5	0	3
2.	1025	27000	C	Female	24	0	2	2	1	1	3

What is better about the second is that the location of each variable is completely documented on each line—the line number and column. Because `infix` does not care about the order in which we read the variables, we could take the dictionary and jumble the lines, and it would still work. For instance,

begin mydata3.dct
```
infix dictionary using mydata {
    2 first
    3 lines
          str sex  2: 6-11
          rcode    3: 6
          str educ 1:12-13
          age      2:13-14
          id       1: 1-4
          q1-q5    3: 7-16
          income   1: 6-10
}
```
end mydata3.dct

will also read these data even though, for each observation, we start on line 2, go forward to line 3, jump back to line 1, and end up on line 1. It is not inefficient to do this because `infix` does not really jump to record 2, then record 3, then record 1 again, etc. `infix` takes what we say and organizes it efficiently. The order in which we say it makes no difference, except that the order of the variables in the resulting Stata dataset will be the order we specify.

Here the reordering is senseless, but in real datasets, reordering variables is often desirable. Moreover, we often construct dictionaries, realize that we omitted a variable, and then go back and modify them. By making each line complete, we can add new variables anywhere in the dictionary and not worry that, because of our addition, something that occurs later will no longer read correctly.

◁

Reading subsets of observations

If you wanted to read only the information about males from some raw data file, you might type

```
. infix id 1-6  str name 7-36  age 38-39  str sex 41  using employee.raw
> if sex=="M"
```

If your specification was instead recorded in a dictionary, you could type

```
. infix using employee.dct if sex=="M"
```

In another dataset, if you wanted to read just the first 100 observations, you could type

```
. infix 2 lines  1: id 1-6  str name 7-36  2: age 1-2  str sex 4  using emp2.raw
> in 1/100
```

or if the specification was instead recorded in a dictionary and you wanted observations 101–573, you could type

```
. infix using emp2.dct in 101/573
```

Also see

[D] **infile (fixed format)** — Import text data in fixed format with a dictionary

[D] **export** — Overview of exporting data from Stata

[D] **import** — Overview of importing data into Stata

[U] **22 Entering and importing data**

Description Quick start Syntax Options
Remarks and examples Reference Also see

Description

input allows you to type data directly into the dataset in memory.

For most users, edit is a better way to add observations to the dataset because it automatically adjusts the storage type of variables, if required, to accommodate new values.

Quick start

Create numeric v1, v2, and v3, and input data directly into Stata

```
input v1 v2 v3
```

Same as above, but create v1 and v2 as type int, v3 as type byte

```
input int (v1 v2) byte v3
```

Add data on string v4 of length 10

```
input str10 v4
```

Input data for all existing variables

```
input
```

Same as above, but add observations by typing strings associated with value labels of existing variables instead of numeric data

```
input, label
```

Syntax

input [*varlist*] [, automatic label]

Options

automatic causes Stata to create value labels from the nonnumeric data it encounters. It also automatically widens the display format to fit the longest label. Specifying automatic implies label, even if you do not explicitly type the label option.

label allows you to type the labels (strings) instead of the numeric values for variables associated with value labels. New value labels are not automatically created unless automatic is specified.

Remarks and examples

If no data are in memory, you must specify *varlist* when you type input. Stata will then prompt you to enter the new observations until you type end.

▷ Example 1

We have data on the accident rate per million vehicle miles along a stretch of highway, along with the speed limit on that highway. We wish to type these data directly into Stata:

```
. input
nothing to input
r(104);
```

Typing input by itself does not provide enough information about our intentions. Stata needs to know the names of the variables we wish to create.

```
. input acc_rate spdlimit
        acc_rate   spdlimit
  1. 4.58 55
  2. 2.86 60
  3. 1.61 .
  4. end
. _
```

We typed input acc_rate spdlimit, and Stata responded by repeating the variable names and prompting us for the first observation. We entered the values for the first two observations, pressing *Return* after each value was entered. For the third observation, we entered the accident rate (1.61), but we entered a period (.) for missing because we did not know the corresponding speed limit for the highway. After entering data for the fourth observation, we typed end to let Stata know that there were no more observations.

We can now list the data to verify that we have entered the data correctly:

```
. list

     +---------------------+
     | acc_rate   spdlimit |
     |---------------------|
  1. |     4.58         55 |
  2. |     2.86         60 |
  3. |     1.61          . |
     +---------------------+
```

◁

If you have data in memory and type input without *varlist*, you will be prompted to enter more information on *all* the variables. This continues until you type end.

▷ Example 2: Adding observations

We now have another observation that we wish to add to the dataset. Typing input by itself tells Stata that we wish to add new observations:

```
. input
        acc_rate   spdlimit
  4. 3.02 60
  5. end
. _
```

Stata reminded us of the names of our variables and prompted us for the fourth observation. We entered the numbers 3.02 and 60 and pressed *Return*. Stata then prompted us for the fifth observation. We could add as many new observations as we wish. Because we needed to add only 1 observation, we typed `end`. Our dataset now has 4 observations.

◁

You may add new variables to the data in memory by typing `input` followed by the names of the new variables. Stata will begin by prompting you for the first observation, then the second, and so on, until you type `end` or enter the last observation.

▷ Example 3: Adding variables

In addition to the accident rate and speed limit, we now obtain data on the number of access points (on-ramps and off-ramps) per mile along each stretch of highway. We wish to enter the new data.

```
. input acc_pts

       acc_pts
  1. 4.6
  2. 4.4
  3. 2.2
  4. 4.7

. _
```

When we typed `input acc_pts`, Stata responded by prompting us for the first observation. There are 4.6 access points per mile for the first highway, so we entered `4.6`. Stata then prompted us for the second observation, and so on. We entered each of the numbers. When we entered the final observation, Stata automatically stopped prompting us—we did not have to type `end`. Stata knows that there are 4 observations in memory, and because we are adding a new variable, it stops automatically.

We can, however, type `end` anytime we wish, and Stata fills the remaining observations on the new variables with *missing*. To illustrate this, we enter one more variable to our data and then `list` the result:

```
. input junk

          junk
  1. 1
  2. 2
  3. end

. list
```

	acc_rate	spdlimit	acc_pts	junk
1.	4.58	55	4.6	1
2.	2.86	60	4.4	2
3.	1.61	.	2.2	.
4.	3.02	60	4.7	.

◁

You can input string variables by using `input`, but you must remember to indicate explicitly that the variables are strings by specifying the type of the variable before the variable's name.

▷ Example 4: Inputting string variables

String variables are indicated by the types `str#` or `strL`. For `str#`, # represents the storage length, or maximum length, in bytes of the variable. You can create variables up to `str2045`. You can create `strL` variables of arbitrary length.

For text with only plain ASCII characters, the length in bytes is equivalent to the number of characters displayed. For instance, a `str4` variable has a maximum length of 4, meaning that it can contain the strings `a`, `ab`, `abc`, and `abcd`, but not `abcde`. Unicode characters beyond the plain ASCII range take 2, 3, or 4 bytes each. Thus the same `str4` variable could contain the strings `á`, `áb`, and `ábc`, but not `ábcd` because `á` takes two bytes to store. If you are using `input` with strings containing Unicode characters, you should allow extra room in your `str#` specification. See **[U] 12.4.2 Handling Unicode strings**.

Strings shorter than the maximum length can be stored in the variable, but strings longer than the maximum length cannot.

Although a `str80` variable can store strings shorter than 80 characters, you should not make all your string variables `str80` because Stata allocates space for strings on the basis of their *maximum* length. Thus doing so would waste the computer's memory.

Let's assume that we have no data in memory and wish to enter the following data:

```
. input str16 name age str6 sex
                 name        age        sex
  1. "Arthur Doyle" 22 male
  2. "Mary Hope" 37 "female"
  3. Guy Fawkes 48 male
'Fawkes' cannot be read as a number
  3. "Guy Fawkes" 48 male
  4. "Kriste Yeager" 25 female
  5. end

. _
```

We first typed `input str16 name age str6 sex`, meaning that `name` is to be a `str16` variable and `sex` a `str6` variable. Because we did not specify anything about `age`, Stata made it a numeric variable.

Stata then prompted us to enter our data. On the first line, the name is Arthur Doyle, which we typed in double quotes. The double quotes are not really part of the string; they merely delimit the beginning and end of the string. We followed that with Mr. Doyle's age, 22, and his sex, male. We did not bother to type double quotes around the word `male` because it contained no blanks or special characters. For the second observation, we typed the double quotes around `female`; it changed nothing.

In the third observation, we omitted the double quotes around the name, and Stata informed us that Fawkes could not be read as a number and reprompted us for the observation. When we omitted the double quotes, Stata interpreted `Guy` as the name, `Fawkes` as the age, and 48 as the sex. This would have been okay with Stata, except for one problem: `Fawkes` looks nothing like a number, so Stata complained and gave us another chance. This time, we remembered to put the double quotes around the name.

Stata was satisfied, and we continued. We entered the fourth observation and typed `end`. Here is our dataset:

```
. list

     +------------------------------+
     |          name   age      sex |
     |------------------------------|
  1. |  Arthur Doyle    22     male |
  2. |     Mary Hope    37   female |
  3. |    Guy Fawkes    48     male |
  4. | Kriste Yeager    25   female |
     +------------------------------+
```

◁

▷ Example 5: Specifying numeric storage types

Just as we indicated the string variables by placing a storage type in front of the variable name, we can indicate the storage type of our numeric variables as well. Stata has five numeric storage types: byte, int, long, float, and double. When you do not specify the storage type, Stata assumes that the variable is a float. See the definitions of numbers in [U] 12 Data.

There are two reasons for explicitly specifying the storage type: to induce more precision or to conserve memory. The default type float has plenty of precision for most circumstances because Stata performs all calculations in double precision, no matter how the data are stored. If you were storing nine-digit Social Security numbers, however, you would want to use a different storage type, or the last digit would be rounded. long would be the best choice; double would work equally well, but it would waste memory.

Sometimes you do not need to store a variable as float. If the variable contains only integers between −32,767 and 32,740, it can be stored as an int and would take only half the space. If a variable contains only integers between −127 and 100, it can be stored as a byte, which would take only half again as much space. For instance, in example 4 we entered data for age without explicitly specifying the storage type; hence, it was stored as a float. It would have been better to store it as a byte. To do that, we would have typed

```
. input str16 name byte age str6 sex
                    name         age         sex
  1. "Arthur Doyle" 22 male
  2. "Mary Hope" 37 "female"
  3. "Guy Fawkes" 48 male
  4. "Kriste Yeager" 25 female
  5. end
. _
```

Stata understands several shorthands. For instance, typing

```
. input int(a b) c
```

allows you to input three variables—a, b, and c—and makes both a and b ints and c a float. Remember, typing

```
. input int a b c
```

would make a an int but both b and c floats. Typing

```
. input a long b double(c d) e
```

would make a a float, b a long, c and d doubles, and e a float.

Stata has a shorthand for variable names with numeric suffixes. Typing v1-v4 is equivalent to typing v1 v2 v3 v4. Thus typing

```
. input int(v1-v4)
```

inputs four variables and stores them as ints.

◁

❑ Technical note

The rest of this section deals with using input with value labels. If you are not familiar with value labels, see [U] 12.6.3 Value labels.

Value labels map numbers into words and vice versa. There are two aspects to the process. First, we must define the association between numbers and words. We might tell Stata that 0 corresponds to `Male` and 1 corresponds to `Female` by typing `label define sexlbl 0 "Male" 1 "Female"`. The correspondences are named, and here we have named the 0↔`Male` 1↔`Female` correspondence `sexlbl`.

Next we must associate this value label with a variable. If we had already entered the data and the variable were called `sex`, we would do this by typing `label values sex sexlbl`. We would have entered the data by typing `0`s and `1`s, but at least now when we `list` the data, we would see the words rather than the underlying numbers.

We can do better than that. After defining the value label, we can associate the value label with the variable at the time we `input` the data and tell Stata to use the value label to interpret what we type:

```
. label define sexlbl 0 "Male" 1 "Female"
. input str16 name byte(age sex:sexlbl), label
                name        age        sex
  1. "Arthur Doyle" 22 male
  2. "Mary Hope" 37 "female"
  3. "Guy Fawkes" 48 male
  4. "Kriste Yeager" 25 female
  5. end
. _
```

After defining the value label, we typed our `input` command. We added the `label` option at the end of the command, and we typed `sex:sexlbl` for the name of the sex variable. The `byte(...)` around `age` and `sex:sexlbl` was not really necessary; it merely forced both `age` and `sex` to be stored as `byte`s.

Let's first decipher `sex:sexlbl`. `sex` is the name of the variable we want to input. The `:sexlbl` part tells Stata that the new variable is to be associated with the value label named `sexlbl`. The `label` option tells Stata to look up any strings we type for labeled variables in their corresponding value label and substitute the number when it stores the data. Thus when we entered the first observation of our data, we typed `male` for Mr. Doyle's sex, even though the corresponding variable is numeric. Rather than complaining that "`"male"` could not be read as a number", Stata accepted what we typed, looked up the number corresponding to `male`, and stored that number in the data.

That Stata has actually stored a number rather than the words `male` or `female` is almost irrelevant. Whenever we `list` the data or make a table, Stata will use the words `male` and `female` just as if those words were actually stored in the dataset rather than their numeric codings:

```
. list

     +------------------------------+
     |          name   age      sex |
     |------------------------------|
  1. |  Arthur Doyle    22     male |
  2. |     Mary Hope    37   female |
  3. |    Guy Fawkes    48     male |
  4. | Kriste Yeager    25   female |
     +------------------------------+

. tabulate sex

        sex |      Freq.     Percent        Cum.
------------+-----------------------------------
       male |          2       50.00       50.00
     female |          2       50.00      100.00
------------+-----------------------------------
      Total |          4      100.00
```

It is only almost irrelevant because we can use the underlying numbers in statistical analyses. For instance, if we were to ask Stata to calculate the mean of `sex` by typing `summarize sex`, Stata would report 0.5. We would interpret that to mean that one-half of our sample is female.

Value labels are permanently associated with variables, so once we associate a value label with a variable, we never have to do so again. If we wanted to add another observation to these data, we could type

```
. input, label
                    name        age         sex
  5. "Mark Esman" 26 male
  6. end

. _
```

❑

❑ Technical note

The `automatic` option automates the definition of the value label. In the previous example, we informed Stata that `male` corresponds to 0 and `female` corresponds to 1 by typing `label define sexlbl 0 "Male" 1 "Female"`. It was not necessary to explicitly specify the mapping. Specifying the `automatic` option tells Stata to interpret what we type as follows:

First, see if the value is a number. If so, store that number and be done with it. If it is not a number, check the value label associated with the variable in an attempt to interpret it. If an interpretation exists, store the corresponding numeric code. If one does not exist, add a new numeric code corresponding to what was typed. Store that new number and update the value label so that the new correspondence is never forgotten.

We can use these features to reenter our age and sex data. Before reentering the data, we `drop _all` and `label drop _all` to prove that we have nothing up our sleeve:

```
. drop _all

. label drop _all

. input str16 name byte(age sex:sexlbl), automatic
                    name        age         sex
  1. "Arthur Doyle" 22 male
  2. "Mary Hope" 37 "female"
  3. "Guy Fawkes" 48 male
  4. "Kriste Yeager" 25 female
  5. end

. _
```

We previously defined the value label `sexlbl` so that `Male` corresponded to 0 and `Female` corresponded to 1. The label that Stata automatically created is slightly different but is just as good:

```
. label list sexlbl
sexlbl:
           1 Male
           2 Female
```

❑

Reference

Kohler, U. 2005. Stata tip 16: Using input to generate variables. *Stata Journal* 5: 134.

Also see

[D] **edit** — Browse or edit data with Data Editor

[D] **import** — Overview of importing data into Stata

[D] **save** — Save Stata dataset

[U] 22 Entering and importing data

insobs — Add or insert observations

Description | Menu | Syntax | Options
Remarks and examples | Acknowledgment | Also see

Description

insobs inserts new observations into the dataset. The number of new observations to insert is specified by *obs*. This command is primarily used by the Data Editor and is of limited use in other contexts. A more popular alternative for programmers is set obs; see [D] **obs**.

If option before(*inspos*) or after(*inspos*) is specified, the new observations are inserted into the middle of the dataset, and the insert position is controlled by *inspos*. Note that *inspos* must be a positive integer between 1 and the total number of observations _N. If the dataset is empty, before() and after() may not be specified.

Menu

Data > Create or change data > Add or insert observations

Syntax

Add new observations at the end of the dataset

insobs *obs*

Insert new observations into the middle of the dataset

insobs *obs* , before(*inspos*) | after(*inspos*)

Options

before(*inspos*) and after(*inspos*) inserts new observations before and after, respectively, *inspos* into the dataset. These options are primarily used by the Data Editor and are of limited use in other contexts. A more popular alternative for most users is order; see [D] **order**.

Remarks and examples

▷ Example 1

insobs can be useful for creating artificial datasets. For instance, if we wanted to create a new dataset with 100 observations, we could type

```
. clear
. insobs 100
(100 observations added)
```

◁

▷ Example 2

We are using auto.dta, but for our specific example, we need the dataset to have more observations than those provided in this dataset. To solve this problem, we could type

```
. sysuse auto, clear
(1978 automobile data)
. insobs 10
(10 observations added)
```

Typing insobs without an option adds the observations at the end of the dataset. Say that instead of the end, we wanted to add five new observations before observation 20. We would type

```
. sysuse auto, clear
(1978 automobile data)
. insobs 5, before(20)
(5 observations added)
```

◁

Acknowledgment

This command was inspired by insob, which was written by Bas Straathof of CPB Netherlands Bureau for Economic Policy Analysis.

Also see

[D] **edit** — Browse or edit data with Data Editor

[D] **obs** — Increase the number of observations in a dataset

inspect — Display simple summary of data's attributes

Description

The `inspect` command provides a quick summary of a numeric variable that differs from the summary provided by `summarize` or `tabulate`. It reports the number of negative, zero, and positive values; the number of integers and nonintegers; the number of unique values; and the number of *missing*; and it produces a small histogram. Its purpose is not analytical but is to allow you to quickly gain familiarity with unknown data.

Quick start

Summary of all numeric variables in the dataset

```
inspect
```

Summary of `v1` for each level of `catvar`

```
bysort catvar: inspect v1
```

Summary of `v1` if `v2` is greater than 30

```
inspect v1 if v2 > 30
```

Menu

Data > Describe data > Inspect variables

Syntax

`inspect` [*varlist*] [*if*] [*in*]

`by` and `collect` are allowed; see **[U] 11.1.10 Prefix commands**.

Remarks and examples

Typing `inspect` by itself produces an inspection for all the variables in the dataset. If you specify a *varlist*, an inspection of just those variables is presented.

▷ Example 1

`inspect` is not a replacement or substitute for `summarize` and `tabulate`. It is instead a data management or information tool that lets us quickly gain insight into the values stored in a variable.

For instance, we receive data that purport to be on automobiles, and among the variables in the dataset is one called `mpg`. Its variable label is `Mileage (mpg)`, which is surely suggestive. We `inspect` the variable,

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. inspect mpg

mpg:  Mileage (mpg)                         Number of observations
______________________                ______________________________________
                                          Total       Integers   Nonintegers
|        #                 Negative           -              -             -
|        #                 Zero               -              -             -
|        #                 Positive          74             74             -
|   #    #                            __________    ___________   ___________
|   #    #    #            Total             74             74             -
|   #    #    #    #    .  Missing            -
+--------------------------           __________
12                    41                     74
  (21 unique values)
```

and we discover that the variable is never *missing*; all 74 observations in the dataset have some value for `mpg`. Moreover, the values are all positive and are all integers, as well. Among those 74 observations are 21 unique (different) values. The variable ranges from 12 to 41, and we are provided with a small histogram that suggests that the variable appears to be what it claims.

◁

▷ Example 2

Bob, a coworker, presents us with some census data. Among the variables in the dataset is one called `region`, which is labeled `Census region` and is evidently a numeric variable. We `inspect` this variable:

```
. use https://www.stata-press.com/data/r19/bobsdata
(1980 Census data by state)

. inspect region

region:  Census region                      Number of observations
______________________                ______________________________________
                                          Total       Integers   Nonintegers
|             #            Negative           -              -             -
|             #    #       Zero               -              -             -
|        #    #    #       Positive          50             50             -
|   #    #    #    #                  __________    ___________   ___________
|   #    #    #    #       Total             50             50             -
|   #    #    #    #    .  Missing            -
+--------------------------           __________
1                      5                     50
   (5 unique values)
      region is labeled but 1 value is NOT documented in the label.
```

In this dataset something may be wrong. `region` takes on five unique values. The variable has a value label, however, and one of the observed values is not documented in the label. Perhaps there is a typographical error.

◁

▷ Example 3

There was indeed an error. Bob fixes it and returns the data to us. Here is what `inspect` produces now:

```
. use https://www.stata-press.com/data/r19/census
(1980 Census data by state)

. inspect region

region:  Census region                      Number of observations
______________________          ________________________________________
                                       Total      Integers   Nonintegers
|         #              Negative          -             -             -
|         #              Zero              -             -             -
|     #   #   #          Positive         50            50             -
|  #  #   #   #                      __________  __________  ___________
|  #  #   #   #          Total            50            50             -
|  #  #   #   #          Missing           -
+----------------------              __________
1                    4                    50
   (4 unique values)

      region is labeled and all values are documented in the label.
```

◁

▷ Example 4

We receive data on the climate in 956 US cities. The variable `tempjan` records the `Average January temperature` in degrees Fahrenheit. The results of `inspect` are

```
. use https://www.stata-press.com/data/r19/citytemp
(City temperature data)

. inspect tempjan

tempjan:  Average January temperature       Number of observations
_____________________________________   ________________________________________
                                       Total      Integers   Nonintegers
|     #                  Negative          -             -             -
|     #                  Zero              -             -             -
|     #                  Positive        954            78           876
|     #   #   #                      __________  __________  ___________
|     #   #   #          Total           954            78           876
|  .  #   #   #   .      Missing           2
+----------------------              __________
2.2               72.6                   956
(More than 99 unique values)
```

In two of the 956 observations, `tempjan` is *missing*. Of the 954 cities that have a recorded `tempjan`, all are positive, and 78 of them are integer values. `tempjan` varies between 2.2 and 72.6. There are more than 99 unique values of `tempjan` in the dataset. (Stata stops counting unique values after 99.)

◁

Stored results

`inspect` stores the following in `r()`:

Scalars

`r(N)`	number of observations
`r(N_neg)`	number of negative observations
`r(N_0)`	number of observations equal to 0
`r(N_pos)`	number of positive observations
`r(N_negint)`	number of negative integer observations
`r(N_posint)`	number of positive integer observations
`r(N_unique)`	number of unique values or . if more than 99
`r(N_undoc)`	number of undocumented values or . if not labeled

Also see

[D] **codebook** — Describe data contents

[D] **compare** — Compare two variables

[D] **describe** — Describe data in memory or in a file

[D] **ds** — Compactly list variables with specified properties

[D] **isid** — Check for unique identifiers

[R] **lv** — Letter-value displays

[R] **summarize** — Summary statistics

[R] **table** — Table of frequencies, summaries, and command results

[R] **tabulate oneway** — One-way table of frequencies

[R] **tabulate, summarize()** — One- and two-way tables of summary statistics

[R] **tabulate twoway** — Two-way table of frequencies

ipolate — Linearly interpolate (extrapolate) values

Description | Quick start | Menu | Syntax | Options
Remarks and examples | Methods and formulas | References | Also see

Description

`ipolate` creates in *newvar* a linear interpolation of *yvar* on *xvar* for missing values of *yvar*.

Because interpolation requires that *yvar* be a function of *xvar*, *yvar* is also interpolated for tied values of *xvar*. When *yvar* is not missing and *xvar* is neither missing nor repeated, the value of *newvar* is just *yvar*.

Quick start

Create `y2` containing a linear interpolation of `y1` on `x` for observations with missing values of `y1` or tied values of `x`

```
ipolate y1 x, generate(y2)
```

Same as above, but use interpolation and extrapolation

```
ipolate y1 x, generate(y2) epolate
```

Same as above, but perform calculation separately for each level of `catvar`

```
by catvar: ipolate y1 x, generate(y2) epolate
```

Menu

Data > Create or change data > Other variable-creation commands > Linearly interpolate/extrapolate values

Syntax

`ipolate` *yvar xvar* [*if*] [*in*] , `generate(`*newvar*`)` [`epolate`]

`by` is allowed; see [D] **by**.

Options

`generate(`*newvar*`)` is required and specifies the name of the new variable to be created.

`epolate` specifies that values be both interpolated and extrapolated. Interpolation only is the default.

Remarks and examples

▷ Example 1

We have data points on y and x, although sometimes the observations on y are missing. We believe that y is a function of x, justifying filling in the missing values by linear interpolation:

```
. use https://www.stata-press.com/data/r19/ipolxmpl1
. list, sep(0)
```

	x	y
1.	0	.
2.	1	3
3.	1.5	.
4.	2	6
5.	3	.
6.	3.5	.
7.	4	18

```
. ipolate y x, gen(y1)
(1 missing value generated)
. ipolate y x, gen(y2) epolate
. list, sep(0)
```

	x	y	y1	y2
1.	0	.	.	0
2.	1	3	3	3
3.	1.5	.	4.5	4.5
4.	2	6	6	6
5.	3	.	12	12
6.	3.5	.	15	15
7.	4	18	18	18

◁

▷ Example 2

We have a dataset of circulations for 10 magazines from 1980 through 2003. The identity of the magazines is recorded in magazine, circulation is recorded in circ, and the year is recorded in year. In a few of the years, the circulation is not known, so we want to fill it in by linear interpolation.

```
. use https://www.stata-press.com/data/r19/ipolxmpl2, clear
. by magazine: ipolate circ year, gen(icirc)
```

When the by prefix is specified, interpolation is performed separately for each group.

◁

Methods and formulas

The value y at x is found by finding the closest points (x_0, y_0) and (x_1, y_1), such that $x_0 < x$ and $x_1 > x$ where y_0 and y_1 are observed, and calculating

$$y = \frac{y_1 - y_0}{x_1 - x_0}(x - x_0) + y_0$$

If epolate is specified and if (x_0, y_0) and (x_1, y_1) cannot be found on both sides of x, the two closest points on the same side of x are found, and the same formula is applied.

If there are multiple observations with the same value for x_0, then y_0 is taken as the average of the corresponding y values for those observations. (x_1, y_1) is handled in the same way.

References

Cox, N. J. 2023. Speaking Stata: Replacing missing values: The easiest problems. *Stata Journal* 23: 884–896.

Meijering, E. 2002. A chronology of interpolation: From ancient astronomy to modern signal and image processing. *Proceedings of the IEEE* 90: 319–342. https://doi.org/10.1109/5.993400.

Also see

[MI] **mi impute** — Impute missing values

isid — Check for unique identifiers

Description Quick start Menu Syntax
Options Remarks and examples Also see

Description

`isid` checks whether the specified variables uniquely identify the observations.

Quick start

Verify that `idvar` uniquely identifies observations

`isid idvar`

Verify that `idvar` uniquely identifies observations within panels identified by `pvar`

`isid idvar pvar`

Same as above

`isid pvar idvar`

Same as above, and indicate that the data should be sorted by `pvar` and `idvar`

`isid pvar idvar, sort`

Verify that `idvar` uniquely identifies observations in `mydata.dta`

`isid idvar using mydata.dta`

Menu

Data > Data utilities > Check for unique identifiers

Syntax

`isid` *varlist* [`using` *filename*] [, `sort` `missok`]

Options

`sort` indicates that the dataset be sorted by *varlist*.

`missok` indicates that missing values are permitted in *varlist*.

Remarks and examples

▷ Example 1

Suppose that we want to check whether the mileage ratings (mpg) uniquely identify the observations in our auto dataset.

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. isid mpg
variable mpg does not uniquely identify the observations
r(459);
```

isid returns an error and reports that there are multiple observations with the same mileage rating. We can locate those observations manually:

```
. sort mpg

. by mpg: generate nobs = _N

. list make mpg if nobs >1, sepby(mpg)
```

	make	mpg
1.	Linc. Continental	12
2.	Linc. Mark V	12
	(output omitted)	
68.	Dodge Colt	30
69.	Mazda GLC	30
72.	Subaru	35
73.	Datsun 210	35

◁

▷ Example 2

isid is useful for checking a time-series panel dataset. For this type of dataset, we usually need two variables to identify the observations: one that labels the individual IDs and another that labels the periods. Before we set the data using tsset, we want to make sure that there are no duplicates with the same panel ID and time. Suppose that we have a dataset that records the yearly gross investment of 10 companies for 20 years. The panel and time variables are company and year.

```
. use https://www.stata-press.com/data/r19/grunfeld, clear

. isid company year
```

isid reports no error, so the two variables company and year uniquely identify the observations. Therefore, we should be able to tsset the data successfully:

```
. tsset company year

Panel variable: company (strongly balanced)
 Time variable: year, 1935 to 1954
         Delta: 1 year
```

◁

❑ Technical note

The `sort` option is a convenient shortcut, especially when combined with `using`. The command

```
. isid patient_id date using newdata, sort
```

is equivalent to

```
. preserve
. use newdata, clear
. sort patient_id date
. isid patient_id date
. save, replace
. restore
```

❑

Also see

[D] **describe** — Describe data in memory or in a file

[D] **ds** — Compactly list variables with specified properties

[D] **duplicates** — Report, tag, or drop duplicate observations

[D] **lookfor** — Search for string in variable names and labels

[D] **codebook** — Describe data contents

[D] **inspect** — Display simple summary of data's attributes

Description | Quick start | Syntax | Options | Remarks and examples
Stored results | References | Also see

Description

jdbc allows you to load data from a database, execute SQL statements on a database, and insert data into a database using Java Database Connectivity (JDBC). JDBC is an application programming interface (API) for the programming language Java and defines how a client (Stata) can access a database. jdbc is oriented toward relational databases or nonrelational database-management systems that have rectangular data. NoSQL databases will not work with jdbc.

jdbc connect stores all database connection settings for subsequent jdbc commands.

jdbc add stores database connection settings as a data source name for a Stata session.

jdbc remove removes a stored data source name for a Stata session.

jdbc list displays all stored data source names for a Stata session.

jdbc showdbs produces a list of all databases for a given URL.

jdbc showtables retrieves a list of table names available from a specified database.

jdbc describe lists column names and data types associated with a specified table.

jdbc load reads a database table into Stata's memory. You can load a table specified in the table() option or load an ODBC table generated by an SQL SELECT statement specified in the exec() option.

jdbc insert writes data from memory to a database table. The data can be appended to an existing table or replace an existing table.

jdbc exec allows for most SQL statements to be issued directly to any database. Statements that produce output, such as SELECT, have their output neatly displayed. By using Stata's ado-language, you can also generate SQL commands on the fly to do positional updates or whatever the situation requires.

Quick start

Store connection settings to database myDB

```
jdbc connect, jar("mysql-connector-java-5.1.49.jar")   ///
  driverclass("com.mysql.jdbc.Driver")        ///
  url("jdbc:mysql://https://www.stata.com/myDB:3306") ///
  user("stata") password("stata")
```

List available table names in database myDB

```
jdbc showtables
```

Describe the column names and data types in table MyTable from myDB

```
jdbc describe "MyTable"
```

Load MyTable into memory from myDB

```
jdbc load, table("MyTable")
```

Syntax

Store JDBC connection settings for all jdbc commands

`jdbc connect` { *DataSourceName* | , *connect_options* }

Add JDBC connection settings as a data source name for the current Stata session

`jdbc add` *DataSourceName* , *connect_options*

Remove JDBC connection settings and data source name for the current Stata session

`jdbc remove` { *DataSourceName* | `_all` }

List stored data source names and URLs for the current Stata session

`jdbc list`

List all databases for a given connection

`jdbc showdbs`

Retrieve available table names from specified data source

`jdbc showtables` ["*SearchString*"]

List column names and data types associated with specified table

`jdbc describe` "*TableName*"

Import data from a database

`jdbc load,` { `table("`*TableName*`")` | `exec("`*SqlStmtList*`")` } [*load_options*]

Export data to a database

`jdbc insert` [*varlist*] [*if*] [*in*] , `table("`*TableName*`")` [*insert_options*]

Allow SQL statements to be issued directly to a database

`jdbc exec` "*SqlStmtList*"

DataSourceName is a name used to store connection settings.

SearchString is a database table name search string; SQL wildcard characters like % and _ are allowed.

TableName is the name of a table in the database.

SqlStmtList may be one valid SQL statement or a list of SQL statements separated by semicolons.

connect_options	Description
* `jar("`*JarFileName*`")`	JAR file name of JDBC driver
* `jarpath("`*DirectoryName*`")`	directory where the driver JAR file is stored along with driver dependencies
* `driverclass("`*ClassName*`")`	Java class name for JDBC driver
* `url("`*URL*`")`	database URL
* `user("`*UserID*`")`	user ID of user establishing connection
* `password("`*Password*`")`	password of user establishing connection
`connprop("`*ConnectionProperty*`")`	driver-specific connection property
`clear`	clear current connection settings from memory; available only with `jdbc connect`

*Either `jar("`*JarFileName*`")` or `jarpath("`*DirectoryName*`")` and `driverclass("`*ClassName*`")`, `url("`*URL*`")`, `user("`*UserID*`")`, and `password("`*Password*`")` are required with `jdbc add`. These options are also required with `jdbc connect` when *DataSourceName* is not specified.

load_options	Description
* `table("`*TableName*`")`	name of table stored in the database
* `exec("`*SqlStmtList*`")`	SQL SELECT statements to generate a table to be read into Stata
`rows(#)`	fetch # result set rows from database; default is `rows(10)`
`clear`	replace data in memory
`case(lower|upper|preserve)`	import variable names as lowercase or uppercase; the default is to preserve the case

*Either `table("`*TableName*`")` or `exec("`*SqlStmtList*`")` must be specified.

insert_options	Description
* `table("`*TableName*`")`	name of table stored in the database
`rows(#)`	build memory result set with # of rows; default is `rows(1)`
`overwrite`	clear data in table before data in memory are written to the table

*`table("`*TableName*`")` is required.

JarFileName is the name of the JDBC driver JAR file.

ClassName is the Java class name stored in the JDBC driver JAR file.

URL is the database URL.

UserID is the user ID.

Password is the user's password.

Options

Options are presented under the following headings:

Options for jdbc connect and jdbc add

`jar("`*JarFileName*`")` specifies the JDBC driver JAR file installed along your ado-path. Either `jar()` or `jarpath()` is required with `jdbc add`. Also, if *DataSourceName* is not specified, either `jar()` or `jarpath()` is required with `jdbc connect` for `jdbc showdbs`, `jdbc showtables`, `jdbc describe`, `jdbc load`, `jdbc insert`, and `jdbc exec` to work. `jar()` may not be combined with `jarpath()`.

`jarpath("`*DirectoryName*`")` specifies the directory where the JDBC driver JAR files are installed along your ado-path. Either `jarpath()` or `jar()` is required with `jdbc add`. Also, if *DataSourceName* is not specified, either `jarpath()` or `jar()` is required with `jdbc connect` for `jdbc showdbs`, `jdbc showtables`, `jdbc describe`, `jdbc load`, `jdbc insert`, and `jdbc exec` to work. `jarpath()` may not be combined with `jar()`.

`driverclass("`*ClassName*`")` specifies the Java class name stored in the JDBC driver JAR file installed along your ado-path. `driverclass()` is required with `jdbc add`. Also, if *DataSourceName* is not specified, `driverclass()` is required with `jdbc connect` for `jdbc showdbs`, `jdbc showtables`, `jdbc describe`, `jdbc load`, `jdbc insert`, and `jdbc exec` to work.

`url("`*URL*`")` specifies the URL to the database the user is attempting to establish the connection to. `url()` is required with `jdbc add`. Also, if *DataSourceName* is not specified, `url()` is required with `jdbc connect` for `jdbc showdbs`, `jdbc showtables`, `jdbc describe`, `jdbc load`, `jdbc insert`, and `jdbc exec` to work. The driver *URL* syntax is as follows:

```
jdbc:Database_type://Host:Port/Database_name?connection_properties
```

`user("`*UserID*`")` specifies the user ID of the user attempting to establish the connection to a database. `user()` is required with `jdbc add`. Also, if *DataSourceName* is not specified, `user()` is required with `jdbc connect` for `jdbc showdbs`, `jdbc showtables`, `jdbc describe`, `jdbc load`, `jdbc insert`, and `jdbc exec` to work.

`password("`*Password*`")` specifies the password of the user attempting to establish the connection to a database. `password()` is required with `jdbc add`. Also, if *DataSourceName* is not specified, `password()` is required with `jdbc connect` for `jdbc showdbs`, `jdbc showtables`, `jdbc describe`, `jdbc load`, `jdbc insert`, and `jdbc exec` to work.

`connprop("`*ConnectionProperty*`")` specifies the driver-specific connection properties. A connection property is a key value pair that is separated by a colon and delimited by a semicolon. For example,

```
jdbc connect, ... connprop("characterEncoding:ISO-8859-1;")
```

These properties can also be set in the `url()` option.

`clear` clears the current connection settings from memory. This option may only be specified with `jdbc connect` and may not be combined with any other `connect` options.

Options for jdbc load

`table("`*TableName*`")` specifies the name of the table stored in a specified database. Either the `table()` option or the `exec()` option—but not both—is required with the `jdbc load` command.

exec("*SqlStmtList*") allows you to issue an SQL SELECT statement to generate a table to be read into Stata. Multiple SQL statements can be issued, with the last SQL statement being a SELECT. Each statement should be delimited by a semicolon. For example,

```
local sql                                                             ///
    "CREATE TEMPORARY TABLE t(a INT, b INT); INSERT INTO t VALUES (1,2); ///
    SELECT * FROM t;"
jdbc load, exec("`sql'")
```

An error message is returned if the SQL statements are invalid SQL. Either the table() option or the exec() option—but not both—is required with the jdbc load command.

rows(#) specifies the number of rows to be fetched from the database result set for each network call. This option may help improve command performance. The default is rows(10). Some drivers do not support this feature. Note that setting rows() to a large number might require you to change the amount of heap memory allocated for the JVM with the java set heapmax command.

clear permits the data to be loaded, even if there are data already in memory, and even if that data have changed since the data were last saved.

case(lower | upper | preserve) specifies the case of the variable names after loading. The default is case(preserve).

Options for jdbc insert

table("*TableName*") specifies the name of the table stored in a specified database.

rows(#) specifies the number of result set rows to be sent to the database for each network call. This option may help improve command performance. The default result set size is 1. This option does not work with datasets that contain strLs. Some drivers do not support this feature. Note that setting the rows(#) to a large number might require you to change the amount of heap memory allocated for the JVM with the java set heapmax command.

overwrite allows data to be dropped from a database table before the Stata data in memory are written to the table. All data from the table are erased, not just the data from the variable columns that will be replaced.

Remarks and examples

jdbc allows you to connect to, load data from, insert data into, and execute queries on a database using JDBC. First, you specify the connection settings with jdbc connect, including the URL for the database you are connecting to and your user ID and password. Thereafter, you can use jdbc showdbs, jdbc showtables, jdbc describe, jdbc load, jdbc insert, and jdbc exec. These commands allow you to execute statements on a database and load data to and from Stata; they will use the connection information you specified with jdbc connect to open a connection and perform the specified task.

If you will be connecting to multiple databases frequently, you can store the connection settings for each database under a data source name with jdbc add. Then, whenever you wish to connect to a database, simply use jdbc connect, and specify the data source name. This avoids having to specify all the connection information every time you wish to connect to a different database.

Remarks are presented under the following headings:

JDBC drivers

To use `jdbc`, you must first download and install your database vendor JDBC driver JAR file. To see information on Stata's current JDBC implementation, click here.

Once you have downloaded the appropriate driver, you must install the driver along Stata's ado-path. If the file is compressed, you can use Stata's `unzipfile` with the downloaded file to extract the `.jar` file. Once extracted, place the `.jar` file along your ado-path so Stata can add it to the Java virtual machine (JVM) class-path. You can use `java query` to check to see whether Stata has loaded your driver along the JVM class-path.

Most users should place the `.jar` files in the `PERSONAL` directory or the current working directory. System administrators may wish to place them in the `SITE` directory if they have a network installation and want to make them available to all users.

Connecting to a database

`jdbc connect` stores all database connection settings for commands `jdbc showdbs`, `jdbc showtables`, `jdbc describe`, `jdbc load`, `jdbc insert`, and `jdbc exec`. Options `jar()`, `driverclass()`, `url()`, `user()`, and `password()` are required, unless you have already saved that information under a data source name and you are specifying that *DataSourceName* with `jdbc connect`.

If you try to use these commands before setting your connection properties, you will receive the following error message:

```
. jdbc showtables
Connection failed
JDBC driver class not found
r(681);
```

❑ Technical note

Storing your database name, user ID, and password in a Stata do-file, ado-file, or log file can be a security risk. Your database vendor might have software called a wallet that can store this information securely on your machine.

❑

▷ Example 1: Creating a connection

Below, we create a connection string for the JDBC driver in Stata:

```
. jdbc connect, jar("mysql-connector-java-8.0.22.jar")
> driverclass("com.mysql.cj.jdbc.Driver")
> url("jdbc:mysql://localhost:3306/myDB")
> user("stata") password("stata_pass")
```

Going forward, when we issue the jdbc showdbs, jdbc showtables, jdbc describe, jdbc load, jdbc insert, or jdbc exec command, each will use this information to connect to the database myDB.

◁

▷ Example 2: Using macros

You can also use macros to make your do-file more readable and easier to change database settings.

```
. local jar "mysql-connector-java-8.0.22.jar"
. local driverclass "com.mysql.cj.jdbc.Driver"
. local url "jdbc:mysql://localhost:3306/myDB"
. local user "stata"
. local pass "stata_pass"
. jdbc connect, jar("`jar'") driverclass("`driverclass'")
> url("`url'") user("`user'") password("`pass'")
```

◁

Data source names

If you would like to have database connection settings stored and ready for jdbc to use every time you start a Stata session, you can place jdbc add in your profile.do to store these settings; see [GSW] **B.3 Executing commands every time Stata is started**, [GSM] **B.1 Executing commands every time Stata is started**, or [GSU] **B.1 Executing commands every time Stata is started**.

Use jdbc list to see the current session's stored connection settings and jdbc remove to remove stored settings.

Exploring a database

jdbc showdbs, jdbc showtables, and jdbc describe are used, respectively, to list database names, table names, and table columns of a connection. Use these commands to search for data to load from your connection.

▷ Example 3: Listing table names

jdbc showtables is used to list table names available from a specified database. To list all the tables stored in database myDB, type

```
. jdbc showtables
Database: myDB
```

Tables
auto

◁

▷ Example 4: Listing column names and data types

jdbc describe displays the column names and JDBC data types of the table listed. To describe the auto table, type

```
. jdbc describe "auto"
Table: auto
```

column name	column type
make	VARCHAR
price	INT
mpg	INT
rep78	SMALLINT
headroom	FLOAT
trunk	SMALLINT
weight	SMALLINT
length	SMALLINT
turn	SMALLINT
displacement	SMALLINT
gear_ratio	FLOAT
domestic	VARCHAR

◁

Loading data from a database

jdbc load is used to load a database table into Stata's memory; this can be an existing table or a subset of a table created by a series of SQL statements.

▷ Example 5: Loading a table

To load a database table listed in the jdbc showtables output, specify the table name in the table() option.

```
. jdbc load, table("auto")
74 observations loaded

. describe

Contains data
 Observations:            74
    Variables:            12
```

Variable name	Storage type	Display format	Value label	Variable label
make	str19	%19s		make
price	long	%12.0g		price
mpg	long	%12.0g		mpg
rep78	int	%8.0g		rep78
headroom	float	%9.0g		headroom
trunk	int	%8.0g		trunk
weight	int	%8.0g		weight
length	int	%8.0g		length
turn	int	%8.0g		turn
displacement	int	%8.0g		displacement
gear_ratio	float	%9.0g		gear_ratio
domestic	str18	%18s		domestic

```
Sorted by:
     Note: Dataset has changed since last saved.
```

◁

▷ Example 6: Loading part of a table

If your database table is large and the memory on your computer is limited, it is a good idea to limit the amount of data loaded from the database using a SELECT statement in the `exec()` option. For example, instead of loading the whole table as we did above, we can just load the `mpg` column:

```
. jdbc load, exec("SELECT mpg FROM auto;")
74 observations loaded

. describe

Contains data
 Observations:            74
    Variables:             1
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
mpg              long    %12.0g               mpg
--------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

◁

❑ Technical note

When Stata loads a table, data are converted from JDBC data types to Stata data types. Stata does not support all JDBC data types. If the column cannot be read because of incompatible data types, Stata will issue a note and skip a column. The following table lists the supported JDBC data types and their corresponding Stata data types:

JDBC data type	Stata data type
BOOLEAN	byte
BIT	byte
TINYINT	byte
SMALLINT	int
INTEGER	long
ROWID	str
BIGINT	str
REAL	float
FLOAT	float
NUMERIC	double
DECIMAL	double
DOUBLE	double
DATE	double
TIME	double
TIMESTAMP	double
TIME_WITH_TIMEZONE	str
TIMESTAMP_WITH_TIMEZONE	str
BINARY	strL
VARBINARY	strL
LONGVARBINARY	strL
BLOB	strL
CHAR	str/strL
VARCHAR	str/strL
LONGVARCHAR	str/strL
NCHAR	str/strL
NVARCHAR	str/strL
LONGNVARCHAR	str/strL
NCLOB	str/strL
CLOB	str/strL
STRUCT	skipped
ARRAY	skipped
SQLXML	skipped
NULL	skipped
OTHER	skipped
REF_CURSOR	skipped
JAVA_OBJECT	skipped
DISTINCT	skipped
REF	skipped
DATALINK	skipped

Stata is a UTF-8 application, so all string data should be encoded as UTF-8. This can be set using a driver connection property. Check your database vendor or driver documentation to see how your string data is encoded by default to see whether this property should be set.

```
. jdbc connect, ... connprop("characterEncoding:UTF8;")
```

❑

Inserting data into a database

`jdbc insert` inserts data in memory into a database table. The database table and the Stata *varlist* must have the same column and variable names, number of columns, and compatible data types for the insert to work correctly. By default, observations are appended to the database table. When you insert data, mapping of the data types are the same as `jdbc load`, with one exception, Stata `bytes`. Stata `bytes` are mapped to SMALLINTs because some database vendors' (SQLServer) BYTE data type is unsigned.

▷ Example 7: Inserting data into a table

Below, we insert the data in memory into the table `auto`.

```
. jdbc insert, table(auto)
74 rows inserted
```

To replace the table with the data in memory, use the option `overwrite`.

```
. jdbc insert, table(auto) overwrite
74 rows affected
74 rows inserted
```

◁

Executing SQL on a database

You use `jdbc exec` to execute SQL commands on the database. If an SQL command returns a result set, like SELECT, that result set will be displayed in the Stata Results window.

▷ Example 8: Executing SQL commands

To use `jdbc insert`, you must have a table already created in your database. If you do not, you can use `jdbc exec` to create a table in your database. For example, one might create a table in a MySQL database with the SQL command below:

```
#delimit ;
local create_table_sql `"CREATE TABLE auto (
        make varchar(19) NOT NULL,
        price int,
        mpg int,
        rep78 smallint,
        headroom float,
        trunk smallint,
        weight smallint,
        length smallint,
        turn smallint,
        displacement smallint,
        gear_ratio float,
        domestic varchar(18)
);"' ;

jdbc exec "`create_table_sql'"
```

If your SQL statement contains double quotes, you must enclose your statement in compound double quotes, as we did with the statement above.

◁

Stored results

jdbc showdbs stores the following in r():

Scalars

r(n_dbs)	number of databases displayed

jdbc showtables stores the following in r():

Scalars

r(n_tables)	number of tables displayed

jdbc describe stores the following in r():

Scalars

r(k)	number of columns displayed

jdbc load stores the following in r():

Scalars

r(k)	number of variables loaded
r(N)	number of observations loaded

jdbc insert stores the following in r():

Scalars

r(k)	number of columns inserted
r(N)	number of rows inserted

References

Crow, K. 2017. Importing WRDS data into Stata. *The Stata Blog: Not Elsewhere Classified.* https://blog.stata.com/2017/09/19/importing-wrds-data-into-stata/.

———. 2022. Wharton Research Data Services, Stata 17, and JDBC. *The Stata Blog: Not Elsewhere Classified.* https://blog.stata.com/2022/01/27/wharton-research-data-services-stata-17-and-jdbc/.

Also see

[D] **odbc** — Load, write, or view data from ODBC sources

[D] **import** — Overview of importing data into Stata

[D] **export** — Overview of exporting data from Stata

joinby — Form all pairwise combinations within groups

Description

`joinby` joins, within groups formed by *varlist*, observations of the dataset in memory with *filename*, a Stata-format dataset. By *join* we mean to form all pairwise combinations. If *filename* is specified without an extension, `.dta` is assumed.

If *varlist* is not specified, `joinby` takes as *varlist* the set of variables common to the dataset in memory and in *filename*.

Observations unique to one or the other dataset are ignored unless `unmatched()` specifies differently. Whether you load one dataset and join the other or vice versa makes no difference in the number of resulting observations.

If there are common variables between the two datasets, however, the combined dataset will contain the values from the master data for those observations. This behavior can be modified with the `update` and `replace` options.

Quick start

Form pairwise combinations of observations from `mydata1.dta` in memory with those from `mydata2.dta` using all common variables and drop unmatched observations

```
joinby using mydata2
```

Same as above, but join on `v1`, `v2`, and `v3`

```
joinby v1 v2 v3 using mydata2
```

Same as above, but include unmatched observations only from `mydata2.dta` and add `_merge` indicating whether the variable was in both datasets or only the using dataset

```
joinby v1 v2 v3 using mydata2, unmatched(using)
```

Same as above, but include unmatched observations only from `mydata1.dta`

```
joinby v1 v2 v3 using mydata2, unmatched(master)
```

Same as above, but name the variable indicating the source of the observation `newv`

```
joinby v1 v2 v3 using mydata2, unmatched(master) _merge(newv)
```

Replace missing data in `mydata1.dta` with values from `mydata2.dta`

```
joinby v1 v2 v3 using mydata2, update
```

Replace missing and conflicting data in `mydata1.dta` with values from `mydata2.dta`

```
joinby v1 v2 v3 using mydata2, update replace
```

Menu

Data > Combine datasets > Form all pairwise combinations within groups

Syntax

`joinby` [*varlist*] `using` *filename* [, *options*]

options	Description
Options	
When observations match:	
`update`	replace missing data in memory with values from *filename*
`replace`	replace all data in memory with values from *filename*
When observations do not match:	
`unmatched(none)`	ignore all; the default
`unmatched(both)`	include from both datasets
`unmatched(master)`	include from data in memory
`unmatched(using)`	include from data in *filename*
`_merge(`*varname*`)`	*varname* marks source of resulting observation; default is `_merge`
`nolabel`	do not copy value-label definitions from *filename*

varlist may not contain `strL`s.

Options

Options

`update` varies the action that `joinby` takes when an observation is matched. By default, values from the master data are retained when the same variables are found in both datasets. If `update` is specified, however, the values from the using dataset are retained where the master dataset contains missing.

`replace`, allowed with `update` only, specifies that nonmissing values in the master dataset be replaced with corresponding values from the using dataset. A nonmissing value, however, will never be replaced with a missing value.

`unmatched(none | both | master | using)` specifies whether observations unique to one of the datasets are to be kept, with the variables from the other dataset set to missing. Valid values are

`none`	ignore all unmatched observations (default)
`both`	include unmatched observations from the master and using data
`master`	include unmatched observations from the master data
`using`	include unmatched observations from the using data

`_merge(`*varname*`)` specifies the name of the variable that will mark the source of the resulting observation. The default name is `_merge(_merge)`. To preserve compatibility with earlier versions of `joinby`, `_merge` is generated only if `unmatched` is specified.

`nolabel` prevents Stata from copying the value-label definitions from the dataset on disk into the dataset in memory. Even if you do not specify this option, label definitions from the disk dataset do not replace label definitions already in memory.

Remarks and examples

The following, admittedly artificial, example illustrates joinby.

▷ Example 1

We have two datasets: child.dta and parent.dta. Both contain a family_id variable, which identifies the people who belong to the same family.

```
. use https://www.stata-press.com/data/r19/child
(Data on Children)

. describe

Contains data from https://www.stata-press.com/data/r19/child.dta
 Observations:             5                  Data on Children
    Variables:             4                  11 Dec 2024 21:08
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
family_id       int     %8.0g                 Family ID number
child_id        byte    %8.0g                 Child ID number
x1              byte    %8.0g
x2              int     %8.0g
-------------------------------------------------------------------------------
Sorted by: family_id

. list

     +-----------------------------------+
     | family~d   child_id   x1     x2   |
     |-----------------------------------|
  1. |     1025          3   11    320   |
  2. |     1025          1   12    300   |
  3. |     1025          4   10    275   |
  4. |     1026          2   13    280   |
  5. |     1027          5   15    210   |
     +-----------------------------------+

. use https://www.stata-press.com/data/r19/parent
(Data on Parents)

. describe

Contains data from https://www.stata-press.com/data/r19/parent.dta
 Observations:             6                  Data on Parents
    Variables:             4                  11 Dec 2024 03:06
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
family_id       int     %8.0g                 Family ID number
parent_id       float   %9.0g                 Parent ID number
x1              float   %9.0g
x3              float   %9.0g
-------------------------------------------------------------------------------
Sorted by:
```

```
. list, sep(0)

     +-----------------------------------+
     | family~d   parent~d   x1     x3   |
     |-----------------------------------|
  1. |     1030         10   39    600   |
  2. |     1025         11   20    643   |
  3. |     1025         12   27    721   |
  4. |     1026         13   30    760   |
  5. |     1026         14   26    668   |
  6. |     1030         15   32    684   |
     +-----------------------------------+
```

We want to join the information for the parents and their children. The data on parents are in memory, and the data on children are posted at https://www.stata-press.com.

```
. joinby family_id using https://www.stata-press.com/data/r19/child
. describe
Contains data
 Observations:             8                  Data on Parents
    Variables:             6
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
family_id       int     %8.0g                 Family ID number
parent_id       float   %9.0g                 Parent ID number
x1              float   %9.0g
x3              float   %9.0g
child_id        byte    %8.0g                 Child ID number
x2              int     %8.0g
-------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
. list, sepby(family_id) abbrev(12)

     +------------------------------------------------------+
     | family_id   parent_id   x1    x3   child_id    x2    |
     |------------------------------------------------------|
  1. |      1025          11   20   643          3   320    |
  2. |      1025          11   20   643          4   275    |
  3. |      1025          11   20   643          1   300    |
  4. |      1025          12   27   721          1   300    |
  5. |      1025          12   27   721          3   320    |
  6. |      1025          12   27   721          4   275    |
     |------------------------------------------------------|
  7. |      1026          13   30   760          2   280    |
  8. |      1026          14   26   668          2   280    |
     +------------------------------------------------------+
```

1. `family_id` of 1027, which appears only in `child.dta`, and `family_id` of 1030, which appears only in `parent.dta`, are not in the combined dataset. Observations for which the matching variables are not in both datasets are omitted.

2. The `x1` variable is in both datasets. Values for this variable in the joined dataset are the values from `parent.dta`—the dataset in memory when we issued the `joinby` command. If we had `child.dta` in memory and `parent.dta` on disk when we requested `joinby`, the values for `x1` would have been those from `child.dta`. Values from the dataset in memory take precedence over the dataset on disk.

◁

Acknowledgment

`joinby` was written by Jeroen Weesie of the Department of Sociology at Utrecht University, The Netherlands.

References

Baum, C. F. 2016. *An Introduction to Stata Programming*. 2nd ed. College Station, TX: Stata Press.

Mazrekaj, D., and J. Wursten. 2021. Stata tip 142: joinby is the real merge m:m. *Stata Journal* 21: 1065–1068.

Also see

[D] **append** — Append datasets

[D] **cross** — Form every pairwise combination of two datasets

[D] **fillin** — Rectangularize dataset

[D] **merge** — Merge datasets

[D] **save** — Save Stata dataset

[U] 23 Combining datasets

Description

`label data` attaches a label (up to 80 characters) to the dataset in memory. Dataset labels are displayed when you `use` the dataset and when you `describe` it. If no label is specified, any existing label is removed.

`label variable` attaches a label (up to 80 characters) to a variable. If no label is specified, any existing variable label is removed.

`label define` creates a value label named *lblname*, which is a set of individual numeric values and their corresponding labels. *lblname* can contain up to 65,536 individual labels; each individual label can be up to 32,000 characters long.

`label values` attaches a value label to *varlist*. If `.` is specified instead of *lblname*, any existing value label is detached from that *varlist*. The value label, however, is not deleted. The syntax `label values` *varname* (that is, nothing following the *varname*) acts the same as specifying the `.`.

`label dir` lists the names of value labels stored in memory.

`label list` lists the names and contents of value labels stored in memory.

`label copy` makes a copy of an existing value label.

`label drop` eliminates value labels.

`label save` saves value label definitions in a do-file. This is particularly useful for value labels that are not attached to a variable because these labels are not saved with the data. By default, `.do` is the filename extension used.

See [D] **label language** for information on the `label language` command.

Quick start

Label the dataset “My data”

```
label data "My data"
```

Label `v1` “First variable”

```
label variable v1 "First variable"
```

Define value label named `mylabel1`

```
label define mylabel1 1 "Value 1" 2 "Value 2"
```

Add labels for values 0 and 3 to `mylabel1`

```
label define mylabel1 0 "Value 0" 3 "Value 3", add
```

Copy `mylabel1` to `mylabel2`

```
label copy mylabel1 mylabel2
```

Redefine value 0 in `mylabel2` to mean “Null”

```
label define mylabel2 0 "Null", modify
```

Apply value label `mylabel1` to `v1`

```
label values v1 mylabel1
```

Save all currently defined value labels to `mylabels.do` for use with other datasets

```
label save using mylabels.do
```

List names and contents of all value labels

```
label list
```

Drop all value labels

```
label drop _all
```

Menu

label data

Data > Data utilities > Label utilities > Label dataset

label variable

Data > Variables Manager

label define

Data > Variables Manager

label values

Data > Variables Manager

label list

Data > Data utilities > Label utilities > List value labels

label copy

Data > Data utilities > Label utilities > Copy value labels

label drop

Data > Variables Manager

label save

Data > Data utilities > Label utilities > Save value labels as do-file

Syntax

Label dataset

label data ["*label*"]

Label variable

label variable *varname* ["*label*"]

Define value label

label define *lblname* # "*label*" [# "*label*" [...]] [, add modify replace nofix]

Assign value label to variables

label values *varlist* *lblname* [, nofix]

Remove value labels

label values *varlist* [.]

List names of value labels

label dir

List names and contents of value labels

label list [*lblname* [*lblname* [...]]]

Copy value label

label copy *lblname* *lblname* [, replace]

Drop value labels

label drop { *lblname* [*lblname* [...]] | _all }

Save value labels in do-file

label save [*lblname* [*lblname* [...]]] using *filename* [, replace]

Labels for variables and values in multiple languages

label language ... (see [D] **label language**)

where # is an integer or an extended missing value (.a, .b, ..., .z).

collect is allowed with label dir, label language, and label list; see [U] **11.1.10 Prefix commands**.

Options

`add` allows you to add # ↔ *label* correspondences to *lblname*. If `add` is not specified, you may create only new *lblname*s. If `add` is specified, you may create new *lblname*s or add new entries to existing *lblname*s.

`modify` allows you to modify or delete existing # ↔ *label* correspondences and add new correspondences. Specifying `modify` implies `add`, even if you do not type the `add` option.

`replace`, with `label define`, allows an existing value label to be redefined. `replace`, with `label copy`, allows an existing value label to be copied over. `replace`, with `label save`, allows *filename* to be replaced.

`nofix` prevents display formats from being widened according to the maximum length of the value label. Consider `label values myvar mylab`, and say that `myvar` has a `%9.0g` display format right now. Say that the maximum length of the strings in `mylab` is 12 characters. `label values` would change the format of `myvar` from `%9.0g` to `%12.0g`. `nofix` prevents this.

`nofix` is also allowed with `label define`, but it is relevant only when you are modifying an existing value label. Without the `nofix` option, `label define` finds all the variables that use this value label and considers widening their display formats. `nofix` prevents this.

Remarks and examples

See **[U] 12.6 Dataset, variable, and value labels** for a complete description of labels. This entry deals only with details not covered there.

Remarks are presented under the following headings:

Overview

Value labels save us the trouble of having to remember how our variables are coded. For example, if we have a variable recording the region where people live, we might not remember if a value of 1 referred to east or west. We can use `label define` to create a value label attaching the labels east and west to numeric values 1 and 2. We can then attach these codings to our region variable with `label values` so that our labels will be displayed in the output of certain summary statistics and estimation commands instead of their corresponding numeric values. The suite of `label` commands makes it easy to create and manipulate these labels.

▷ Example 1: Creating a value label

Although `describe` shows the names of the value labels, those value labels may not exist. Stata does not consider it an error to label the values of a variable with a nonexistent label. When this occurs, Stata still shows the association on `describe` but otherwise acts as if the variable's values are unlabeled. This way, you can associate a value label name with a variable before creating the corresponding label. Similarly, you can define labels that you have not yet used.

```
. use https://www.stata-press.com/data/r19/hbp4
. describe
Contains data from https://www.stata-press.com/data/r19/hbp4.dta
 Observations:         1,130
    Variables:             7                  22 Jan 2024 11:12
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
id              str10   %10s                  Record identification number
city            byte    %8.0g
year            int     %8.0g
age_grp         byte    %8.0g
race            byte    %8.0g
hbp             byte    %8.0g
female          byte    %8.0g      sexlbl
-------------------------------------------------------------------------------
Sorted by:
```

The dataset is using the value label `sexlbl`. Let's define the value label `yesno`:

```
. label define yesno 0 "No" 1 "Yes"
```

`label dir` shows you the value labels that you have actually defined:

```
. label dir
yesno
sexlbl
```

We have two value labels stored in memory: `yesno` and `sexlbl`.

We can display the contents of a value label with the `label list` command:

```
. label list yesno
yesno:
           0 No
           1 Yes
```

The value label `yesno` labels the values 0 as `no` and 1 as `yes`.

If you do not specify the name of the value label on the `label list` command, Stata lists all the value labels:

```
. label list
yesno:
           0 No
           1 Yes
sexlbl:
           0 Male
           1 Female
```

◁

You can add new codings to an existing value label by using the `add` option with the `label define` command. You can modify existing codings by using the `modify` option. You can redefine a value label by specifying the `replace` option.

▷ Example 2: Modifying a value label

The value label yesno codes 0 as no and 1 as yes. You might wish later to add a third coding: 2 as maybe. Typing label define with no options results in an error:

```
. label define yesno 2 maybe
label yesno already defined
r(110);
```

If you do not specify the add, modify, or replace options, label define can be used only to create *new* value labels. The add option lets you add codings to an existing value label:

```
. label define yesno 2 maybe, add

. label list yesno
yesno:
           0 No
           1 Yes
           2 maybe
```

Perhaps you have accidentally mislabeled a value. For instance, 2 may not mean "maybe" but may instead mean "don't know". add does not allow you to change an existing label:

```
. label define yesno 2 "Don't know", add
invalid attempt to modify label
r(180);
```

Instead, you would specify the modify option:

```
. label define yesno 2 "Don't know", modify

. label list yesno
yesno:
           0 No
           1 Yes
           2 Don't know
```

In this way, Stata attempts to protect you from yourself. If you type label define with no options, you can only create a new value label—you cannot accidentally change an existing one. If you specify the add option, you can add new labels to an existing value label, but you cannot accidentally change any existing label. If you specify the modify option, which you may not abbreviate, you can change any existing label.

You can even use the modify option to eliminate existing labels. To do this, you map the numeric code to a *null string*, that is, "":

```
. label define yesno 2 "", modify

. label list yesno
yesno:
           0 No
           1 Yes
```

◁

You can eliminate entire value labels by using the label drop command.

▷ Example 3: Dropping value labels

We currently have two value labels stored in memory—sexlbl and yesno—as shown by the label dir command:

```
. label dir
yesno
sexlbl
```

The dataset that we have in memory uses only one of the labels—sexlbl. describe reports that yesno is not being used:

```
. describe

Contains data from https://www.stata-press.com/data/r19/hbp4.dta
 Observations:         1,130
    Variables:             7                  22 Jan 2024 11:12
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
id              str10   %10s                  Record identification number
city            byte    %8.0g
year            int     %8.0g
age_grp         byte    %8.0g
race            byte    %8.0g
hbp             byte    %8.0g
female          byte    %8.0g      sexlbl
-------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

We can eliminate the value label yesno by typing

```
. label drop yesno

. label dir
sexlbl
```

We could eliminate *all* the value labels in memory by typing

```
. label drop _all

. label dir
```

The value label `sexlbl`, which no longer exists, was associated with the variable `female`. Even after dropping the value label, `sexlbl` is still associated with the variable:

```
. describe

Contains data from https://www.stata-press.com/data/r19/hbp4.dta
 Observations:         1,130
    Variables:             7                  22 Jan 2024 11:12
────────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
────────────────────────────────────────────────────────────────────────────────
id              str10   %10s                  Record identification number
city            byte    %8.0g
year            int     %8.0g
age_grp         byte    %8.0g
race            byte    %8.0g
hbp             byte    %8.0g
female          byte    %8.0g      sexlbl
────────────────────────────────────────────────────────────────────────────────
Sorted by:
     Note: Dataset has changed since last saved.
```

If we wanted to disassociate this nonexistent value label from the variable it was attached to, we could issue the `label values` command without specifying a value label name.

◁

▷ Example 4: Copying a value label

`label copy` is useful when you want to create a new value label that is similar to an existing value label. For example, assume that we currently have the value label `yesno` in memory:

```
. label list yesno
yesno:
           1 Yes
           2 No
```

Assume that we have some variables in our dataset coded with 1 and 2 for "yes" and "no" and that we have some other variables coded with 1 for "yes", 2 for "no", and 3 for "maybe".

We could make a copy of value label `yesno` and then add the new coding to that copy:

```
. label copy yesno yesnomaybe

. label define yesnomaybe 3 "Maybe", add

. label list
yesnomaybe:
           1 Yes
           2 No
           3 Maybe
yesno:
           1 Yes
           2 No
```

◁

▷ Example 5: Saving value labels

Data and variable labels are automatically stored with your dataset when you save it. You might have more value labels stored in memory than are actually used in the dataset, but only those value labels that are attached to variables will be stored with a dataset unless you use `save`'s `orphans` option.

Conversely, the use command drops all in-memory labels before loading the new dataset along with any labels it might contain. You might want to store a value label not currently in use or move a value label from one dataset to another. The label save command allows you to do this.

For example, assume that we currently have the value label yesnomaybe in memory:

```
. label list yesnomaybe
yesnomaybe:
           1 Yes
           2 No
           3 Maybe
```

We have a dataset stored on disk called survey.dta to which we wish to add this value label. We might use survey and then retype the label define yesnomaybe command. Retyping the label would not be too tedious here but if the value label in memory mapped, say, the 50 states of the United States, retyping it would be irksome. label save provides an alternative:

```
. label save yesnomaybe using ynfile
file ynfile.do saved
```

Typing label save yesnomaybe using ynfile caused Stata to create a do-file called ynfile.do containing the definition of the yesnomaybe value label. Because we did not specify an extension for our file, .do was assumed. Also, if we had not specified a value label name, all value labels would have been stored in ynfile.do.

To see the contents of the file, we can use the type command:

```
. type ynfile.do
label define yesnomaybe 1 `"Yes"', modify
label define yesnomaybe 2 `"No"', modify
label define yesnomaybe 3 `"Maybe"', modify
```

We can now use our new dataset, survey.dta:

```
. use survey, clear
(Household survey data)
. label dir
```

Using the new dataset causes Stata to eliminate all value labels stored in memory. The label yesnomaybe is now gone. Because we saved it in the file ynfile.do, however, we can get it back by typing either do ynfile or run ynfile. If we type do, we will see the commands in the file execute. If we type run, the file will execute silently:

```
. run ynfile
. label dir
yesnomaybe
```

The value label is now restored just as if we had typed it from the keyboard.

◁

❑ Technical note

You can also use the label save command to more easily edit value labels. You can save a label in a file, leave Stata and use your word processor or editor to edit the label, and then return to Stata. Using do or run, you can load the edited values.

❑

Video examples

How to label variables

How to label the values of categorical variables

Stored results

`label list` stores the following in `r()`:

Scalars

`r(k)`	number of mapped values, including missings
`r(min)`	minimum nonmissing value label
`r(max)`	maximum nonmissing value label
`r(hasemiss)`	`1` if extended missing values labeled, `0` otherwise

`label dir` stores the following in `r()`:

Macros

`r(names)`	names of value labels

References

Bjärkefur, K., L. Cardoso de Andrade, and B. Daniels. 2020. iefieldkit: Commands for primary data collection and cleaning. *Stata Journal* 20: 892–915.

———. 2023. iefieldkit: Commands for primary data collection and cleaning (update). *Stata Journal* 23: 875–883.

Klein, D. 2019. Extensions to the label commands. *Stata Journal* 19: 867–882.

Long, J. S. 2009. *The Workflow of Data Analysis Using Stata*. College Station, TX: Stata Press.

Weesie, J. 2005a. Value label utilities: labeldup and labelrename. *Stata Journal* 5: 154–161.

———. 2005b. Multilingual datasets. *Stata Journal* 5: 162–187.

Also see

[D] **label language** — Labels for variables and values in multiple languages

[D] **labelbook** — Label utilities

[D] **encode** — Encode string into numeric and vice versa

[D] **varmanage** — Manage variable labels, formats, and other properties

[U] 12.6 Dataset, variable, and value labels

Description	Quick start	Menu	Syntax
Option	Remarks and examples	Stored results	Methods and formulas
References	Also see		

Description

`label language` lets you create and use datasets that contain different sets of data, variable, and value labels. A dataset might contain one set in English, another in German, and a third in Spanish. A dataset may contain up to 100 sets of labels.

We will write about the different sets as if they reflect different spoken languages, but you need not use the multiple sets in this way. You could create a dataset with one set of long labels and another set of shorter ones.

One set of labels is in use at any instant, but a dataset may contain multiple sets. You can choose among the sets by typing

. `label language` *languagename*

When other Stata commands produce output (such as `describe` and `tabulate`), they use the currently set language. When you define or modify the labels by using the other `label` commands (see [D] **label**), you modify the current set.

`label language` (without arguments)
: lists the available languages and the name of the current one. The current language refers to the labels you will see if you used, say, `describe` or `tabulate`. The available languages refer to the names of the other sets of previously created labels. For instance, you might currently be using the labels in `en` (English), but labels in `de` (German) and `es` (Spanish) may also be available.

`label language` *languagename*
: changes the labels to those of the specified language. For instance, if `label language` revealed that `en`, `de`, and `es` were available, typing `label language de` would change the current language to German.

`label language` *languagename*`, new`
: allows you to create a new set of labels and collectively name them *languagename*. You may name the set as you please, as long as the name does not exceed 24 characters. If the labels correspond to spoken languages, we recommend that you use the language's ISO 639-1 two-letter code, such as `en` for English, `de` for German, and `es` for Spanish. A list of codes for popular languages is listed in the appendix below. For a complete list, see https://en.wikipedia.org/wiki/List_of_ISO_639-1_codes.

`label language` *languagename*`, rename`
: changes the name of the label set currently in use. If the label set in use were named `default` and you now wanted to change that to `en`, you could type `label language en, rename`.

: Our choice of the name `default` in the example was not accidental. If you have not yet used `label language` to create a new language, the dataset will have one language, named `default`.

`label language` *languagename*`, delete`
: deletes the specified label set. If *languagename* is also the current language, one of the other available languages becomes the current language.

Quick start

Name unnamed default language en for English

```
label language en, rename
```

Create new set of labels in French named `fr`

```
label language fr, new
```

Change current label language from English to French

```
label language fr
```

List defined languages

```
label language
```

Delete English label set

```
label language en, delete
```

Menu

Data > Data utilities > Label utilities > Set label language

Syntax

List defined languages

`label language`

Change labels to specified language name

`label language` *languagename*

Create new set of labels with specified language name

`label language` *languagename* `, new` [`copy`]

Rename current label set

`label language` *languagename* `, rename`

Delete specified label set

`label language` *languagename* `, delete`

`collect` is allowed; see **[U] 11.1.10 Prefix commands**.

Option

`copy` is used with `label language, new` and copies the labels from the current language to the new language.

Remarks and examples

Remarks are presented under the following headings:

Creating labels in the first language

You can begin by ignoring the `label language` command. You create the data, variable, and value labels just as you would ordinarily; see [D] **label**.

```
. label data "1978 automobile data"
. label variable foreign "Car type"
. label values foreign origin
. label define origin  0 "Domestic"  1 "Foreign"
```

At some point—at the beginning, the middle, or the end—rename the language appropriately. For instance, if the labels you defined were in English, type

```
. label language en, rename
```

`label language, rename` simply changes the name of the currently set language. You may change the name as often as you wish.

Creating labels in the second and subsequent languages

After creating the first language, you can create a new language by typing

```
. label language newlanguagename, new
```

or by typing the two commands

```
. label language existinglanguagename
. label language newlanguagename, new copy
```

In the first case, you start with a clean slate: no data, variable, or value labels are defined. In the second case, you start with the labels from *existinglanguagename*, and you can make the changes from there.

Creating labels from a clean slate

To create new labels in the language named `de`, type

```
. label language de, new
```

If you were now to type `describe`, you would find that there are no data, variable, or value labels. You can define new labels in the usual way:

```
. label data "1978 automobil daten"
. label variable foreign "Art auto"
. label values foreign origin_de
. label define origin_de  0 "Innen"  1 "Ausländisch"
```

Creating labels from a previously existing language

It is sometimes easier to start with the labels from a previously existing language, which you can then translate:

```
. label language en
. label language de, new copy
```

If you were now to type `describe`, you would see the English-language labels, even though the new language is named `de`. You can then work to translate the labels:

```
. label data "1978 automobil daten"
. label variable foreign "Art auto"
```

Typing `describe`, you might also discover that the variable `foreign` has the value label `origin`. Do not change the contents of the value label. Instead, create a new value label:

```
. label define origin_de  0 "Innen"  1 "Ausländisch"
. label values foreign origin_de
```

Creating value labels with the `copy` option is no different from creating them from a clean slate, except that you start with an existing set of labels from another language. Using `describe` can make it easier to translate them.

Switching languages

You can discover the names of the previously defined languages by typing

```
. label language
```

You can switch to a previously defined language—say, to `en`—by typing

```
. label language en
```

Changing the name of a language

To change the name of a previously defined language make it the current language and then specify the `rename` option:

```
. label language de
. label language German, rename
```

You may rename a language as often as you wish:

```
. label language de, rename
```

Deleting a language

To delete a previously defined language, such as `de`, type

```
. label language de, delete
```

The `delete` option deletes the specified language and, if the language was also the currently set language, resets the current language to one of the other languages or to `default` if there are none.

Appendix: Selected ISO 639-1 two-letter codes

You may name languages as you please. You may name German labels `Deutsch`, `German`, `Aleman`, or whatever else appeals to you. For consistency across datasets, if the language you are creating is a spoken language, we suggest that you use the ISO 639-1 two-letter codes. Some of them are listed below, and the full list can be found at https://en.wikipedia.org/wiki/List_of_ISO_639-1_codes.

Two-letter code	English name of language
ar	Arabic
bn	Bengali
cs	Czech
de	German
do	Danish
el	Greek
en	English
es	Spanish; Castillian
fa	Persian
fi	Finnish
fr	French
ga	Irish
he	Hebrew
hi	Hindi
is	Icelandic
it	Italian
ja	Japanese
ko	Korean
lt	Lithuanian
lv	Latvian
nl	Dutch; Flemish
no	Norwegian
pa	Punjabi
pl	Polish
pt	Portuguese
ro	Romanian; Moldavian
ru	Russian
sk	Slovak
sr	Serbian
sv	Swedish
te	Telugu
tr	Turkish
uk	Ukrainian
ur	Urdu
zh	Chinese

Stored results

`label language` without arguments stores the following in `r()`:

Scalars	
`r(k)`	number of languages defined
Macros	
`r(languages)`	list of languages, listed one after the other
`r(language)`	name of current language

Methods and formulas

This section is included for programmers who wish to access or extend the services `label language` provides.

Language sets are implemented using [P] **char**. The names of the languages and the name of the current language are stored in

`_dta[_lang_list]`	list of defined languages
`_dta[_lang_c]`	currently set language

If these characteristics are undefined, results are as if each contained the word "`default`". Do not change the contents of the above two macros except by using `label language`.

For each language *languagename* except the current language, data, variable, and value labels are stored in

`_dta[_lang_v_`*languagename*`]`	data label
varname`[_lang_v_`*languagename*`]`	variable label
varname`[_lang_l_`*languagename*`]`	value-label name

References

Golbe, D. L. 2010. Stata tip 83: Merging multilingual datasets. *Stata Journal* 10: 152–156.
Weesie, J. 2005. Multilingual datasets. *Stata Journal* 5: 162–187.

Also see

[D] **label** — Manipulate labels

[D] **labelbook** — Label utilities

[D] **codebook** — Describe data contents

Description

`labelbook` displays information for the value labels specified or, if no labels are specified, all the labels in the data.

For multilingual datasets (see [D] **label language**), `labelbook` lists the variables to which value labels are attached in all defined languages.

`numlabel` prefixes numeric values to value labels. For example, a value mapping of `2 -> "catholic"` will be changed to `2 -> "2. catholic"`. See option `mask()` for the different formats. Stata commands that display the value labels also show the associated numeric values. Prefixes are removed with the `remove` option.

`uselabel` is a programmer's command that reads the value-label information from the currently loaded dataset or from an optionally specified filename.

`uselabel` creates a dataset in memory that contains only that value-label information. The new dataset has four variables named `label`, `lname`, `value`, and `trunc`; is sorted by `lname value`; and has 1 observation per mapping. Value labels can be longer than the maximum string length in Stata; see [R] **Limits**. The new variable `trunc` contains `1` if the value label is truncated to fit in a string variable in the dataset created by `uselabel`.

`uselabel` complements `label, save`, which produces a text file of the value labels in a format that allows easy editing of the value-label texts.

Specifying no list or `_all` is equivalent to specifying all value labels. Value-label names may not be abbreviated or specified with wildcards.

Quick start

Codebook of all currently defined value labels

```
labelbook
```

Same as above, but only include labels `mylabel1`, `mylabel2`, and `mylabel3`

```
labelbook mylabel1 mylabel2 mylabel3
```

Same as above, and check that value labels are unique to the first 8 characters

```
labelbook mylabel1 mylabel2 mylabel3, length(8)
```

Prefix numeric values to `mylabel1` with the number separated from the text by a hyphen

```
numlabel mylabel1, add mask("# - ")
```

Remove a prefixed numeric value from a value label when the "# -" mask was used

```
numlabel mylabel1, remove mask("# - ")
```

Menu

labelbook

Data > Data utilities > Label utilities > Produce codebook of value labels

numlabel

Data > Data utilities > Label utilities > Prepend values to value labels

uselabel

Data > Data utilities > Label utilities > Create dataset from value labels

Syntax

Produce a codebook describing value labels

`labelbook` [*lblname-list*] [, *labelbook_options*]

Prefix numeric values to value labels

`numlabel` [*lblname-list*] , { `add` | `remove` } [*numlabel_options*]

Make dataset containing value-label information

`uselabel` [*lblname-list*] [`using` *filename*] [, `clear` `var`]

labelbook_options	Description
`alpha`	alphabetize label mappings
`length(#)`	check if value labels are unique to length #; default is `length(12)`
`list(#)`	list maximum of # mappings; default is `list(32000)`
`problems`	describe potential problems in a summary report
`detail`	do not suppress detailed report on variables or value labels

`collect` is allowed with `labelbook`; see **[U] 11.1.10 Prefix commands**.

numlabel_options	Description
* `add`	prefix numeric values to value labels
* `remove`	remove numeric values from value labels
`mask(`*str*`)`	mask for formatting numeric labels; default mask is `"#. "`
`force`	force adding or removing of numeric labels
`detail`	provide details about value labels, where some labels are prefixed with numbers and others are not

* Either `add` or `remove` must be specified.

Options

Options are presented under the following headings:

Options for labelbook
Options for numlabel
Options for uselabel

Options for labelbook

`alpha` specifies that the list of value-label mappings be sorted alphabetically on label. The default is to sort the list on value.

`length(#)` specifies the minimum length that `labelbook` checks to determine whether shortened value labels are still unique. It defaults to 12, the width used by most Stata commands. `labelbook` also reports whether value labels are unique at their full length.

`list(#)` specifies the maximum number of value-label mappings to be listed. If a value label defines more mappings, a random subset of # mappings is displayed. By default, `labelbook` displays all mappings. `list(0)` suppresses the listing of the value-label definitions.

`problems` specifies that a summary report be produced describing potential problems that were diagnosed:

1. Value label has gaps in mapped values (for example, values 0 and 2 are labeled, while 1 is not)
2. Value label strings contain leading or trailing blanks
3. Value label contains duplicate labels, that is, there are different values that map into the same string
4. Value label contains duplicate labels at length 12
5. Value label contains numeric $\rightarrow$ numeric mappings
6. Value label contains numeric $\rightarrow$ null string mappings
7. Value label is not used by variables

`detail` may be specified only with `problems`. It specifies that the detailed report on the variables or value labels not be suppressed.

Options for numlabel

`add` specifies that numeric values be prefixed to value labels. Value labels that are already `numlabeled` (using the same mask) are not modified.

`remove` specifies that numeric values be removed from the value labels. If you added numeric values by using a nondefault mask, you must specify the same mask to remove them. Value labels that are not `numlabeled` or are `numlabeled` using a different mask are not modified.

`mask(`*str*`)` specifies a mask for formatting the numeric labels. In the mask, # is replaced by the numeric label. The default mask is `"#. "` so that numeric value 3 is shown as `"3. "`. Spaces are relevant. For the mask `"[#]"`, numeric value 3 would be shown as `"[3]"`.

`force` specifies that adding or removing numeric labels be performed, even if some value labels are `numlabeled` using the mask and others are not. Here only labels that are not `numlabeled` will be modified.

`detail` specifies that details be provided about the value labels that are sometimes, but not always, `numlabeled` using the mask.

Options for uselabel

`clear` permits the dataset to be created, even if the dataset already in memory has changed since it was last saved.

`var` specifies that the varlists using value label *vl* be returned in `r(`*vl*`)`.

Remarks and examples

Remarks are presented under the following headings:

labelbook

`labelbook` produces a detailed report of the value labels in your data. You can restrict the report to a list of labels, meaning that no abbreviations or wildcards will be allowed. `labelbook` is a companion command to [D] **codebook**, which describes the data, focusing on the variables.

For multilingual datasets (see [D] **label language**), `labelbook` lists the variables to which value labels are attached in any of the languages.

▷ Example 1

We request a `labelbook` report for value labels in a large dataset on the internal organization of households. We restrict output to three value labels: `agree5` (used for five-point Likert-style items), `divlabor` (division of labor between husband and wife), and `noyes` for simple no-or-yes questions.

```
. use https://www.stata-press.com/data/r19/labelbook1
. labelbook agree5 divlabor noyes
-------------------------------------------------------------------------------
Value label agree5
-------------------------------------------------------------------------------

      Values                                    Labels
       Range:  [1,5]                    String length:  [8,11]
           N:  5                Unique at full length:  yes
        Gaps:  no                 Unique at length 12:  yes
  Missing .*:  0                          Null string:  no
                              Leading/trailing blanks:  no
                                   Numeric -> numeric:  no
  Definition
           1   -- disagree
           2   - disagree
           3   indifferent
           4   + agree
           5   ++ agree

   Variables:  rs056 rs057 rs058 rs059 rs060 rs061 rs062 rs063 rs064 rs065
               rs066 rs067 rs068 rs069 rs070 rs071 rs072 rs073 rs074 rs075
               rs076 rs077 rs078 rs079 rs080 rs081
```

```
--------------------------------------------------------------------------------
Value label divlabor
--------------------------------------------------------------------------------

      Values                                    Labels
       Range:  [1,7]                      String length:  [7,16]
           N:  7                  Unique at full length:  yes
        Gaps:  no                   Unique at length 12:  yes
  Missing .*:  0                            Null string:  no
                                Leading/trailing blanks:  yes
                                     Numeric -> numeric:  no
  Definition
           1   wife only
           2   wife >> husband
           3   wife > husband
           4   equally
           5   husband > wife
           6   husband >> wife
           7   husband only

   Variables:  hm01_a hm01_b hm01_c hm01_d hm01_e hn19 hn21 hn25_a hn25_b
               hn25_c hn25_d hn25_e hn27_a hn27_b hn27_c hn27_d hn27_e hn31
               hn36 hn38 hn42 hn46_a hn46_b hn46_c hn46_d hn46_e ho01_a ho01_b
               ho01_c ho01_d ho01_e

--------------------------------------------------------------------------------
Value label noyes
--------------------------------------------------------------------------------

      Values                                    Labels
       Range:  [1,2]                      String length:  [2,16]
           N:  4                  Unique at full length:  yes
        Gaps:  no                   Unique at length 12:  yes
  Missing .*:  2                            Null string:  no
                                Leading/trailing blanks:  no
                                     Numeric -> numeric:  no
  Definition
           1   no
           2   yes
          .a   not applicable
          .b   ambiguous answer

   Variables:  hb12 hd01_a hd01_b hd03 hd04_a hd04_b he03_a he03_b hlat hn09_b
               hn24_a hn34 hn49 hu05_a hu06_1c hu06_2c hx07_a hx08 hlat2
               hfinish rh02 rj10_01 rk16_a rk16_b rl01 rl03 rl08_a rl08_b
               rl09_a rs047 rs048 rs049 rs050 rs051 rs052 rs053 rs054 rs093
               rs095 rs096 rs098
```

The report is largely self-explanatory. Extended missing values are denoted by "`.*`". In the definition of the mappings, the leading 12 characters of longer value labels are underlined to make it easier to check that the value labels still make sense after truncation. The following example emphasizes this feature. The option `alpha` specifies that the value-label mappings be sorted in alphabetical order by the label strings rather than by the mapped values.

```
. use https://www.stata-press.com/data/r19/labelbook2
. labelbook sports, alpha
─────────────────────────────────────────────────────────────────────────────
Value label sports
─────────────────────────────────────────────────────────────────────────────

      Values                                    Labels
       Range:  [1,5]                   String length:  [16,23]
           N:  4               Unique at full length:  yes
        Gaps:  yes               Unique at length 12:  no
  Missing .*:  0                         Null string:  no
                             Leading/trailing blanks:  no
                                  Numeric -> numeric:  no
  Definition
           5   college baseball
           4   college basketball
           2   professional baseball
           1   professional basketball

   Variables:  active passive
```

The report includes information about potential problems in the data. These are discussed in greater detail in the next section.

◁

Diagnosing problems

`labelbook` can diagnose a series of potential problems in the value-label mappings. `labelbook` produces warning messages for a series of problems:

1. Gaps in the labeled values (for example, values 0 and 2 are labeled, whereas 1 is not) may occur when value labels of the intermediate values have not been defined.
2. Leading or trailing blanks in the value labels may distort Stata output.
3. Stata allows you to define blank labels, that is, the mapping of a number to the empty string. Below we give you an example of the unexpected output that may result. Blank labels are most often the result of a mistaken value-label definition, for instance, the expansion of a nonexisting macro in the definition of a value label.
4. Stata does not require that the labels within each value label consist of *unique* strings, that is, that different values be mapped into different strings. For instance, you might accidentally define the value label `gender` as

   ```
   label define gender 1 female 2 female
   ```

   You will probably catch most of the problems, but in more complicated value labels, it is easy to miss the error. `labelbook` finds such problems and displays a warning.
5. Stata allows long value labels (32,000 characters), so labels can be long. However, some commands may need to display truncated value labels, typically at length 12. Consequently, even if the value labels are unique, the truncated value labels may not be, which can cause problems. `labelbook` warns you for value labels that are not unique at length 12.
6. Stata allows value labels that can be interpreted as numbers. This is sometimes useful, but it can cause highly misleading output. Think about tabulating a variable for which the associated value label incorrectly maps 1 into “2”, 2 into “3”, and 3 into “1”. `labelbook` looks for such problematic labels and warns you if they are found.

7. In Stata, value labels are defined as separate objects that can be associated with more than one variable:

```
label define labname # str # str ...
label value varname1 labname
label value varname2 labname
...
```

If you forget to associate a variable label with a variable, Stata considers the label unused and drops its definition. `labelbook` reports unused value labels so that you may fix the problem.

The related command `codebook` reports on two other potential problems concerning value labels:

a. A variable is value labeled, but some values of the variable are not labeled. You may have forgotten to define a mapping for some values, or you generated a variable incorrectly; for example, your `sex` variable has an unlabeled value 3, and you are not working in experimental genetics!

b. A variable has been associated with an undefined value label.

`labelbook` can also be invoked with the `problems` option, specifying that only a report on potential problems be displayed without the standard detailed description of the value labels.

❑ Technical note

The following two examples demonstrate some features of value labels that may be difficult to understand. In the first example, we `encode` a string variable with blank strings of various sizes; that is, we turn a string variable into a value-labeled numeric variable. Then we tabulate the generated variable.

```
. clear all

. set obs 5
Number of observations (_N) was 0, now 5.

. generate str10 horror = substr("      ", 1, _n)

. encode horror, gen(Ihorror)

. tabulate horror

     horror |      Freq.     Percent        Cum.
------------+-----------------------------------
            |          1       20.00       20.00
            |          1       20.00       40.00
            |          1       20.00       60.00
            |          1       20.00       80.00
            |          1       20.00      100.00
------------+-----------------------------------
      Total |          5      100.00
```

It may look as if you have discovered a bug in Stata because there are no value labels in the first column of the table. This happened because we encoded a variable with only blank strings, so the associated value label maps integers into blank strings.

```
. label list Ihorror
Ihorror:
           1
           2
           3
           4
           5
```

In the first column of the table, `tabulate` displayed the value-label texts, just as it should. Because these texts are all blank, the first column is empty. As illustrated below, `labelbook` would have warned you about this odd value label.

Our second example illustrates what could go wrong with numeric values stored as string values. We want to turn this into a numeric variable, but we incorrectly `encode` the variable rather than using the appropriate command, `destring`.

```
. generate str10 horror2 = string(_n+1)
. encode horror2, gen(Ihorror2)
. tabulate Ihorror2

   Ihorror2 |      Freq.     Percent        Cum.
------------+-----------------------------------
          2 |          1       20.00       20.00
          3 |          1       20.00       40.00
          4 |          1       20.00       60.00
          5 |          1       20.00       80.00
          6 |          1       20.00      100.00
------------+-----------------------------------
      Total |          5      100.00
. tabulate Ihorror2, nolabel

   Ihorror2 |      Freq.     Percent        Cum.
------------+-----------------------------------
          1 |          1       20.00       20.00
          2 |          1       20.00       40.00
          3 |          1       20.00       60.00
          4 |          1       20.00       80.00
          5 |          1       20.00      100.00
------------+-----------------------------------
      Total |          5      100.00
. label list Ihorror2
Ihorror2:
           1 2
           2 3
           3 4
           4 5
           5 6
```

❑

`labelbook` skips the detailed descriptions of the value labels and reports only the potential problems in the value labels if the `problems` option is specified. This report would have alerted you to the problems with the value labels we just described.

```
. use https://www.stata-press.com/data/r19/data_in_trouble, clear
. labelbook, problem
  Potential problems in dataset   https://www.stata-press.com/data/r19/
> data_in_trouble.dta
                 Potential problem   Value labels
--------------------------------------------------
                Numeric -> numeric   Ihorror2
      Leading or trailing blanks   Ihorror
               Numeric -> null str   Ihorror
--------------------------------------------------
```

Running `labelbook, problems` and `codebook, problems` on new data might catch a series of annoying problems.

numlabel

The `numlabel` command allows you to prefix numeric codes to value labels. The reason you might want to do this is best seen in an example using the automobile data. First, we create a value label for the variable `rep78` (repair record in 1978),

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)
. label define repair 1 "very poor" 2 "poor" 3 "medium" 4 good 5 "very good"
. label values rep78 repair
```

and tabulate it.

```
. tabulate rep78
```

Repair record 1978	Freq.	Percent	Cum.
very poor	2	2.90	2.90
poor	8	11.59	14.49
medium	30	43.48	57.97
good	18	26.09	84.06
very good	11	15.94	100.00
Total	69	100.00	

Suppose that we want to recode the variable by joining the categories *poor* and *very poor*. To do this, we need the numerical codes of the categories, not the value labels. However, Stata does not display both the numeric codes and the value labels. We could redisplay the table with the `nolabel` option. The `numlabel` command provides a simple alternative: it modifies the value labels so that they also contain the numeric codes.

```
. numlabel, add
. tabulate rep78
```

Repair record 1978	Freq.	Percent	Cum.
1. very poor	2	2.90	2.90
2. poor	8	11.59	14.49
3. medium	30	43.48	57.97
4. good	18	26.09	84.06
5. very good	11	15.94	100.00
Total	69	100.00	

If you do not like the way the numeric codes are formatted, you can use `numlabel` to change the formatting. First, we remove the numeric codes again:

```
. numlabel repair, remove
```

In this example, we specified the name of the label. If we had not typed it, `numlabel` would have removed the codes from all the value labels. We can include the numeric codes while specifying a mask:

```
. numlabel, add mask("[#]  ")
. tabulate rep78

 Repair record │
          1978 │      Freq.     Percent        Cum.
───────────────┼───────────────────────────────────
[1]  very poor │          2        2.90        2.90
     [2]  poor │          8       11.59       14.49
   [3]  medium │         30       43.48       57.97
     [4]  good │         18       26.09       84.06
[5]  very good │         11       15.94      100.00
───────────────┼───────────────────────────────────
         Total │         69      100.00
```

numlabel prefixes rather than postfixes the value labels with numeric codes. Because value labels can be fairly long (up to 80 characters), Stata usually displays only the first 12 characters.

uselabel

uselabel is of interest primarily to programmers. Here we briefly illustrate it with the auto dataset.

▷ Example 2

```
. use https://www.stata-press.com/data/r19/auto, clear
(1978 automobile data)
. uselabel
. describe

Contains data
 Observations:             2
    Variables:             4
───────────────────────────────────────────────────────────────────────────────
Variable      Storage   Display    Value
    name         type    format    label      Variable label
───────────────────────────────────────────────────────────────────────────────
lname           str6    %9s
value           byte    %10.0g
label           str8    %9s
trunc           byte    %8.0g
───────────────────────────────────────────────────────────────────────────────
Sorted by: lname  value
     Note: Dataset has changed since last saved.
. list

     ┌────────────────────────────────────┐
     │  lname   value      label   trunc  │
     ├────────────────────────────────────┤
  1. │ origin       0   Domestic       0  │
  2. │ origin       1    Foreign       0  │
     └────────────────────────────────────┘
```

uselabel created a dataset containing the labels and values for the value label origin.

The maximum length of the text associated with a value label is 32,000 characters, whereas the maximum length of a string variable in a Stata dataset is 2,045. uselabel uses only the first 2,045 characters of the label. The trunc variable will record a 1 if the text was truncated for this reason.

◁

Stored results

`labelbook` stores the following in `r()`:

Macros

`r(names)`	*lblname-list*
`r(gaps)`	gaps in mapped values
`r(blanks)`	leading or trailing blanks
`r(null)`	name of value label containing null strings
`r(nuniq)`	duplicate labels
`r(nuniq_sh)`	duplicate labels at length 12
`r(ntruniq)`	duplicate labels at maximum string length
`r(notused)`	not used by any of the variables
`r(numeric)`	name of value label containing mappings to numbers

`uselabel` stores the following in `r()`:

Macros

`r(`*lblname*`)`	list of variables that use value label *lblname* (only when `var` option is specified)

Acknowledgments

`labelbook` and `numlabel` were written by Jeroen Weesie of the Department of Sociology at Utrecht University, The Netherlands. A command similar to `numlabel` was written by J. M. Lauritsen (2001) of Odense Universiteshospital, Denmark.

References

Lauritsen, J. M. 2001. dm84: labjl: Adding numerical codes to value labels. *Stata Technical Bulletin* 59: 6–7. Reprinted in *Stata Technical Bulletin Reprints*, vol. 10, pp. 35–37. College Station, TX: Stata Press.

Weesie, J. 1997. dm47: Verifying value label mappings. *Stata Technical Bulletin* 37: 7–8. Reprinted in *Stata Technical Bulletin Reprints*, vol. 7, pp. 39–40. College Station, TX: Stata Press.

Also see

[D] **codebook** — Describe data contents

[D] **describe** — Describe data in memory or in a file

[D] **ds** — Compactly list variables with specified properties

[D] **encode** — Encode string into numeric and vice versa

[D] **label** — Manipulate labels

[U] 12.6 Dataset, variable, and value labels

[U] 15 Saving and printing output—log files

list — List values of variables

Description | Quick start | Menu | Syntax
Options | Remarks and examples | References | Also see

Description

`list` displays the values of variables. If no *varlist* is specified, the values of all the variables are displayed. Also see `browse` in [D] **edit**.

Quick start

List the data in memory

```
list
```

List only data in variables `v1`, `v2`, and `v3`

```
list v1 v2 v3
```

Same as above, but include only the first 10 observations and suppress numbering

```
list v1 v2 v3 in f/10, noobs
```

Same as above, but list the last 10 observations

```
list v1 v2 v3 in -10/l, noobs
```

Draw separator line every 10 observations, and repeat header row every 20 observations

```
list v1 v2 v3, separator(10) header(20)
```

Same as above, but also show a footer row of variable names

```
list v1 v2 v3, separator(10) header(20) footer
```

Same as above, but draw separator line between values of `v1` and do not show the header and footer

```
list v1 v2 v3, sepby(v1) noheader
```

Same as above, but draw separator line before and after observation 4, with a header

```
list v1 v2 v3, sepbyexp(_n==4)
```

Add the mean and sum of the observations at the end of the table, and suppress separator and divider lines

```
list v1 v2 v3, mean sum clean
```

Menu

Data > Describe data > List data

Syntax

`list` [*varlist*] [*if*] [*in*] [, *options*]

`flist` is equivalent to `list` with the `fast` option.

options	Description
Main	
`compress`	compress width of columns in both table and display formats
`nocompress`	use display format of each variable
`fast`	synonym for `nocompress`; no delay in output of large datasets
`abbreviate(#)`	abbreviate variable names to # display columns; default is `ab(8)`
`string(#)`	truncate string variables to # display columns
`noobs`	do not list observation numbers
`fvall`	display all levels of factor variables
Options	
`table`	force table format
`display`	force display format
`header`	display variable header once; default is table mode
`noheader`	suppress variable header
`header(#)`	display variable header every # lines
`footer`	display variable names as a footer
`clean`	force table format with no divider or separator lines
`divider`	draw divider lines between columns
`separator(#)`	draw a separator line every # lines; default is `separator(5)`
`sepby(`*varlist*$_2$`)`	draw a separator line whenever *varlist*$_2$ values change
`sepbyexp(`*exp*`)`	draw a separator line whenever value of *exp* changes
`ds`	use double-spaced lines
`nolabel`	display numeric codes rather than label values
Summary	
`mean`[`(`*varlist*$_2$`)`]	add line reporting the mean for the (specified) variables
`sum`[`(`*varlist*$_2$`)`]	add line reporting the sum for the (specified) variables
`N`[`(`*varlist*$_2$`)`]	add line reporting the number of nonmissing values for the (specified) variables
`labvar(`*varname*`)`	substitute `Mean`, `Sum`, or `N` for value of *varname* in added line reporting mean, sum, or N
Advanced	
`constant`[`(`*varlist*$_2$`)`]	separate and list variables that are constant only once
`notrim`	suppress string trimming
`absolute`	display overall observation numbers when using `by` *varlist*`:`
`relative`	display relative observation numbers for a subset of observations specified by qualifiers `if` and `in`
`nodotz`	display numerical values equal to `.z` as field of blanks
`subvarname`	substitute characteristic for variable name in header
`linesize(#)`	columns per line; default is `linesize(79)`

varlist may contain factor variables; see [U] **11.4.3 Factor variables**.

varlist may contain time-series operators; see [U] **11.4.4 Time-series varlists**.

by is allowed with list; see [D] **by**.

Options

Main

compress and nocompress change the width of the columns in both table and display formats. By default, list examines the data and allocates the needed width to each variable. For instance, a variable might be a string with a %18s format, and yet the longest string will be only 12 characters long. Or a numeric variable might have a %9.0g format, and yet, given the values actually present, the widest number needs only four columns.

nocompress prevents list from examining the data. Widths will be set according to the display format of each variable. Output generally looks better when nocompress is not specified, but for very large datasets (say, 1,000,000 observations or more), nocompress can speed up the execution of list.

compress allows list to engage in a little more compression than it otherwise would by telling list to abbreviate variable names to fewer than eight characters.

fast is a synonym for nocompress. fast may be of interest to those with very large datasets who wish to see output appear without delay.

abbreviate(#) is an alternative to compress that allows you to specify the minimum abbreviation of variable names to be considered. For example, you could specify abbreviate(16) if you never wanted variables abbreviated to less than 16 display columns. For most users, the number of display columns is equal to the number of characters. However, some languages, such as Chinese, Japanese, and Korean (CJK), require two display columns per character.

string(#) specifies that when string variables are listed, they be truncated to # display columns in the output. Any value that is truncated will be appended with ".." to indicate the truncation. string() is useful for displaying just a part of long strings.

noobs suppresses the listing of the observation numbers.

fvall specifies that the entire dataset be used to determine how many levels are in any factor variables specified in *varlist*. The default is to determine the number of levels by using only the observations in the if and in qualifiers.

Options

table and display determine the style of output. By default, list determines whether to use table or display on the basis of the width of your screen and the linesize() option, if you specify it.

table forces table format. Forcing table format when list would have chosen otherwise generally produces impossible-to-read output because of the linewraps. However, if you are logging output in SMCL format and plan to print the output on wide paper later, specifying table can be a reasonable thing to do.

display forces display format.

`header`, `noheader`, `header(#)`, and `footer` specify how the variable header or footer is to be displayed.

`header` is the default in table mode and displays the variable header once, at the top of the table.

`noheader` suppresses the header altogether.

`header(#)` redisplays the variable header every # observations. For example, `header(10)` would display a new header every 10 observations.

`footer` displays variable names as a footer. With `footer`, a variable header is also displayed; `footer` cannot be combined with `noheader`.

The default in display mode is to display the variable names interweaved with the data:

```
     +-------------------------------------------------------------------------+
  1. | make         | price | mpg | rep78 | headroom | trunk | weight | length |
     | AMC Concord  | 4,099 |  22 |     3 |      2.5 |    11 |  2,930 |    186 |
     |-------------------------------------------------------------------------|
     |    turn     |      displa~t      |      gear_r~o      |      foreign     |
     |      40     |           121      |          3.58      |     Domestic     |
     +-------------------------------------------------------------------------+
```

However, if you specify `header`, the header is displayed once, at the top of the table:

```
     +-------------------------------------------------------------------------+
     | make         | price | mpg | rep78 | headroom | trunk | weight | length |
     |-------------------------------------------------------------------------|
     |    turn     |      displa~t      |      gear_r~o      |      foreign     |
     +-------------------------------------------------------------------------+

     +-------------------------------------------------------------------------+
  1. | AMC Concord  | 4,099 |  22 |     3 |      2.5 |    11 |  2,930 |    186 |
     |-------------------------------------------------------------------------|
     |      40     |           121      |          3.58      |     Domestic     |
     +-------------------------------------------------------------------------+
```

`clean` is a better alternative to `table` when you want to force table format and your goal is to produce more readable output on the screen. `clean` implies `table`, and it removes dividing and separating lines, which is what makes wrapped table output nearly impossible to read. Blank separator lines may be included by specifying the `ds` option.

`divider`, `separator(#)`, `sepby(`*varlist*$_2$`)`, `sepbyexp(`*exp*`)`, and `ds` specify how dividers and separator lines should be displayed. These five options affect only table format.

`divider` specifies that divider lines be drawn between columns. The default is to not display a divider.

`separator(#)` and `sepby(`*varlist*$_2$`)` indicate when separator lines should be drawn between rows. To make these separator lines blank, specify the `ds` option.

`separator(#)` specifies how often separator lines should be drawn between rows. The default is `separator(5)`, meaning every 5 observations. You may specify `separator(0)` to suppress separators altogether.

`sepby(`*varlist*$_2$`)` specifies that a separator line be drawn whenever any of the variables in `sepby(`*varlist*$_2$`)` change their values; up to 10 variables may be specified. You need not make sure the data were sorted on `sepby(`*varlist*$_2$`)` before issuing the `list` command. The variables in `sepby(`*varlist*$_2$`)` also need not be among the variables being listed.

`sepbyexp(`*exp*`)` specifies that a separator line be drawn whenever the value of *exp* changes. *exp* can be any expression and does not necessarily have to refer to the variables being listed.

`ds` specifies that the lines be double spaced, meaning that a blank separator line be inserted after every observation. To control when blank separator lines are inserted, specify `ds` with `separator(#)`, `sepby(`*varlist*$_2$`)`, or `sepbyexp(`*exp*`)`.

By default, separator lines are suppressed when specifying the `clean` option unless `ds` is specified, in which case blank separator lines will be used.

`nolabel` specifies that numeric codes be displayed rather than the label values.

Summary

`mean`, `sum`, `N`, `mean(`*varlist*$_2$`)`, `sum(`*varlist*$_2$`)`, and `N(`*varlist*$_2$`)` all specify that lines be added to the output reporting the mean, sum, or number of nonmissing values for the (specified) variables. If you do not specify the variables, all numeric variables in the *varlist* following `list` are used.

`labvar(`*varname*`)` is for use with `mean[()]`, `sum[()]`, and `N[()]`. `list` displays `Mean`, `Sum`, or `N` where the observation number would usually appear to indicate the end of the table—where a row represents the calculated mean, sum, or number of observations.

`labvar(`*varname*`)` changes that. Instead, `Mean`, `Sum`, or `N` is displayed where the value for *varname* would be displayed. For instance, you might type

```
. list group costs profits, sum(costs profits) labvar(group)

     +--------------------------+
     | group   costs   profits  |
     |--------------------------|
  1. |     1      47         5  |
  2. |     2     123        10  |
  3. |     3      22         2  |
     |--------------------------|
     |   Sum     192        17  |
     +--------------------------+
```

and then also specify the `noobs` option to suppress the observation numbers.

Advanced

`constant` and `constant(`*varlist*$_2$`)` specify that variables that do not vary observation by observation be separated out and listed only once.

`constant` specifies that `list` determine for itself which variables are constant.

`constant(`*varlist*$_2$`)` allows you to specify which of the constant variables you want listed separately. `list` verifies that the variables you specify really are constant and issues an error message if they are not.

`constant` and `constant()` respect `if` *exp* and `in` *range*. If you type

```
. list if group==3
```

variable `x` might be constant in the selected observations, even though the variable varies in the entire dataset.

`notrim` affects how string variables are listed. The default is to trim strings at the width implied by the widest possible column given your screen width (or `linesize()`, if you specified that). `notrim` specifies that strings not be trimmed. `notrim` implies `clean` (see above) and, in fact, is equivalent to the `clean` option, so specifying either makes no difference.

`absolute` affects output only when `list` is prefixed with `by` *varlist*`:`. Observation numbers are displayed, but the overall observation numbers are used rather than the observation numbers within each by-group. For example, if the first group had 4 observations and the second had 2, by default the observations would be numbered 1, 2, 3, 4 and 1, 2. If `absolute` is specified, the observations will be numbered 1, 2, 3, 4 and 5, 6.

`relative` affects output only when a subset of observations is listed by using qualifiers `if` and `in`. Observation numbers are displayed, but the observations are numbered 1, 2, 3, etc. When `list` is prefixed with `by` *varlist*`:` and `relative` is specified, relative observation numbers will be used for each subgroup formed by *varlist*.

`nodotz` is a programmer's option that specifies that numerical values equal to `.z` be listed as a field of blanks rather than as `.z`.

`subvarname` is a programmer's option. If a variable has the characteristic *var*[`varname`] set, then the contents of that characteristic will be used in place of the variable's name in the headers.

`linesize(#)` specifies the width of the page to be used for determining whether table or display format should be used and for formatting the resulting table. Specifying a value of `linesize()` that is wider than your screen width can produce truly ugly output on the screen, but that output can nevertheless be useful if you are logging output and plan to print the log later on a wide printer.

Remarks and examples

`list`, typed by itself, lists all the observations and variables in the dataset. If you specify *varlist*, only those variables are listed. Specifying one or both of `in` *range* and `if` *exp* limits the observations listed.

`list` respects line size. That is, if you resize the Results window (in windowed versions of Stata) before running `list`, it will take advantage of the available horizontal space. Stata for Unix(console) users can instead use the `set linesize` command to take advantage of this feature; see [R] **log**.

`list` may not display all the large strings. You have two choices: 1) you can specify the `clean` option, which makes a different, less attractive listing, or 2) you can increase line size, as discussed above.

▷ Example 1

`list` has two output formats, known as table and display. The table format is suitable for listing a few variables, whereas the display format is suitable for listing an unlimited number of variables. Stata chooses automatically between those two formats:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)
. list in 1/2

     +------------------------------------------------------------------------+
  1. | make        | price | mpg | rep78 | headroom | trunk | weight | length |
     | AMC Concord | 4,099 |  22 |     3 |      2.5 |    11 |  2,930 |    186 |
     |------------------------------------------------------------------------|
     |    turn     |     displa~t     |     gear_r~o     |       foreign       |
     |     40      |          121     |         3.58     |      Domestic       |
     +------------------------------------------------------------------------+

     +------------------------------------------------------------------------+
  2. | make        | price | mpg | rep78 | headroom | trunk | weight | length |
     | AMC Pacer   | 4,749 |  17 |     3 |      3.0 |    11 |  3,350 |    173 |
     |------------------------------------------------------------------------|
     |    turn     |     displa~t     |     gear_r~o     |       foreign       |
     |     40      |          258     |         2.53     |      Domestic       |
     +------------------------------------------------------------------------+

. list make mpg weight displ rep78 in 1/5

     +------------------------------------------------+
     | make            mpg   weight   displa~t   rep78 |
     |------------------------------------------------|
  1. | AMC Concord      22    2,930        121       3 |
  2. | AMC Pacer        17    3,350        258       3 |
  3. | AMC Spirit       22    2,640        121       . |
  4. | Buick Century    20    3,250        196       3 |
  5. | Buick Electra    15    4,080        350       4 |
     +------------------------------------------------+
```

The first case is an example of display format; the second is an example of table format. The table format is more readable and takes less space, but it is effective only if the variables can fit on one line across the screen. Stata chose to list all 12 variables in display format, but when the *varlist* was restricted to five variables, Stata chose table format.

If you are dissatisfied with Stata's choice, you can decide for yourself. You can specify the `display` option to force display format and the `nodisplay` option to force table format.

◁

❑ Technical note

If you have long string variables in your data—say, `str75` or longer—by default, `list` displays only the first 70 or so characters of each; the exact number is determined by the width of your Results window. The first 70 or so characters will be shown followed by "...". If you need to see the entire contents of the string, you can

1. specify the `clean` option, which makes a different (and uglier) style of list, or
2. make your Results window wider [Stata for Unix(console) users: increase `set linesize`].

❑

❑ Technical note

Among the things that determine the widths of the columns, the variable names play a role. Left to itself, `list` will never abbreviate variable names to fewer than eight characters. You can use the `compress` option to abbreviate variable names to fewer characters than that.

❑

❑ Technical note

When Stata lists a string variable in table output format, the variable is displayed right-justified by default.

When Stata lists a string variable in display output format, it decides whether to display the variable right-justified or left-justified according to the display format for the string variable; see **[U] 12.5 Formats: Controlling how data are displayed**. In our previous example, `make` has a display format of `%-18s`.

```
. describe make

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------

make            str18   %-18s                 Make and model
```

The negative sign in the `%-18s` instructs Stata to left-justify this variable. If the display format had been `%18s`, Stata would have right-justified the variable.

The `foreign` variable appears to be string, but if we `describe` it, we see that it is not:

```
. describe foreign

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------

foreign         byte    %8.0g      origin     Car origin
```

`foreign` is stored as a `byte`, but it has an associated value label named `origin`; see **[U] 12.6.3 Value labels**. Stata decides whether to right-justify or left-justify a numeric variable with an associated value label by using the same rule used for string variables: it looks at the display format of the variable. Here the display format of `%8.0g` tells Stata to right-justify the variable. If the display format had been `%-8.0g`, Stata would have left-justified this variable.

❑

❑ Technical note

You can `list` the variables in any order. When you specify the *varlist*, `list` displays the variables in the order you specify. You may also include variables more than once in the *varlist*.

❑

▷ Example 2

Sometimes you may wish to suppress the observation numbers. You do this by specifying the `noobs` option:

```
. list make mpg weight displ foreign in 46/55, noobs
```

make	mpg	weight	displa~t	foreign
Plym. Volare	18	3,330	225	Domestic
Pont. Catalina	18	3,700	231	Domestic
Pont. Firebird	18	3,470	231	Domestic
Pont. Grand Prix	19	3,210	231	Domestic
Pont. Le Mans	19	3,200	231	Domestic
Pont. Phoenix	19	3,420	231	Domestic
Pont. Sunbird	24	2,690	151	Domestic
Audi 5000	17	2,830	131	Foreign
Audi Fox	23	2,070	97	Foreign
BMW 320i	25	2,650	121	Foreign

After seeing the table, we decide that we want to separate the "Domestic" observations from the "Foreign" observations, so we specify `sepby(foreign)`.

```
. list make mpg weight displ foreign in 46/55, noobs sepby(foreign)
```

make	mpg	weight	displa~t	foreign
Plym. Volare	18	3,330	225	Domestic
Pont. Catalina	18	3,700	231	Domestic
Pont. Firebird	18	3,470	231	Domestic
Pont. Grand Prix	19	3,210	231	Domestic
Pont. Le Mans	19	3,200	231	Domestic
Pont. Phoenix	19	3,420	231	Domestic
Pont. Sunbird	24	2,690	151	Domestic
Audi 5000	17	2,830	131	Foreign
Audi Fox	23	2,070	97	Foreign
BMW 320i	25	2,650	121	Foreign

◁

▷ Example 3

We want to add vertical lines in the table to separate the variables, so we specify the `divider` option. We also want to draw a horizontal line after every 2 observations, so we specify `separator(2)`.

```
. list make mpg weight displ foreign in 46/55, divider separator(2)
```

	make	mpg	weight	displa~t	foreign
46.	Plym. Volare	18	3,330	225	Domestic
47.	Pont. Catalina	18	3,700	231	Domestic
48.	Pont. Firebird	18	3,470	231	Domestic
49.	Pont. Grand Prix	19	3,210	231	Domestic
50.	Pont. Le Mans	19	3,200	231	Domestic
51.	Pont. Phoenix	19	3,420	231	Domestic
52.	Pont. Sunbird	24	2,690	151	Domestic
53.	Audi 5000	17	2,830	131	Foreign
54.	Audi Fox	23	2,070	97	Foreign
55.	BMW 320i	25	2,650	121	Foreign

After seeing the table, we decide that we do not want to abbreviate `displacement`, so we specify `abbreviate(12)`.

```
. list make mpg weight displ foreign in 46/55, divider sep(2) abbreviate(12)
```

	make	mpg	weight	displacement	foreign
46.	Plym. Volare	18	3,330	225	Domestic
47.	Pont. Catalina	18	3,700	231	Domestic
48.	Pont. Firebird	18	3,470	231	Domestic
49.	Pont. Grand Prix	19	3,210	231	Domestic
50.	Pont. Le Mans	19	3,200	231	Domestic
51.	Pont. Phoenix	19	3,420	231	Domestic
52.	Pont. Sunbird	24	2,690	151	Domestic
53.	Audi 5000	17	2,830	131	Foreign
54.	Audi Fox	23	2,070	97	Foreign
55.	BMW 320i	25	2,650	121	Foreign

◁

❑ Technical note

You can suppress the use of value labels by specifying the `nolabel` option. For instance, the `foreign` variable in the examples above really contains numeric codes, with 0 meaning `Domestic` and 1 meaning `Foreign`. When we `list` the variable, however, we see the corresponding value labels rather than the underlying numeric code:

```
. list foreign in 51/55

     +----------+
     |  foreign |
     |----------|
 51. | Domestic |
 52. | Domestic |
 53. |  Foreign |
 54. |  Foreign |
 55. |  Foreign |
     +----------+
```

Specifying the `nolabel` option displays the underlying numeric codes:

```
. list foreign in 51/55, nolabel

     +---------+
     | foreign |
     |---------|
 51. |       0 |
 52. |       0 |
 53. |       1 |
 54. |       1 |
 55. |       1 |
     +---------+
```

❑

▷ Example 4

With the `separator(#)` option, a separator line is drawn every # observations. With the `sepby(`*varlist*`)` option, a separator line is drawn every time *varlist* values change. The `sepbyexp(`*exp*`)` option allows more flexible conditions for drawing a separator line: a line is drawn every time expression *exp* changes. For example, you may want a separator line whenever a string variable starts with a different letter of the alphabet:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. sort make

. list make weight in 1/15, sepbyexp(substr(make,1,1))

     +------------------------+
     | make            weight |
     |------------------------|
  1. | AMC Concord      2,930 |
  2. | AMC Pacer        3,350 |
  3. | AMC Spirit       2,640 |
  4. | Audi 5000        2,830 |
  5. | Audi Fox         2,070 |
     |------------------------|
  6. | BMW 320i         2,650 |
  7. | Buick Century    3,250 |
  8. | Buick Electra    4,080 |
  9. | Buick LeSabre    3,670 |
 10. | Buick Opel       2,230 |
 11. | Buick Regal      3,280 |
 12. | Buick Riviera    3,880 |
 13. | Buick Skylark    3,400 |
     |------------------------|
 14. | Cad. Deville     4,330 |
 15. | Cad. Eldorado    3,900 |
     +------------------------+
```

You can separate observations based on the value of a numerical variable, for example, weight in the thousands, two thousands, etc.:

```
. sort weight

. list make weight in 1/10, sepbyexp(floor(weight/1000))

     +-------------------------+
     | make             weight |
     |-------------------------|
  1. | Honda Civic       1,760 |
  2. | Plym. Champ       1,800 |
  3. | Ford Fiesta       1,800 |
  4. | Renault Le Car    1,830 |
  5. | VW Rabbit         1,930 |
  6. | Mazda GLC         1,980 |
  7. | VW Scirocco       1,990 |
     |-------------------------|
  8. | Datsun 210        2,020 |
  9. | VW Diesel         2,040 |
 10. | Subaru            2,050 |
     +-------------------------+
```

Observations can be delineated based on more elaborate expressions. For example, in daily time-series data, weekdays can be separated from weekend days as follows. (Function `dow()` returns the day of the week, where 0 = Sunday, 1 = Monday, ..., 6 = Saturday.)

```
. use https://www.stata-press.com/data/r19/tsline2
(Simulated data of calories consumed for 365 days)

. sort day

. generate dow = dow(day)

. list day dow in 1/14, sepbyexp(dow==0 | dow==6)

     +----------------+
     |       day  dow |
     |----------------|
  1. | 01jan2002    2 |
  2. | 02jan2002    3 |
  3. | 03jan2002    4 |
  4. | 04jan2002    5 |
     |----------------|
  5. | 05jan2002    6 |
  6. | 06jan2002    0 |
     |----------------|
  7. | 07jan2002    1 |
  8. | 08jan2002    2 |
  9. | 09jan2002    3 |
 10. | 10jan2002    4 |
 11. | 11jan2002    5 |
     |----------------|
 12. | 12jan2002    6 |
 13. | 13jan2002    0 |
     |----------------|
 14. | 14jan2002    1 |
     +----------------+
```

◁

References

Cox, N. J. 2017. Speaking Stata: Tables as lists: The groups command. *Stata Journal* 17: 760–773.

Harrison, D. A. 2006. Stata tip 34: Tabulation by listing. *Stata Journal* 6: 425–427.

Also see

[D] **edit** — Browse or edit data with Data Editor

[P] **display** — Display strings and values of scalar expressions

[P] **tabdisp** — Display tables

[R] **table** — Table of frequencies, summaries, and command results

Description

`lookfor` helps you find variables by searching for *string* among all variable names and labels. If multiple *string*s are specified, `lookfor` will search for each of them separately. You may search for a phrase by enclosing *string* in double quotes.

Quick start

Search variable names and variable labels for the phrase "my text" regardless of case

```
lookfor "my text"
```

Search for "word1" or "word2"

```
lookfor word1 word2
```

Syntax

`lookfor` *string* [*string* [...]]

`collect` is allowed; see [U] **11.1.10 Prefix commands**.

Remarks and examples

▷ Example 1

`lookfor` finds variables by searching for *string*, ignoring case, among the variable names and labels.

```
. use https://www.stata-press.com/data/r19/nlswork
(National Longitudinal Survey of Young Women, 14-24 years old in 1968)
. lookfor code

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
idcode          int     %8.0g                 NLS ID
ind_code        byte    %8.0g                 Industry of employment
occ_code        byte    %8.0g                 Occupation
```

Three variable names contain the word `code`.

```
. lookfor married

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
msp             byte    %8.0g                 1 if married, spouse present
nev_mar         byte    %8.0g                 1 if never married
```

Two variable labels contain the word `married`.

```
. lookfor gnp

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
ln_wage         float   %9.0g                 ln(wage/GNP deflator)
```

lookfor ignores case, so lookfor gnp found GNP in a variable label.

◁

▷ Example 2

If multiple strings are specified, all variable names or labels containing any of the strings are listed.

```
. lookfor code married

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
idcode          int     %8.0g                 NLS ID
msp             byte    %8.0g                 1 if married, spouse present
nev_mar         byte    %8.0g                 1 if never married
ind_code        byte    %8.0g                 Industry of employment
occ_code        byte    %8.0g                 Occupation
```

◁

To search for a phrase, enclose *string* in double quotes.

```
. lookfor "never married"

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
nev_mar         byte    %8.0g                 1 if never married
```

Stored results

lookfor stores the following in r():

Macros
    r(varlist)   the varlist of found variables

Reference

Cox, N. J. 2010. Speaking Stata: Finding variables. *Stata Journal* 10: 281–296.

Also see

[D] **describe** — Describe data in memory or in a file

[D] **ds** — Compactly list variables with specified properties

memory — Memory management

Description | Quick start | Syntax | Options
Remarks and examples | Stored results | Also see

Description

Memory usage and settings are described here.

`memory` displays a report on Stata's current memory usage.

`query memory` displays the current values of Stata's memory settings.

`set maxvar`, `set niceness`, `set min_memory`, `set max_memory`, and `set segmentsize` change the values of the memory settings.

If you are a Unix user, see *Serious bug in Linux OS* under *Remarks and examples* below.

Quick start

Display memory usage report

```
memory
```

Display memory settings

```
query memory
```

Increase the maximum number of variables to 8,000 in Stata/MP or Stata/SE

```
set maxvar 8000
```

Set maximum memory allocation to avoid potential memory allocation bug in Linux

```
set max_memory 16g, permanently
```

Syntax

Display memory usage report

`memory`

Display memory settings

`query memory`

Modify memory settings

`set maxvar #  [, permanently]`

`set niceness #  [, permanently]`

`set min_memory amt [, permanently]`

`set max_memory amt [, permanently]`

`set segmentsize amt [, permanently]`

where *amt* is #[b|k|m|g], and the default unit is b.

Parameter	Default	Minimum	Maximum	
maxvar	5000	2048	120000	(MP)
	5000	2048	32767	(SE)
	2048	2048	2048	(BE)
niceness	5	0	10	
min_memory	0	0	max_memory	
max_memory	.	2×segmentsize	.	
segmentsize	32m	1m	32g	(64-bit)

Notes:

1. The maximum number of variables in your dataset is limited to maxvar. The default value of maxvar is 5,000 for Stata/MP and Stata/SE, and 2,048 for Stata/BE. With Stata/MP and Stata/SE, this default value may be increased by using set maxvar. The default value is fixed for Stata/BE.
2. Most users do not need to read beyond this point. Stata's memory management is completely automatic. If, however, you are using the Linux operating system, see *Serious bug in Linux OS* under *Remarks and examples* below.
3. The maximum number of observations is fixed at 1,099,511,627,775 for Stata/MP and is fixed at 2,147,483,619 for Stata/SE and Stata/BE regardless of computer size or memory settings. Depending on the amount of memory on your computer, you may face a lower practical limit. See help obs_advice.

4. `max_memory` specifies the maximum amount of memory Stata can use to store your data. The default of missing (`.`) means all the memory the operating system is willing to supply. There are three reasons to change the value from missing to a finite number.
    1. You are a Linux user; see *Serious bug in Linux OS* under *Remarks and examples* below.
    2. You wish to reduce the chances of accidents, such as typing `expand 100000` with a large dataset in memory and actually having Stata do it. You would rather see an insufficient-memory error message. Set `max_memory` to the amount of physical memory on your computer or more than that if you are willing to use virtual memory.
    3. You are a system administrator; see *Notes for system administrators* under *Remarks and examples* below.
5. The remaining memory parameters—`niceness`, `min_memory`, and `segment_size`—affect efficiency only; they do not affect the size of datasets you can analyze.
6. Memory amounts for `min_memory`, `max_memory`, and `segmentsize` may be specified in bytes, kilobytes, megabytes, or gigabytes; suffix `b`, `k`, `m`, or `g` to the end of the number. The following are equivalent ways of specifying 1 gigabyte:

```
1073741824
  1048576k
     1024m
        1g
```

   Suffix `k` is defined as (multiply by) 1024, `m` is defined as 1024^2, and `g` is defined as 1024^3.
7. 64-bit computers can theoretically provide up to 18,446,744,073,709,551,616 bytes of memory, equivalent to 17,179,869,184 gigabytes, 16,777,216 terabytes, 16,384 petabytes, or 16 exabytes. Real computers have less.
8. Stata allocates memory for data in units of `segmentsize`. Smaller values of `segmentsize` can result in more efficient use of available memory but require Stata to jump around more. The default provides a good balance. We recommend resetting `segmentsize` only if your computer has large amounts of memory.
9. If you have large amounts of memory and you use it to process large datasets, you may wish to increase `segmentsize`. Suggested values are

memory	`segmentsize`
32g	64m
64g	128m
128g	256m
256g	512m
512g	1g
1024g	2g

10. `niceness` affects how soon Stata gives back unused segments to the operating system. If Stata releases them too soon, it often needs to turn around and get them right back. If Stata waits too long, Stata is consuming memory that it is not using. One reason to give memory back is to be nice to other users on multiuser systems or to be nice to yourself if you are running other processes.

The default value of 5 is defined to provide good performance. Waiting times are currently defined as

niceness	waiting time (m:s)
10	0:00.000
9	0:00.125
8	0:00.500
7	0:01
6	0:30
5	1:00
4	5:00
3	10:00
2	15:00
1	20:00
0	30:00

Niceness 10 corresponds to being totally nice. Niceness 0 corresponds to being an inconsiderate, self-centered, totally selfish jerk.

11. `min_memory` specifies an amount of memory Stata will not fall below. For instance, you have a long do-file. You know that late in the do-file, you will need 8 gigabytes. You want to ensure that the memory will be available later. At the start of your do-file, you `set min_memory 8g`.
12. Concerning `min_memory` and `max_memory`, be aware that Stata allocates memory in `segmentsize` blocks. Both `min_memory` and `max_memory` are rounded down. Thus the actual minimum memory Stata will reserve will be

    ```
    segmentsize*trunc(min_memory/segmentsize)
    ```

    The effective maximum memory is calculated similarly. (Stata does not round up `min_memory` because some users set `min_memory` equal to `max_memory`.)

Options

`permanently` specifies that, in addition to making the change right now, the new limit be remembered and become the default setting when you invoke Stata.

`once` is not shown in the syntax diagram but is allowed with `set niceness`, `set min_memory`, `set max_memory`, and `set segmentsize`. It is for use by system administrators; see *Notes for system administrators* under *Remarks and examples* below.

Remarks and examples

Remarks are presented under the following headings:

Examples

Here is our memory-usage report after we load `auto.dta` that comes with Stata using Stata/MP:

```
. sysuse auto
(1978 automobile data)

. memory

Memory usage
                                         Used                Allocated
----------------------------------------------------------------------
Data                                    3,182              100,663,296
strLs                                       0                        0
----------------------------------------------------------------------
Data & strLs                            3,182              100,663,296
----------------------------------------------------------------------
Data & strLs                            3,182              100,663,296
Variable names, %fmts, ...              4,178                  396,279
Overhead                            1,081,344                1,082,136

Stata matrices                              0                        0
ado-files                              53,718                   53,718
Stored results                              0                        0

Mata matrices                          10,880                   10,880
Mata functions                          2,720                    2,720

set maxvar usage                    4,636,521                4,636,521

Other                                   3,497                    3,497
----------------------------------------------------------------------
Total                               5,773,999              106,849,047
```

We could then obtain the current memory-settings report by typing

```
. query memory
-------------------------------------------------------------------------------
    Memory settings
      set maxvar          5000        2048-120000; max. vars allowed
      set niceness        5           0-10
      set min_memory      0           0-1600g
      set max_memory      .           32m-1600g or .
      set segmentsize     32m         1m-32g
      set adosize         1000        kilobytes
      set max_preservemem 1g          0-1600g
```

Serious bug in Linux OS

If you use Linux OS, we strongly suggest that you set `max_memory`. Here's why:

> "By default, Linux follows an optimistic memory allocation strategy. This means that when malloc() returns non-NULL there is no guarantee that the memory really is available. This is a really bad bug. In case it turns out that the system is out of memory, one or more processes will be killed by the infamous OOM killer. In case Linux is employed under circumstances where it would be less desirable to suddenly lose some randomly picked processes, and moreover the kernel version is sufficiently recent, one can switch off this overcommitting behavior using [...]"
>
> – Output from Unix command `man malloc`.

What this means is that Stata requests memory from Linux, Linux says yes, and then later when Stata uses that memory, the memory might not be available and Linux crashes Stata, or worse. The Linux documentation writer exercised admirable restraint. This bug can cause Linux itself to crash. It is easy.

The proponents of this behavior call it "optimistic memory allocation". We will, like the documentation writer, refer to it as a bug.

The bug is fixable. Type `man malloc` at the Unix prompt for instructions. Note that `man malloc` is an instruction of Unix, not Stata. If the bug is not mentioned, perhaps it has been fixed. Before assuming that, we suggest using a search engine to search for "linux optimistic memory allocation".

Alternatively, Stata can live with the bug if you set `max_memory`. Find out how much physical memory is on your computer and `set max_memory` to that. If you want to use virtual memory, you might set it larger, just make sure your Linux system can provide the requested memory. Specify the option `permanently` so you only need to do this once. For example,

```
. set max_memory 16g, permanently
```

Doing this does not guarantee that the bug does not bite, but it makes it unlikely.

Notes for system administrators

System administrators can set `max_memory`, `min_memory`, and `niceness` so that Stata users cannot change them. They can also do this with `max_preservemem` (see [P] **preserve**). You may want to do this on shared computers to prevent individual users from hogging resources.

There is no reason you would want to do this on users' personal computers.

You can also set `segmentsize`, but there is no reason to do this even on shared systems.

The instructions are to create (or edit) the text file `sysprofile.do` in the directory where the Stata executable resides. Add the lines

```
set min_memory 0, once
set max_memory 16g, once
set niceness 5, once
```

The file must be plain text, and there must be end-of-line characters at the end of each line, including the last line. Blank lines at the end are recommended.

The `16g` on `set max_memory` is merely for example. Choose an appropriate number.

The values of 0 for `min_memory` and 5 for `niceness` are recommended.

Stored results

`memory` stores all reported numbers in `r()`. StataCorp may change what `memory` reports, and you should not expect the same `r()` results to exist in future versions of Stata. To see the stored results from `memory`, type `return list, all`.

Also see

[P] **creturn** — Return c-class values

[R] **query** — Display system parameters

[U] 6 Managing memory

Description

merge joins corresponding observations from the dataset currently in memory (called the master dataset) with those from *filename*.dta (called the using dataset), matching on one or more key variables. merge can perform match merges (one-to-one, one-to-many, many-to-one, and many-to-many), which are often called *joins* by database people. merge can also perform sequential merges, which have no equivalent in the relational database world.

merge is for adding new variables from a second dataset to existing observations. You use merge, for instance, when combining hospital patient and discharge datasets. If you wish to add new observations to existing variables, then see [D] **append**. You use append, for instance, when adding current discharges to past discharges.

To link datasets in separate frames, you can use the frlink and fralias add commands. Linking and merging solve similar problems, and each is better than the other in some ways. You may prefer linking, for instance, when dealing with an individual-level dataset and a county-level dataset. Linking also works well when you have nested linkages such as linking a county dataset, a school-within-county dataset, and a student-within-school dataset or when you need to link a dataset to itself. See [D] **frlink** and [D] **fralias** for more information and examples.

By default, merge creates a new variable, _merge, containing numeric codes concerning the source and the contents of each observation in the merged dataset. These codes are explained below in the match results table.

Key variables cannot be strLs.

If *filename* is specified without an extension, then .dta is assumed.

Quick start

One-to-one merge of mydata1.dta in memory with mydata2.dta on v1

```
merge 1:1 v1 using mydata2
```

Same as above, and also treat v2 as a key variable and name the new variable indicating the merge result for each observation newv

```
merge 1:1 v1 v2 using mydata2, generate(newv)
```

Same as above, but keep only v3 from mydata2.dta and use default merge result variable _merge

```
merge 1:1 v1 v2 using mydata2, keepusing(v3)
```

Same as above, but keep only observations in both datasets

```
merge 1:1 v1 v2 using mydata2, keepusing(v3) keep(match)
```

Same as above

```
merge 1:1 v1 v2 using mydata2, keepusing(v3) keep(3)
```

Same as above, but assert that all observations should match or return an error otherwise

```
merge 1:1 v1 v2 using mydata2, keepusing(v3) assert(3)
```

Replace missing data in `mydata1.dta` with values from `mydata2.dta`

```
merge 1:1 v1 v2 using mydata2, update
```

Replace missing and conflicting data in `mydata1.dta` with values from `mydata2.dta`

```
merge 1:1 v1 v2 using mydata2, update replace
```

Many-to-one merge on `v1` and `v2`

```
merge m:1 v1 v2 using mydata2
```

One-to-many merge on `v1` and `v2`

```
merge 1:m v1 v2 using mydata2
```

Menu

Data > Combine datasets > Merge two datasets

Syntax

One-to-one merge on specified key variables

`merge 1:1` *varlist* `using` *filename* [, *options*]

Many-to-one merge on specified key variables

`merge m:1` *varlist* `using` *filename* [, *options*]

One-to-many merge on specified key variables

`merge 1:m` *varlist* `using` *filename* [, *options*]

Many-to-many merge on specified key variables

`merge m:m` *varlist* `using` *filename* [, *options*]

One-to-one merge by observation

`merge 1:1 _n using` *filename* [, *options*]

options	Description
Options	
`keepusing(`*varlist*`)`	variables to keep from using data; default is all
`generate(`*newvar*`)`	name of new variable to mark merge results; default is `_merge`
`nogenerate`	do not create `_merge` variable
`nolabel`	do not copy value-label definitions from using
`nonotes`	do not copy notes from using
`update`	update missing values of same-named variables in master with values from using
`replace`	replace all values of same-named variables in master with nonmissing values from using (requires `update`)
`noreport`	do not display match result summary table
`force`	allow string/numeric variable type mismatch without error
Results	
`assert(`*results*`)`	specify required match results
`keep(`*results*`)`	specify which match results to keep
`sorted`	do not sort; dataset already sorted

`sorted` does not appear in the dialog box.

Options

Options

`keepusing(`*varlist*`)` specifies the variables from the using dataset that are kept in the merged dataset. By default, all variables are kept. For example, if your using dataset contains 2,000 demographic characteristics but you want only `sex` and `age`, then type `merge` ..., `keepusing(sex age)` ....

generate(*newvar*) specifies that the variable containing match results information should be named *newvar* rather than _merge.

nogenerate specifies that _merge not be created. This would be useful if you also specified keep(match), because keep(match) ensures that all values of _merge would be 3.

nolabel specifies that value-label definitions from the using file be ignored. This option should be rare, because definitions from the master are already used.

nonotes specifies that notes in the using dataset not be added to the merged dataset; see [D] **notes**.

update and replace both perform an update merge rather than a standard merge. In a standard merge, the data in the master are the authority and inviolable. For example, if the master and using datasets both contain a variable age, then matched observations will contain values from the master dataset, while unmatched observations will contain values from their respective datasets.

If update is specified, then matched observations will update missing values from the master dataset with values from the using dataset. Nonmissing values in the master dataset will be unchanged.

If replace is specified, then matched observations will contain values from the using dataset, unless the value in the using dataset is missing.

Specifying either update or replace affects the meanings of the match codes. See *Treatment of overlapping variables* for details.

noreport specifies that merge not present its summary table of match results.

force allows string/numeric variable type mismatches, resulting in missing values from the using dataset. If omitted, merge issues an error; if specified, merge issues a warning.

Results

assert(*results*) specifies the required match results. The possible *results* are

Numeric code	Equivalent word (*results*)	Description
1	master	observation appeared in master only
2	using	observation appeared in using only
3	match	observation appeared in both
4	match_update	observation appeared in both, missing values updated
5	match_conflict	observation appeared in both, conflicting nonmissing values

Codes 4 and 5 can arise only if the update option is specified. If codes of both 4 and 5 could pertain to an observation, then 5 is used.

Numeric codes and words are equivalent when used in the assert() or keep() options.

The following synonyms are allowed: masters for master, usings for using, matches and matched for match, match_updates for match_update, and match_conflicts for match_conflict.

Using assert(match master) specifies that the merged file is required to include only matched master or using observations and unmatched master observations, and may not include unmatched using observations. Specifying assert() results in merge issuing an error message if there are match results you did not explicitly allow.

The order of the words or codes is not important, so all the following `assert()` specifications would be the same:

`assert(match master)`

`assert(master matches)`

`assert(1 3)`

When the match results contain codes other than those allowed, return code 9 is returned, and the merged dataset with the unanticipated results is left in memory to allow you to investigate.

`keep(`*results*`)` specifies which observations are to be kept from the merged dataset. Using `keep(match master)` specifies keeping only matched observations and unmatched master observations after merging.

`keep()` differs from `assert()` because it selects observations from the merged dataset rather than enforcing requirements. `keep()` is used to pare the merged dataset to a given set of observations when you do not care if there are other observations in the merged dataset. `assert()` is used to verify that only a given set of observations is in the merged dataset.

You can specify both `assert()` and `keep()`. If you require matched observations and unmatched master observations but you want only the matched observations, then you could specify `assert(match master) keep(match)`.

`assert()` and `keep()` are convenience options whose functionality can be duplicated using `_merge` directly.

```
. merge ..., assert(match master) keep(match)
```

is identical to

```
. merge ...
. assert _merge==1 | _merge==3
. keep if _merge==3
```

The following option is available with `merge` but is not shown in the dialog box:

`sorted` specifies that the master and using datasets are already sorted by *varlist*. If the datasets are already sorted, then `merge` runs a little more quickly; the difference is hardly detectable, so this option is of interest only where speed is of the utmost importance.

Remarks and examples

Remarks are presented under the following headings:

Overview

merge 1:1 *varlist* ... specifies a one-to-one match merge. *varlist* specifies variables common to both datasets that together uniquely identify single observations in both datasets. For instance, suppose you have a dataset of customer information, called customer.dta, and have a second dataset of other information about roughly the same customers, called other.dta. Suppose further that both datasets identify individuals by using the pid variable, and there is only one observation per individual in each dataset. You would merge the two datasets by typing

```
. use customer
. merge 1:1 pid using other
```

Reversing the roles of the two files would be fine. Choosing which dataset is the master and which is the using matters only if there are overlapping variable names. 1:1 merges are less common than 1:m and m:1 merges.

merge 1:m and merge m:1 specify one-to-many and many-to-one match merges, respectively. To illustrate the two choices, suppose you have a dataset containing information about individual hospitals, called hospitals.dta. In this dataset, each observation contains information about one hospital, which is uniquely identified by the hospitalid variable. You have a second dataset called discharges.dta, which contains information on individual hospital stays by many different patients. discharges.dta also identifies hospitals by using the hospitalid variable. You would like to join all the information in both datasets. There are two ways you could do this.

merge 1:m *varlist* ... specifies a one-to-many match merge.

```
. use hospitals
. merge 1:m hospitalid using discharges
```

would join the discharge data to the hospital data. This is a 1:m merge because hospitalid uniquely identifies individual observations in the dataset in memory (hospitals), but could correspond to many observations in the using dataset.

merge m:1 *varlist* ... specifies a many-to-one match merge.

```
. use discharges
. merge m:1 hospitalid using hospitals
```

would join the hospital data to the discharge data. This is an m:1 merge because hospitalid can correspond to many observations in the master dataset, but uniquely identifies individual observations in the using dataset.

merge m:m *varlist* ... specifies a many-to-many match merge. This is allowed for completeness, but it is difficult to imagine an example of when it would be useful. For an m:m merge, *varlist* does not uniquely identify the observations in either dataset. Matching is performed by combining observations with equal values of *varlist*; within matching values, the first observation in the master dataset is matched with the first matching observation in the using dataset; the second, with the second; and so on. If there is an unequal number of observations within a group, then the last observation of the shorter group is used repeatedly to match with subsequent observations of the longer group. Use of merge m:m is not encouraged.

merge 1:1 _n performs a sequential merge. _n is not a variable name; it is Stata syntax for observation number. A sequential merge performs a one-to-one merge on observation number. The first observation of the master dataset is matched with the first observation of the using dataset; the second, with the second; and so on. If there is an unequal number of observations, the remaining observations are unmatched. Sequential merges are dangerous, because they require you to rely on sort order to know that observations belong together. Use this merge at your own risk.

Basic description

Think of merge as being *master* + *using* = *merged result*.

Call the dataset in memory the *master* dataset, and the dataset on disk the *using* dataset. This way we have general names that are not dependent on individual datasets.

Suppose we have two datasets,

master in memory

id	age
1	22
2	56
5	17

on disk in file *filename*

id	wgt
1	130
2	180
4	110

We would like to join together the age and weight information. We notice that the `id` variable identifies unique observations in both datasets: if you tell me the `id` number, then I can tell you the one observation that contains information about that `id`. This is true for both the master and the using datasets.

Because `id` uniquely identifies observations in both datasets, this is a `1:1` merge. We can bring in the dataset from disk by typing

`. merge 1:1 id using` *filename*

in memory *master* + in *filename*`.dta` *using* = *merged result*

id	age
1	22
2	56
5	17

id	wgt
1	130
2	180
4	110

id	age	wgt	
1	22	130	(matched)
2	56	180	(matched)
5	17	.	(master only)
4	.	110	(using only)

The original data in memory are called the master data. The data in *filename*`.dta` are called the using data. After `merge`, the merged result is left in memory. The `id` variable is called the key variable. Stata jargon is that the datasets were merged on `id`.

Observations for `id==1` existed in both the master and using datasets and so were combined in the merged result. The same occurred for `id==2`. For `id==5` and `id==4`, however, no matches were found and thus each became a separate observation in the merged result. Thus each observation in the merged result came from one of three possible sources:

Numeric code	Equivalent word	Description
1	`master`	originally appeared in master only
2	`using`	originally appeared in using only
3	`match`	originally appeared in both

`merge` encodes this information into new variable `_merge`, which `merge` adds to the merged result:

in memory *master* + in *filename*`.dta` *using* = *merged result*

id	age
1	22
2	56
5	17

id	wgt
1	130
2	180
4	110

id	age	wgt	_merge
1	22	130	3
2	56	180	3
5	17	.	1
4	.	110	2

Note: Above we show the master and using data sorted by `id` before merging; this was for illustrative purposes. The dataset resulting from a `1:1` merge will have the same data, regardless of the sort order of the master and using datasets.

The formal definition for `merge` behavior is the following: Start with the first observation of the master. Find the corresponding observation in the using data, if there is one. Record the matched or unmatched result. Proceed to the next observation in the master dataset. When you finish working through the master dataset, work through unused observations from the using data. By default, unmatched observations are kept in the merged data, whether they come from the master dataset or the using dataset.

Remember this formal definition. It will serve you well.

1:1 merges

The example shown above is called a `1:1` merge, because the key variable uniquely identified each observation in each of the datasets.

A variable or variable list uniquely identifies the observations if each distinct value of the variable(s) corresponds to one observation in the dataset.

In some datasets, multiple variables are required to identify the observations. Imagine data obtained by observing patients at specific points in time so that variables `pid` and `time`, taken together, identify the observations. Below we have two such datasets and run a `1:1` merge on `pid` and `time`,

`. merge 1:1 pid time using` *filename*

master + *using* = *merged result*

pid	time	x1
14	1	0
14	2	0
14	4	0
16	1	1
16	2	1
17	1	0

pid	time	x2
14	1	7
14	2	9
16	1	2
16	2	3
17	1	5
17	2	2

pid	time	x1	x2	_merge
14	1	0	7	3
14	2	0	9	3
14	4	0	.	1
16	1	1	2	3
16	2	1	3	3
17	1	0	5	3
17	2	.	2	2

This is a `1:1` merge because the combination of the values of `pid` and `time` uniquely identifies observations in both datasets.

By default, there is nothing about a `1:1` merge that implies that all, or even any of, the observations match. Above five observations matched, one observation was only in the master (subject 14 at time 4), and another was only in the using (subject 17 at time 2).

m:1 merges

In an `m:1` merge, the key variable or variables uniquely identify the observations in the using data, but not necessarily in the master data. Suppose you had person-level data within regions and you wished to bring in regional data. Here is an example:

```
. merge m:1 region using filename
```

master + *using* = *merged result*

id	region	a
1	2	26
2	1	29
3	2	22
4	3	21
5	1	24
6	5	20

region	x
1	15
2	13
3	12
4	11

id	region	a	x	_merge
1	2	26	13	3
2	1	29	15	3
3	2	22	13	3
4	3	21	12	3
5	1	24	15	3
6	5	20	.	1
.	4	.	11	2

To bring in the regional information, we need to merge on `region`. The values of `region` identify individual observations in the using data, but it is not an identifier in the master data.

We show the merged dataset sorted by `id` because this makes it easier to see how the merged dataset was constructed. For each observation in the master data, `merge` finds the corresponding observation in the using data. `merge` combines the values of the variables in the using dataset to the observations in the master dataset.

1:m merges

`1:m` merges are similar to `m:1`, except that now the key variables identify unique observations in the master dataset. Any datasets that can be merged using an `m:1` merge may be merged using a `1:m` merge by reversing the roles of the master and using datasets. Here is the same example as used previously, with the master and using datasets reversed:

```
. merge 1:m region using filename
```

master + *using* = *merged result*

region	x
1	15
2	13
3	12
4	11

id	region	a
1	2	26
2	1	29
3	2	22
4	3	21
5	1	24
6	5	20

region	x	id	a	_merge
1	15	2	29	3
1	15	5	24	3
2	13	1	26	3
2	13	3	22	3
3	12	4	21	3
4	11	.	.	1
5	.	6	20	2

This merged result is identical to the merged result in the previous section, except for the sort order and the contents of `_merge`. This time, we show the merged result sorted by `region` rather than `id`. Reversing the roles of the files causes a reversal in the 1s and 2s for `_merge`: where `_merge` was previously 1, it is now 2, and vice versa. These exchanged `_merge` values reflect the reversed roles of the master and using data.

For each observation in the master data, merge found the corresponding observation(s) in the using data and then wrote down the matched or unmatched result. Once the master observations were exhausted, merge wrote down any observations from the using data that were never used.

m:m merges

m:m specifies a many-to-many merge and is a bad idea. In an m:m merge, observations are matched within equal values of the key variable(s), with the first observation being matched to the first; the second, to the second; and so on. If the master and using have an unequal number of observations within the group, then the last observation of the shorter group is used repeatedly to match with subsequent observations of the longer group. Thus m:m merges are dependent on the current sort order—something which should never happen.

Because m:m merges are such a bad idea, we are not going to show you an example. If you think that you need an m:m merge, then you probably need to work with your data so that you can use a 1:m or m:1 merge. Tips for this are given in *Troubleshooting m:m merges* below.

Sequential merges

In a *sequential* merge, there are no key variables. Observations are matched solely on their observation number:

```
. merge 1:1 _n using filename
```

master + *using* = *merged result*

x1
10
30
20
5

x2
7
2
1
9
3

x1	x2	_merge
10	7	3
30	2	3
20	1	3
5	9	3
.	3	2

In the example above, the using data are longer than the master, but that could be reversed. In most cases where sequential merges are appropriate, the datasets are expected to be of equal length, and you should type

```
. merge 1:1 _n using filename, assert(match) nogenerate
```

Sequential merges, like m:m merges, are dangerous. Both depend on the current sort order of the data.

Treatment of overlapping variables

When performing merges of any type, the master and using datasets may have variables in common other than the key variables. We will call such variables overlapping variables. For instance, if the variables in the master and using datasets are

master: id, region, sex, age, race
using: id, sex, bp, race

and id is the key variable, then the overlapping variables are sex and race.

By default, merge treats values from the master as inviolable. When observations match, it is the master's values of the overlapping variables that are recorded in the merged result.

If you specify the update option, however, then all missing values of overlapping variables in matched observations are replaced with values from the using data. Because of this new behavior, the merge codes change somewhat. Codes 1 and 2 keep their old meaning. Code 3 splits into codes 3, 4, and 5. Codes 3, 4, and 5 are filtered according to the following rules; the first applicable rule is used.

5 corresponds to matched observations where at least one overlapping variable had conflicting nonmissing values.

4 corresponds to matched observations where at least one missing value was updated, but there were no conflicting nonmissing values.

3 means observations matched, and there were neither updated missing values nor conflicting nonmissing values.

If you specify both the update and replace options, then the _merge==5 cases are updated with values from the using data.

Sort order

As we have mentioned, in the 1:1, 1:m, and m:1 match merges, the sort orders of the master and using datasets do not affect the data in the merged dataset. This is not the case of m:m, which we recommend you never use.

Sorting is used by merge internally for efficiency, so the merged result can be produced most quickly when the master and using datasets are already sorted by the key variable(s) before merging. You are not required to have the dataset sorted before using merge, however, because merge will sort behind the scenes, if necessary. If the using dataset is not sorted, then a temporary copy is made and sorted to ensure that the current sort order on disk is not affected.

All of this is to reassure you that 1) your datasets on disk will not be modified by merge and 2) despite the fact that our discussion has ignored sort issues, merge is, in fact, efficient behind the scenes.

It hardly makes any difference in run times, but if you know that the master and using data are already sorted by the key variable(s), then you can specify the sorted option. All that will be saved is the time merge would spend discovering that fact for itself.

The merged result produced by merge orders the variables and observations in a special and sometimes useful way. If you think of datasets as tables, then the columns for the new variables appear to the right of what was the master. If the master data originally had k variables, then the new variables will be the $(k+1)$st, $(k+2)$nd, and so on. The new observations are similarly ordered so that they all appear at the end of what was the master. If the master originally had N observations, then the new observations, if any, are the $(N+1)$st, $(N+2)$nd, and so on. Thus the original master data can be found from the merged result by extracting the first k variables and first N observations. If merge with the update option was specified, however, then be aware that the extracted master may have some updated values.

If you care about the ordering of observations in the data after a merge, then you should sort the data after the merge. You should sort it in such a way that it has a unique ordering; see *Sorting with ties* in [D] **sort**. If, against this recommendation, you wish to have a reproducible ordering after a merge, then read the next paragraph. But be forewarned; just because something is reproducible does not mean it is useful. Again, see *Sorting with ties*.

The resulting dataset after any merge is unsorted. That is to say, if you type `describe`, the “Sorted by” result will be empty. That is not to say that the data will not be ordered; a dataset always has an order. After `1:1` merges, the ordering will always be in the original order of the master dataset, with any additional observations from the using dataset at the bottom and in their order from the using dataset. For all other merges, you will need to go to some effort to ensure a reproducible ordering. For `m:1`, `1:m`, and `m:m` merges, you must first sort the master and using datasets by the merge keys and by other variables that will produce a unique ordering of the dataset. You may have to create those other variables. (See *Sorting with ties* for obtaining a unique sort.) After `m:1` merges, the ordering will be the original ordering of the master data with any unmatched observations from the using dataset appended to the bottom in their order from the using dataset. After `1:m` and `m:m` merges, the ordering is difficult to explain. Regardless, the ordering will be the same if you repeat the merge after uniquely sorting each dataset—it is reproducible.

Troubleshooting m:m merges

First, if you think you need to perform an `m:m` merge, then we suspect you are wrong. If you would like to match every observation in the master to every observation in the using with the same values of the key variable(s), then you should be using `joinby`; see [D] **joinby**.

If you still want to use `merge`, then it is likely that you have forgotten one or more key variables that could be used to identify observations within groups. Perhaps you have panel data with 4 observations on each subject, and you are thinking that what you need to do is

```
. merge m:m subjectid using filename
```

Ask yourself if you have a variable that identifies observation within panel, such as a sequence number or a time. If you have, say, a `time` variable, then you probably should try something like

```
. merge 1:m subjectid time using filename
```

(You might need a `1:1` or `m:1` merge; `1:m` was arbitrarily chosen for the example.)

If you do not have a time or time-like variable, then ask yourself if there is a meaning to matching the first observations within subject, the second observations within subject, and so on. If so, then there is a concept of sequence within subject.

Suppose you do indeed have a sequence concept, but in your dataset it is recorded via the ordering of the observations. Here you are in a dangerous situation because any kind of sorting would lose the identity of the first, second, and nth observation within subject. Your first goal should be to fix this problem by creating an explicit sequence variable from the current ordering—your `merge` can come later.

Start with your master data. Type

```
. sort subjectid, stable
. by subjectid: generate seqnum = _n
```

Do not omit `sort`’s `stable` option. That is what will keep the observations in the same order within subject. Save the data. Perform these same three steps on your using data.

After fixing the datasets, you can now type

```
. merge 1:m subjectid seqnum using filename
```

If you do not think there is a meaning to being the first, second, and nth observation within subject, then you need to ask yourself what it means to match the first observations within `subjectid`, the second observations within `subjectid`, and so on. Would it make equal sense to match the first with the third, the second with the fourth, or any other haphazard matching? If so, then there is no real ordering, so there is no real meaning to merging. You are about to obtain a haphazard result; you need to rethink your merge.

Working with alias variables

merge allows alias variables in the master and using datasets, with the following restrictions. An alias variable with a broken linkage will cause merge to exit with an informative error message; see [D] **fralias** for examples.

If a key variable in the master dataset is an alias, then it must be an alias with the same linkage in the using dataset; otherwise, you get something like the following error message:

```
variable keyvar is alias in master data but float in using data
    Key variables (on which observations are matched) may be type alias,
    but their alias characteristics must match between the master and
    using datasets for the merged data to be correct and complete. When
    alias characteristics do not match, or when a master key variable is
    alias but the using key variable is not, you could use command
    frunalias to recast the key variables in the master data
    to avoid this error message.
r(106);
```

If an overlapping variable in the master dataset is an alias, then it must be an alias with the same linkage in the using dataset; otherwise, you get something like the following error message:

```
variable ovar is alias in master data but float in using data
    You could use command frunalias to recast ovar in the master data to avoid
    this error message.
r(106);
```

Examples

▷ Example 1: A 1:1 merge

We have two datasets, one of which has information about the size of old automobiles and the other of which has information about their expense:

```
. use https://www.stata-press.com/data/r19/autosize
(1978 automobile data)

. list
```

	make	weight	length
1.	Toyota Celica	2,410	174
2.	BMW 320i	2,650	177
3.	Cad. Seville	4,290	204
4.	Pont. Grand Prix	3,210	201
5.	Datsun 210	2,020	165
6.	Plym. Arrow	3,260	170

```
. use https://www.stata-press.com/data/r19/autoexpense
(1978 automobile data)

. list

     +---------------------------------+
     | make               price    mpg |
     |---------------------------------|
  1. | Toyota Celica      5,899     18 |
  2. | BMW 320i           9,735     25 |
  3. | Cad. Seville      15,906     21 |
  4. | Pont. Grand Prix   5,222     19 |
  5. | Datsun 210         4,589     35 |
     +---------------------------------+
```

We can see that these datasets contain different information about nearly the same cars—the `autosize` file has one more car. We would like to get all the information about all the cars into one dataset.

Because we are adding new variables to old variables, this is a job for the `merge` command. We need only to decide what type of match merge we need.

Looking carefully at the datasets, we see that the `make` variable, which identifies the cars in each of the two datasets, also identifies individual observations within the datasets. What this means is that if you tell me the make of car, I can tell you the one observation that corresponds to that car. Because this is true for both datasets, we should use a `1:1` merge.

We will start with a clean slate to show the full process:

```
. use https://www.stata-press.com/data/r19/autosize
(1978 automobile data)

. merge 1:1 make using https://www.stata-press.com/data/r19/autoexpense
    Result                      Number of obs
    -----------------------------------------
    Not matched                             1
        from master                         1  (_merge==1)
        from using                          0  (_merge==2)

    Matched                                 5  (_merge==3)
    -----------------------------------------

. list

     +----------------------------------------------------------------------+
     | make               weight   length    price   mpg             _merge |
     |----------------------------------------------------------------------|
  1. | BMW 320i            2,650      177    9,735    25        Matched (3) |
  2. | Cad. Seville        4,290      204   15,906    21        Matched (3) |
  3. | Datsun 210          2,020      165    4,589    35        Matched (3) |
  4. | Plym. Arrow         3,260      170        .     .    Master only (1) |
  5. | Pont. Grand Prix    3,210      201    5,222    19        Matched (3) |
     |----------------------------------------------------------------------|
  6. | Toyota Celica       2,410      174    5,899    18        Matched (3) |
     +----------------------------------------------------------------------+
```

The merge is successful—all the data are present in the combined dataset, even that from the one car that has only size information. If we wanted only those makes for which all information is present, it would be up to us to `drop` the observations for which `_merge` < 3.

◁

▷ Example 2: Requiring matches

Suppose we had the same setup as in the previous example, but we erroneously think that we have all the information on all the cars. We could tell merge that we expect only matches by using the assert option.

```
. use https://www.stata-press.com/data/r19/autosize, clear
(1978 automobile data)

. merge 1:1 make using https://www.stata-press.com/data/r19/autoexpense,
> assert(match)
merge:  after merge, not all observations matched
        (merged result left in memory)
r(9);
```

merge tells us that there is a problem with our assumption. To see how many mismatches there were, we can tabulate _merge:

```
. tabulate _merge
```

_merge	Freq.	Percent	Cum.
master only (1)	1	16.67	16.67
matched (3)	5	83.33	100.00
Total	6	100.00	

If we would like to list the problem observation, we can type

```
. list if _merge < 3
```

	make	weight	length	price	mpg	_merge
4.	Plym. Arrow	3,260	170	.	.	master only (1)

If we were convinced that all data should be complete in the two datasets, we would have to rectify the mismatch in the original datasets.

◁

▷ Example 3: Keeping just the matches

Once again, suppose that we had the same datasets as before, but this time we want the final dataset to have only those observations for which there is a match. We do not care if there are mismatches—all that is important are the complete observations. By using the keep(match) option, we will guarantee that this happens. Because we are keeping only those observations for which the key variable matches, there is no need to generate the _merge variable. We could do the following:

```
. use https://www.stata-press.com/data/r19/autosize, clear
(1978 automobile data)

. merge 1:1 make using https://www.stata-press.com/data/r19/autoexpense,
> keep(match) nogenerate
```

Result	Number of obs
Not matched	0
Matched	5

```
. list
```

	make	weight	length	price	mpg
1.	BMW 320i	2,650	177	9,735	25
2.	Cad. Seville	4,290	204	15,906	21
3.	Datsun 210	2,020	165	4,589	35
4.	Pont. Grand Prix	3,210	201	5,222	19
5.	Toyota Celica	2,410	174	5,899	18

◁

▷ Example 4: Many-to-one matches

We have two datasets: one has salespeople in regions and the other has regional data about sales. We would like to put all the information into one dataset. Here are the datasets:

```
. use https://www.stata-press.com/data/r19/sforce, clear
(Sales Force)
. list
```

	region	name
1.	N Cntrl	Krantz
2.	N Cntrl	Phipps
3.	N Cntrl	Willis
4.	NE	Ecklund
5.	NE	Franks
6.	South	Anderson
7.	South	Dubnoff
8.	South	Lee
9.	South	McNeil
10.	West	Charles
11.	West	Cobb
12.	West	Grant

```
. use https://www.stata-press.com/data/r19/dollars
(Regional Sales & Costs)
. list
```

	region	sales	cost
1.	N Cntrl	419,472	227,677
2.	NE	360,523	138,097
3.	South	532,399	330,499
4.	West	310,565	165,348

We can see that the region would be used to match observations in the two datasets, and this time we see that `region` identifies individual observations in the `dollars` dataset but not in the `sforce` dataset. This means we will have to use either an `m:1` or a `1:m` merge. Here we will open the `sforce` dataset and then `merge` the `dollars` dataset. This will be an `m:1` merge, because `region` does not identify individual observations in the dataset in memory but does identify them in the using dataset. Here is the command and its result:

```
. use https://www.stata-press.com/data/r19/sforce
(Sales Force)

. merge m:1 region using https://www.stata-press.com/data/r19/dollars
(label region already defined)

    Result                      Number of obs
    -----------------------------------------
    Not matched                             0
    Matched                                12  (_merge==3)
    -----------------------------------------

. list

     +-------------------------------------------------------+
     | region       name     sales      cost          _merge |
     |-------------------------------------------------------|
  1. | N Cntrl   Krantz   419,472   227,677     Matched (3) |
  2. | N Cntrl   Phipps   419,472   227,677     Matched (3) |
  3. | N Cntrl   Willis   419,472   227,677     Matched (3) |
  4. | NE       Ecklund   360,523   138,097     Matched (3) |
  5. | NE        Franks   360,523   138,097     Matched (3) |
     |-------------------------------------------------------|
  6. | South   Anderson   532,399   330,499     Matched (3) |
  7. | South    Dubnoff   532,399   330,499     Matched (3) |
  8. | South        Lee   532,399   330,499     Matched (3) |
  9. | South     McNeil   532,399   330,499     Matched (3) |
 10. | West     Charles   310,565   165,348     Matched (3) |
     |-------------------------------------------------------|
 11. | West        Cobb   310,565   165,348     Matched (3) |
 12. | West       Grant   310,565   165,348     Matched (3) |
     +-------------------------------------------------------+
```

We can see from the result that all the values of `region` were matched in both datasets. This is a rare occurrence in practice!

Had we had the `dollars` dataset in memory and merged in the `sforce` dataset, we would have done a `1:m` merge.

◁

We would now like to use a series of examples that shows how `merge` treats nonkey variables, which have the same names in the two datasets. We will call these “overlapping” variables.

▷ Example 5: Overlapping variables

Here are two datasets whose only purpose is for this illustration:

```
. use https://www.stata-press.com/data/r19/overlap1, clear
. list, sepby(id)
```

	id	seq	x1	x2
1.	1	1	1	1
2.	1	2	1	.
3.	1	3	1	2
4.	1	4	.	2
5.	2	1	.	1
6.	2	2	.	2
7.	2	3	1	1
8.	2	4	1	2
9.	2	5	.a	1
10.	2	6	.a	2
11.	3	1	.	.a
12.	3	2	.	1
13.	3	3	.	.
14.	3	4	.a	.a
15.	10	1	5	8

```
. use https://www.stata-press.com/data/r19/overlap2
. list
```

	id	bar	x1	x2
1.	1	11	1	1
2.	2	12	.	1
3.	3	14	.	.a
4.	20	18	1	1

We can see that `id` can be used as the key variable for putting the two datasets together. We can also see that there are two overlapping variables: `x1` and `x2`.

We will start with a simple `m:1` merge:

```
. use https://www.stata-press.com/data/r19/overlap1

. merge m:1 id using https://www.stata-press.com/data/r19/overlap2

    Result                      Number of obs
    -----------------------------------------
    Not matched                             2
        from master                         1  (_merge==1)
        from using                          1  (_merge==2)

    Matched                                14  (_merge==3)
    -----------------------------------------

. list, sepby(id)

     +--------------------------------------------------+
     | id   seq   x1   x2   bar                  _merge |
     |--------------------------------------------------|
  1. |  1     1    1    1    11             Matched (3) |
  2. |  1     2    1    .    11             Matched (3) |
  3. |  1     3    1    2    11             Matched (3) |
  4. |  1     4    .    2    11             Matched (3) |
     |--------------------------------------------------|
  5. |  2     1    .    1    12             Matched (3) |
  6. |  2     2    .    2    12             Matched (3) |
  7. |  2     3    1    1    12             Matched (3) |
  8. |  2     4    1    2    12             Matched (3) |
  9. |  2     5   .a    1    12             Matched (3) |
 10. |  2     6   .a    2    12             Matched (3) |
     |--------------------------------------------------|
 11. |  3     1    .   .a    14             Matched (3) |
 12. |  3     2    .    1    14             Matched (3) |
 13. |  3     3    .    .    14             Matched (3) |
 14. |  3     4   .a   .a    14             Matched (3) |
     |--------------------------------------------------|
 15. | 10     1    5    8     .         Master only (1) |
     |--------------------------------------------------|
 16. | 20     .    1    1    18          Using only (2) |
     +--------------------------------------------------+
```

Careful inspection shows that for the matched `id`, the values of `x1` and `x2` are still the values that were originally in the `overlap1` dataset. This is the default behavior of `merge`—the data in the master dataset are the authority and are kept intact.

◁

▷ Example 6: Updating missing data

Now we would like to investigate the `update` option. Used by itself, it will replace missing values in the master dataset with values from the using dataset:

```
. use https://www.stata-press.com/data/r19/overlap1, clear
. merge m:1 id using https://www.stata-press.com/data/r19/overlap2, update
    Result                      Number of obs
    -----------------------------------------
    Not matched                             2
        from master                         1  (_merge==1)
        from using                          1  (_merge==2)

    Matched                                14
        not updated                         5  (_merge==3)
        missing updated                     4  (_merge==4)
        nonmissing conflict                 5  (_merge==5)
    -----------------------------------------

. list, sepby(id)
```

	id	seq	x1	x2	bar	_merge
1.	1	1	1	1	11	Matched (3)
2.	1	2	1	1	11	Missing updated (4)
3.	1	3	1	2	11	Nonmissing conflict (5)
4.	1	4	1	2	11	Nonmissing conflict (5)
5.	2	1	.	1	12	Matched (3)
6.	2	2	.	2	12	Nonmissing conflict (5)
7.	2	3	1	1	12	Matched (3)
8.	2	4	1	2	12	Nonmissing conflict (5)
9.	2	5	.	1	12	Missing updated (4)
10.	2	6	.	2	12	Nonmissing conflict (5)
11.	3	1	.	.a	14	Matched (3)
12.	3	2	.	1	14	Matched (3)
13.	3	3	.	.a	14	Missing updated (4)
14.	3	4	.	.a	14	Missing updated (4)
15.	10	1	5	8	.	Master only (1)
16.	20	.	1	1	18	Using only (2)

Looking through the resulting dataset observation by observation, we can see both what the `update` option updated as well as how the `_merge` variable gets its values.

The following is a listing that shows what is happening, where x1_m and x2_m come from the master dataset (overlap1), x1_u and x2_u come from the using dataset (overlap2), and x1 and x2 are the values that appear when using merge with the update option.

	id	x1_m	x1_u	x1	x2_m	x2_u	x2	_merge
1.	1	1	1	1	1	1	1	matched (3)
2.	1	1	1	1	.	1	1	missing updated (4)
3.	1	1	1	1	2	1	2	nonmissing conflict (5)
4.	1	.	1	1	2	1	2	nonmissing conflict (5)
5.	2	.	.	.	1	1	1	matched (3)
6.	2	.	.	.	2	1	2	nonmissing conflict (5)
7.	2	1	.	1	1	1	1	matched (3)
8.	2	1	.	1	2	1	2	nonmissing conflict (5)
9.	2	.a	.	.	1	1	1	missing updated (4)
10.	2	.a	.	.	2	1	2	nonmissing conflict (5)
11.	3	.	.	.	.a	.a	.a	matched (3)
12.	3	.	.	.	1	.a	1	matched (3)
13.	3	.	.	.	.	.a	.a	missing updated (4)
14.	3	.a	.	.	.a	.a	.a	missing updated (4)
15.	10	5	.	5	8	.	8	master only (1)
16.	20	.	1	1	.	1	1	using only (2)

From this, we can see two important facts: if there are both a conflict and an updated value, the value of _merge will reflect that there was a conflict, and missing values in the master dataset are updated by missing values in the using dataset.

◁

▷ Example 7: Updating all common observations

We would like to see what happens if the update and replace options are specified. The replace option extends the action of update to use nonmissing values of the using dataset to replace values in the master dataset. The values of _merge are unaffected by using both update and replace.

```
. use https://www.stata-press.com/data/r19/overlap1, clear
. merge m:1 id using https://www.stata-press.com/data/r19/overlap2, update replace
    Result                      Number of obs
    -----------------------------------------
    Not matched                             2
        from master                         1  (_merge==1)
        from using                          1  (_merge==2)

    Matched                                14
        not updated                         5  (_merge==3)
        missing updated                     4  (_merge==4)
        nonmissing conflict                 5  (_merge==5)
    -----------------------------------------
```

```
. list, sepby(id)

     +------------------------------------------------------+
     | id   seq   x1   x2   bar                      _merge |
     |------------------------------------------------------|
  1. |  1     1    1    1    11                 Matched (3) |
  2. |  1     2    1    1    11          Missing updated (4) |
  3. |  1     3    1    1    11     Nonmissing conflict (5) |
  4. |  1     4    1    1    11     Nonmissing conflict (5) |
     |------------------------------------------------------|
  5. |  2     1    .    1    12                 Matched (3) |
  6. |  2     2    .    1    12     Nonmissing conflict (5) |
  7. |  2     3    1    1    12                 Matched (3) |
  8. |  2     4    1    1    12     Nonmissing conflict (5) |
  9. |  2     5    .    1    12         Missing updated (4) |
 10. |  2     6    .    1    12     Nonmissing conflict (5) |
     |------------------------------------------------------|
 11. |  3     1    .   .a    14                 Matched (3) |
 12. |  3     2    .    1    14                 Matched (3) |
 13. |  3     3    .   .a    14         Missing updated (4) |
 14. |  3     4    .   .a    14         Missing updated (4) |
     |------------------------------------------------------|
 15. | 10     1    5    8     .             Master only (1) |
     |------------------------------------------------------|
 16. | 20     .    1    1    18              Using only (2) |
     +------------------------------------------------------+
```

◁

▷ Example 8: More on the keep() option

Suppose we would like to use the `update` option, as we did above, but we would like to keep only those observations for which the value of the key variable, `id`, was found in both datasets. This will be more complicated than in our earlier example, because the `update` option splits the `matches` into `matches`, `match_updates`, and `match_conflicts`. We must either use all of these code words in the `keep` option or use their numerical equivalents, 3, 4, and 5. Here the latter is simpler.

```
. use https://www.stata-press.com/data/r19/overlap1, clear

. merge m:1 id using https://www.stata-press.com/data/r19/overlap2, update
> keep(3 4 5)
    Result                      Number of obs
    -----------------------------------------
    Not matched                             0

    Matched                                14
        not updated                         5  (_merge==3)
        missing updated                     4  (_merge==4)
        nonmissing conflict                 5  (_merge==5)
    -----------------------------------------
```

```
. list, sepby(id)

     +---------------------------------------------------------+
     | id   seq   x1   x2   bar                         _merge |
     |---------------------------------------------------------|
  1. |  1     1    1    1    11                    Matched (3) |
  2. |  1     2    1    1    11            Missing updated (4) |
  3. |  1     3    1    2    11        Nonmissing conflict (5) |
  4. |  1     4    1    2    11        Nonmissing conflict (5) |
     |---------------------------------------------------------|
  5. |  2     1    .    1    12                    Matched (3) |
  6. |  2     2    .    2    12        Nonmissing conflict (5) |
  7. |  2     3    1    1    12                    Matched (3) |
  8. |  2     4    1    2    12        Nonmissing conflict (5) |
  9. |  2     5    .    1    12            Missing updated (4) |
 10. |  2     6    .    2    12        Nonmissing conflict (5) |
     |---------------------------------------------------------|
 11. |  3     1    .   .a    14                    Matched (3) |
 12. |  3     2    .    1    14                    Matched (3) |
 13. |  3     3    .   .a    14            Missing updated (4) |
 14. |  3     4    .   .a    14            Missing updated (4) |
     +---------------------------------------------------------+
```

◁

▷ Example 9: A one-to-many merge

As a final example, we would like show one example of a `1:m` merge. There is nothing conceptually different here; what is interesting is the order of the observations in the final dataset:

```
. use https://www.stata-press.com/data/r19/overlap2, clear

. merge 1:m id using https://www.stata-press.com/data/r19/overlap1

    Result                      Number of obs
    -----------------------------------------
    Not matched                             2
        from master                         1  (_merge==1)
        from using                          1  (_merge==2)

    Matched                                14  (_merge==3)
    -----------------------------------------
```

```
. list, sepby(id)
```

	id	bar	x1	x2	seq	_merge
1.	1	11	1	1	1	Matched (3)
2.	2	12	.	1	1	Matched (3)
3.	3	14	.	.a	1	Matched (3)
4.	20	18	1	1	.	Master only (1)
5.	1	11	1	1	2	Matched (3)
6.	1	11	1	1	3	Matched (3)
7.	1	11	1	1	4	Matched (3)
8.	2	12	.	1	2	Matched (3)
9.	2	12	.	1	3	Matched (3)
10.	2	12	.	1	4	Matched (3)
11.	2	12	.	1	5	Matched (3)
12.	2	12	.	1	6	Matched (3)
13.	3	14	.	.a	2	Matched (3)
14.	3	14	.	.a	3	Matched (3)
15.	3	14	.	.a	4	Matched (3)
16.	10	.	5	8	1	Using only (2)

We can see here that the first four observations come from the master dataset, and all additional observations, whether matched or unmatched, come below these observations. This illustrates that the master dataset is always in the upper-left corner of the merged dataset.

◁

Video example

How to merge files into a single dataset

References

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Gould, W. W. 2011a. Merging data, part 1: Merges gone bad. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2011/04/18/merging-data-part-1-merges-gone-bad/.

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Wasi, N., and A. Flaaen. 2015. Record linkage using Stata: Preprocessing, linking, and reviewing utilities. *Stata Journal* 15: 672–697.

Also see

[D] **append** — Append datasets

[D] **cross** — Form every pairwise combination of two datasets

[D] **fralias** — Alias variables from linked frames

[D] **frget** — Copy variables from linked frame

[D] **frlink** — Link frames

[D] **frunalias** — Change storage type of alias variables

[D] **joinby** — Form all pairwise combinations within groups

[D] **save** — Save Stata dataset

[U] 23 Combining datasets

Description

This entry provides a quick reference for Stata's missing values.

Remarks and examples

Stata has 27 numeric missing values:

`.`, the default, which is called the *system missing value* or `sysmiss`

and

`.a`, `.b`, `.c`, ..., `.z`, which are called the *extended missing values*.

Numeric missing values are represented by large positive values. The ordering is

$$\text{all nonmissing numbers} < \texttt{.} < \texttt{.a} < \texttt{.b} < \cdots < \texttt{.z}$$

Thus the expression

$$\texttt{age} > 60$$

is true if variable `age` is greater than 60 or missing.

To exclude missing values, ask whether the value is less than '`.`'.

```
. list if age > 60 & age < .
```

To specify missing values, ask whether the value is greater than or equal to '`.`'. For instance,

```
. list if age >=.
```

Stata has one string missing value, which is denoted by `""` (blank).

References

Cox, N. J. 2010. Stata tip 84: Summing missings. *Stata Journal* 10: 157–159.

———. 2015. Speaking Stata: A set of utilities for managing missing values. *Stata Journal* 15: 1174–1185.

Also see

[U] **12.2.1 Missing values**

Description Quick start Syntax Option Remarks and examples Also see

Description

`mkdir` creates a new directory (folder).

Quick start

Create `mysubdir` in the current working directory

    mkdir mysubdir

Same as above, but make `mysubdir` readable by everyone regardless of default permissions

    mkdir mysubdir, public

Create `mysubdir` in `C:\mydir` using Stata for Windows

    mkdir c:\mydir\mysubdir

Create `mysubdir` in `~/mydir` using Stata for Mac or Unix

    mkdir ~/mydir/mysubdir

Create `my folder` in `C:\my dir` using Stata for Windows

    mkdir "c:\my dir\my folder"

Syntax

`mkdir` *directoryname* [, `public`]

Double quotes may be used to enclose *directoryname*, and the quotes must be used if *directoryname* contains embedded spaces.

Option

`public` specifies that *directoryname* be readable by everyone; otherwise, the directory will be created according to the default permissions of your operating system.

Remarks and examples

Examples:

Windows

```
. mkdir myproj
. mkdir c:\projects\myproj
. mkdir "c:\My Projects\Project 1"
```

Mac and Unix

```
. mkdir myproj
. mkdir ~/projects/myproj
```

Also see

[D] **cd** — Change directory

[D] **copy** — Copy file from disk or URL

[D] **dir** — Display filenames

[D] **erase** — Erase a disk file

[D] **rmdir** — Remove directory

[D] **shell** — Temporarily invoke operating system

[D] **type** — Display contents of a file

[U] 11.6 Filenaming conventions

mvencode — Change missing values to numeric values and vice versa

Description	Quick start	Menu	Syntax
Options	Remarks and examples	Acknowledgment	Also see

Description

`mvencode` changes missing values in the specified *varlist* to numeric values.

`mvdecode` changes occurrences of a numlist in the specified *varlist* to a missing-value code.

Missing-value codes may be sysmiss (`.`) and the extended missing-value codes `.a`, `.b`, ..., `.z`.

String variables in *varlist* are ignored.

Quick start

Replace all missing values in `v1` with 99

```
mvencode v1, mv(99)
```

Replace extended missing value `.a` with 888 and `.b` with 999 in `v2`

```
mvencode v2, mv(.a=888 \ .b=999)
```

Replace `.a` with 888, `.b` with 999, and other missing values with 99 in numeric variables

```
mvencode _all, mv(.a=888 \ .b=999 \ else=99)
```

Same as above, but only for observations where `catvar` equals 1

```
mvencode _all if catvar==1, mv(.a=888 \ .b=999 \ else=99)
```

Replace 888 and 999 with system missing `.` in all numeric variables

```
mvdecode _all, mv(888 999)
```

Same as above, but replace 888 with `.a` and 999 with `.b`

```
mvdecode _all, mv(888=.a \ 999=.b)
```

Menu

mvencode

Data > Create or change data > Other variable-transformation commands > Change missing values to numeric

mvdecode

Data > Create or change data > Other variable-transformation commands > Change numeric values to missing

Syntax

Change missing values to numeric values

`mvencode` *varlist* [*if*] [*in*] , `mv(`# | *mvc* = # [\ *mvc* = #. . .] [\ `else` = #]`)` [`override`]

Change numeric values to missing values

`mvdecode` *varlist* [*if*] [*in*] , `mv(`*numlist* | *numlist* = *mvc* [\ *numlist* = *mvc* . . .]`)`

where *mvc* is one of `.` | `.a` | `.b` | . . . | `.z`

Options

Main

`mv(`# | *mvc* = # [\ *mvc* = #. . .] [\ `else` = #]`)` is required and specifies the numeric values to which the missing values are to be changed.

`mv(`#`)` specifies that all types of missing values be changed to #.

`mv(`*mvc*=#`)` specifies that occurrences of missing-value code *mvc* be changed to #. Multiple transformation rules may be specified, separated by a backward slash (\). The list may be terminated by the special rule `else=`#, specifying that all types of missing values not yet transformed be set to #.

Examples: `mv(9)`, `mv(.=99\.a=98\.b=97)`, `mv(.=99\ else=98)`

`mv(`*numlist* | *numlist*=*mvc* [\ *numlist* = *mvc* . . .]`)` is required and specifies the numeric values that are to be changed to missing values.

`mv(`*numlist*=*mvc*`)` specifies that the values in *numlist* be changed to missing-value code *mvc*. Multiple transformation rules may be specified, separated by a backward slash (\). See [P] **numlist** for the syntax of a numlist.

Examples: `mv(9)`, `mv(99=.\98=.a\97=.b)`, `mv(99=.\ 100/999=.a)`

`override` specifies that the protection provided by `mvencode` be overridden. Without this option, `mvencode` refuses to make the requested change if any of the numeric values are already used in the data.

Remarks and examples

Remarks are presented under the following headings:

Overview

You may occasionally read data in which missing (for example, a respondent failed to answer a survey question or the data were not collected) is coded with a special numeric value. Popular codings are 9, 99, −9, −99, and the like. If missing were encoded as −99, then

```
. mvdecode _all, mv(-99)
```

would translate the special code to the Stata missing value "`.`". Use this command cautiously because, even if −99 were not a special code, all −99s in the data would be changed to missing.

Sometimes different codes are used to represent different reasons for missing values. For instance, 98 may be used for "refused to answer" and 99 for "not applicable". Extended missing values (`.a`, `.b`, and so on) may be used to code these differences.

```
. mvdecode _all, mv(98=.a\ 99=.b)
```

Conversely, you might need to export data to software that does not understand that "`.`" indicates a missing value, so you might code missing with a special numeric value. To change all missings to −99, you could type

```
. mvencode _all, mv(-99)
```

To change extended missing values back to numeric values, type

```
. mvencode _all, mv(.a=98\ .b=99)
```

This would leave sysmiss and all other extended missing values unchanged. To encode in addition sysmiss `.` to 999 and all other extended missing values to 97, you might type

```
. mvencode _all, mv(.=999\ .a=98\ .b=99\ else=97)
```

`mvencode` will automatically recast variables upward, if necessary, so even if a variable is stored as a `byte`, its missing values can be recoded to, say, 999. Also `mvencode` refuses to make the change if # (−99 here) is already used in the data, so you can be certain that your coding is unique. You can override this feature by including the `override` option.

Be aware of another potential problem with encoding and decoding missing values: value labels are not automatically adapted to the changed codings. You have to do this yourself. For example, the value label `divlabor` maps the value 99 to the string "not applicable". You used `mvdecode` to recode 99 to `.a` for all variables that are associated with this label. To fix the value label, clear the mapping for 99 and define it again for `.a`.

```
. label define divlabor 99 "", modify
. label define divlabor .a "not applicable", add
```

▷ Example 1

Our automobile dataset contains 74 observations and 12 variables. Let's first attempt to translate the missing values in the data to 1:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)
. mvencode _all, mv(1)
        make: string variable ignored
       rep78: already 1 in     2 observations
     foreign: already 1 in    22 observations
no action taken
r(9);
```

Our attempt failed. `mvencode` first informed us that `make` is a string variable—this is not a problem but is reported merely for our information. String variables are ignored by `mvencode`. It next informed us that `rep78` was already coded 1 in 2 observations and that `foreign` was already coded 1 in 22 observations. Thus 1 would be a poor choice for encoding missing values because, after encoding, we could not tell a real 1 from a coded missing value 1.

We could force mvencode to encode the data with 1, anyway, by typing mvencode _all, mv(1) override. That would be appropriate if the 1s in our data already represented missing data. They do not, however, so we code missing as 999:

```
. mvencode _all, mv(999)
        make: string variable ignored
       rep78: 5 missing values
```

This worked, and we are informed that the only changes necessary were to 5 observations of rep78.

Example 2

Let's now pretend that we just read in the automobile data from some raw dataset in which all the missing values were coded 999. We can convert the 999s to real missings by typing

```
. mvdecode _all, mv(999)
        make: string variable ignored
       rep78: 5 missing values
```

We are informed that make is a string variable, so it was ignored, and that rep78 contained 5 observations with 999. Those observations have now been changed to contain missing.

Video example

How to convert missing value codes to missing values

Acknowledgment

These versions of mvencode and mvdecode were written by Jeroen Weesie of the Department of Sociology at Utrecht University, The Netherlands.

Also see

[D] **generate** — Create or change contents of variable

[D] **recode** — Recode categorical variables

notes — Place notes in data

Description Quick start Menu Syntax
Remarks and examples Reference Also see

Description

`notes` attaches notes to the dataset in memory. These notes become a part of the dataset and are saved when the dataset is saved and retrieved when the dataset is used; see [D] **save** and [D] **use**. `notes` can be attached generically to the dataset or specifically to a variable within the dataset.

Quick start

Attach "My note about data" to current dataset

```
notes: My note about data
```

Add note "There is one note for v1" to `v1`

```
notes v1: There is one note for v1
```

Add note "A note was added to v2 on" and a time stamp for the note

```
notes v2: A note was added to v2 on TS
```

Add note "Data have changed" to the dataset

```
notes: Data have changed
```

Remove the first note from the dataset

```
notes drop _dta in 1
```

Renumber notes after removing a note from the dataset

```
notes renumber _dta
```

Same as above, but for a variable

```
notes renumber v1
```

List all notes

```
notes
```

List notes for the dataset but omit notes applied to variables

```
notes _dta
```

List only notes for variables

```
notes *
```

Search all notes for the word "check"

```
notes search check
```

Menu

notes (add)

Data > Variables Manager

notes list and notes search

Data > Data utilities > Notes utilities > List or search notes

notes replace

Data > Variables Manager

notes drop

Data > Variables Manager

notes renumber

Data > Data utilities > Notes utilities > Renumber notes

Syntax

Attach notes to dataset

`notes` [*evarname*] `:` *text*

List all notes

`notes`

List specific notes

`notes` [`list`] *evarlist* [`in` #[/#]]

Search for a text string across all notes in all variables and _dta

`notes search` [*sometext*]

Replace a note

`notes replace` *evarname* `in` # `:` *text*

Drop notes

`notes drop` *evarlist* [`in` #[/#]]

Renumber notes

`notes renumber` *evarname*

where *evarname* is `_dta` or a varname, *evarlist* is a varlist that may contain the `_dta`, and # is a number or the letter `l`.

If *text* includes the letters `TS` surrounded by blanks, the `TS` is removed, and a time stamp is substituted in its place.

Remarks and examples

Remarks are presented under the following headings:

How notes are numbered

Notes are numbered sequentially, with the first note being 1. Say the `myvar` variable has four notes numbered 1, 2, 3, and 4. If you type `notes drop myvar in 3`, the remaining notes will be numbered 1, 2, and 4. If you now add another note, it will be numbered 5. That is, notes are not renumbered and new notes are added immediately after the highest numbered note. Thus, if you now dropped notes 4 and 5, the next note added would be 3.

You can renumber notes by using `notes renumber`. Going back to when `myvar` had notes numbered 1, 2, and 4 after dropping note 3, if you typed `notes renumber myvar`, the notes would be renumbered 1, 2, and 3. If you added a new note after that, it would be numbered 4.

Attaching and listing notes

A note is nothing formal; it is merely a string of text reminding you to do something, cautioning you against something, or saying anything else you might feel like jotting down. People who work with real data invariably end up with paper notes plastered around their terminal saying things like, "Send the new sales data to Bob", "Check the income variable in `salary95`; I don't believe it", or "The gender dummy was significant!" It would be better if these notes were attached to the dataset.

Adding a note to your dataset requires typing `note` or `notes` (they are synonyms), a colon (`:`), and whatever you want to remember. The note is added to the dataset currently in memory.

```
. note:  Send copy to Bob once verified.
```

You can replay your notes by typing `notes` (or `note`) by itself.

```
. notes
_dta:
  1.  Send copy to Bob once verified.
```

Once you resave your data, you can replay the note in the future, too. You add more notes just as you did the first:

```
. note: Mary wants a copy, too.
. notes
_dta:
  1.  Send copy to Bob once verified.
  2.  Mary wants a copy, too.
```

You can place time stamps on your notes by placing the word TS (in capitals) in the text of your note:

```
. note: TS merged updates from JJ&F

. notes

_dta:
  1.  Send copy to Bob once verified.
  2.  Mary wants a copy, too.
  3.  19 Apr 2024 15:38 merged updates from JJ&F
```

Notes may contain SMCL directives:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. note: check reason for missing values in {cmd:rep78}

. notes

_dta:
  1.  from Consumer Reports with permission
  2.  check reason for missing values in rep78
```

The notes we have added so far are attached to the dataset generically, which is why Stata prefixes them with _dta when it lists them. You can attach notes to variables:

```
. note mpg: is the 44 a mistake?  Ask Bob.

. note mpg: what about the two missing values?

. notes

_dta:
  1.  Send copy to Bob once verified.
  2.  Mary wants a copy, too.
  3.  19 Apr 2024 15:38 merged updates from JJ&F

mpg:
  1.  is the 44 a mistake? Ask Bob.
  2.  what about the two missing values?
```

Up to 9,999 generic notes can be attached to _dta, and another 9,999 notes can be attached to each variable.

Selectively listing notes

Typing notes by itself lists all the notes. In full syntax, notes is equivalent to typing notes _all in 1/l. Here are some variations:

notes _dta	list all generic notes
notes mpg	list all notes for variable mpg
notes _dta mpg	list all generic notes and mpg notes
notes _dta in 3	list generic note 3
notes _dta in 3/5	list generic notes 3–5
notes mpg in 3/5	list mpg notes 3–5
notes _dta in 3/l	list generic notes 3 through last

Searching and replacing notes

You had a bad day yesterday, and you want to recheck the notes that you added to your dataset. Fortunately, you always put a time stamp on your notes.

```
. notes search "29 Jan"

_dta:
  2.  29 Jan 2024 13:40 check reason for missing values in foreign
```

Good thing you checked. It is rep78 that has missing values.

```
. notes replace _dta in 2: TS check reason for missing values in rep78
  (note 2 for _dta replaced)

. notes

_dta:
  1.  from Consumer Reports with permission
  2.  30 Jan 2024 12:32 check reason for missing values in rep78
```

Deleting notes

notes drop works much like listing notes, except that typing notes drop by itself does not delete all notes; you must type notes drop _all. Here are some variations:

notes drop _dta	delete all generic notes
notes drop _dta in 3	delete generic note 3
notes drop _dta in 3/5	delete generic notes 3–5
notes drop _dta in 3/l	delete generic notes 3 through last
notes drop mpg in 4	delete mpg note 4

Warnings

- Notes are stored with the data, and as with other updates you make to the data, the additions and deletions are not permanent until you save the data; see [D] **save**.
- The maximum length of one note is 67,784 characters for Stata/MP, Stata/SE, and Stata/BE.

Video example

How to add notes to a variable

Reference

Long, J. S. 2009. *The Workflow of Data Analysis Using Stata*. College Station, TX: Stata Press.

Also see

[D] **codebook** — Describe data contents

[D] **describe** — Describe data in memory or in a file

[D] **ds** — Compactly list variables with specified properties

[D] **save** — Save Stata dataset

[D] **varmanage** — Manage variable labels, formats, and other properties

[U] 12.8 Characteristics

obs — Increase the number of observations in a dataset

Description Quick start Syntax Remarks and examples Also see

Description

`set obs` changes the number of observations in the current dataset. # must be at least as large as the current number of observations. If there are variables in memory, the values of all new observations are set to missing.

Quick start

Add 100 observations with no observations currently in memory

```
set obs 100
```

Add 100 observations with 100 observations currently in memory

```
set obs 200
```

Syntax

`set obs #`

Remarks and examples

▷ Example 1

`set obs` can be useful for creating artificial datasets. For instance, if we wanted to graph the function $y = x^2$ over the range 1–100, we could type

```
. drop _all
. set obs 100
Number of observations (_N) was 0, now 100.
. generate x = _n
. generate y = x^2
. scatter y x
  (graph omitted)
```

◁

▷ Example 2

If we want to add an extra data point in a program, we could type

```
. local np1 = _N + 1
. set obs `np1'
Number of observations (_N) was 0, now 1.
```

or

```
. set obs `=_N + 1'
```

◁

Also see

[D] **describe** — Describe data in memory or in a file

[D] **insobs** — Add or insert observations

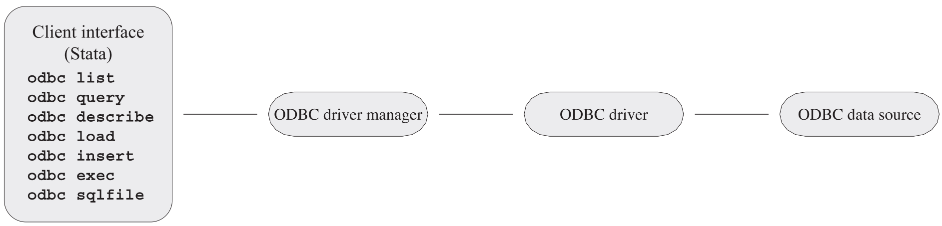
odbc — Load, write, or view data from ODBC sources

Description	Quick start	Menu	Syntax
Options	Remarks and examples	Reference	Also see

Description

odbc allows you to load, write, and view data from Open DataBase Connectivity (ODBC) sources into Stata. ODBC is a standardized set of function calls for accessing data stored in both relational and nonrelational database-management systems. By default on Unix platforms, iODBC is the ODBC driver manager Stata uses, but you can use unixODBC by using the command `set odbcmgr unixodbc`.

ODBC's architecture consists of four major components (or layers): the client interface, the ODBC driver manager, the ODBC drivers, and the data sources. Stata provides `odbc` as the client interface. The system is illustrated as follows:



`odbc list` produces a list of ODBC data source names to which Stata can connect.

`odbc query` retrieves a list of table names available from a specified data source's system catalog.

`odbc describe` lists column names and types associated with a specified table.

`odbc load` reads an ODBC table into memory. You can load an ODBC table specified in the `table()` option or load an ODBC table generated by an SQL SELECT statement specified in the `exec()` option. In both cases, you can choose which columns and rows of the ODBC table to read by specifying *extvarlist* and `if` and `in` conditions. *extvarlist* specifies the columns to be read and allows you to rename variables. For example,

```
. odbc load id=ID name="Last Name", table(Employees) dsn(Northwind)
```

reads two columns, `ID` and `Last Name`, from the `Employees` table of the `Northwind` data source. It will also rename variable `ID` to `id` and variable `Last Name` to `name`.

`odbc insert` writes data from memory to an ODBC table. The data can be appended to an existing table or replace an existing table.

`odbc exec` allows for most SQL statements to be issued directly to any ODBC data source. Statements that produce output, such as SELECT, have their output neatly displayed. By using Stata's ado language, you can also generate SQL commands on the fly to do positional updates or whatever the situation requires.

`odbc sqlfile` provides a "batch job" alternative to the `odbc exec` command. A file is specified that contains any number of any length SQL commands. Every SQL command in this file should be delimited by a semicolon and must be constructed as pure SQL. Stata macros and ado-language syntax are not permitted. The advantage in using this command, as opposed to `odbc exec`, is that only one connection is established for multiple SQL statements. A similar sequence of SQL commands used via `odbc exec` would require constructing an ado-file that issued a command and, thus, a connection for every SQL command. Another slight difference is that any output that might be generated from an SQL command is suppressed by default. A `loud` option is provided to toggle output back on.

`set odbcdriver unicode` specifies that the ODBC driver is a Unicode driver (the default). `set odbcdriver ansi` specifies that the ODBC driver is an ANSI driver. You must restart Stata for the setting to take effect.

`set odbcmgr iodbc` specifies that the ODBC driver manager is iODBC (the default). `set odbcmgr unixodbc` specifies that the ODBC driver manager is unixODBC.

Quick start

List all defined data source names (DSNs) to which Stata can connect

```
odbc list
```

List available table names in `MyDSN`

```
odbc query "MyDSN"
```

Describe the column names and data types in table `MyTable` from `MyDSN`

```
odbc describe "MyTable", dsn("MyDSN")
```

Load `MyTable` into memory from `MyDSN`

```
odbc load, table("MyTable") dsn("MyDSN")
```

Menu

odbc load

File > Import > ODBC data source

odbc insert

File > Export > ODBC data source

Syntax

List ODBC sources to which Stata can connect

odbc list

Retrieve available names from specified data source

odbc query ["*DataSourceName*" , verbose schema *connect_options*]

List column names and types associated with specified table

odbc describe ["*TableName*" , *connect_options*]

Import data from an ODBC data source

odbc load [*extvarlist*] [*if*] [*in*] , { table("*TableName*") | exec("*SqlStmt*") }
[*load_options connect_options*]

Export data to an ODBC data source

odbc insert [*varlist*] [*if*] [*in*], table("*TableName*")
{dsn("*DataSourceName*") | connectionstring("*ConnectStr*")}
[*insert_options connect_options*]

Allow SQL statements to be issued directly to ODBC data source

odbc exec("*SqlStmt*") ,
{dsn("*DataSourceName*") | connectionstring("*ConnectStr*")}
[*connect_options*]

Batch job alternative to odbc exec

odbc sqlfile("*filename*") ,
{dsn("*DataSourceName*") | connectionstring("*ConnectStr*")}
[loud *connect_options*]

Specify ODBC driver type

set odbcdriver { unicode | ansi } [, permanently]

Specify ODBC driver manager (Mac and Unix only)

set odbcmgr { iodbc | unixodbc } [, permanently]

DataSourceName is the name of the ODBC source (database, spreadsheet, etc.)

ConnectStr is a valid ODBC connection string

TableName is the name of a table within the ODBC data source

SqlStmt is an SQL SELECT statement

filename is pure SQL commands separated by semicolons

extvarlist contains

sqlvarname

varname = *sqlvarname*

connect_options	Description
`user(`*UserID*`)`	user ID of user establishing connection
`password(`*Password*`)`	password of user establishing connection
`dialog(noprompt)`	do not display ODBC connection-information dialog, and do not prompt user for connection information
`dialog(prompt)`	display ODBC connection-information dialog
`dialog(complete)`	display ODBC connection-information dialog only if there is not enough information
`dialog(required)`	display ODBC connection-information dialog only if there is not enough mandatory information provided
* `dsn("`*DataSourceName*`")`	name of data source
* `connectionstring("`*ConnectStr*`")`	ODBC connection string

*`dsn("`*DataSourceName*`")` is not allowed with `odbc query`. You may not specify both *DataSourceName* and `connectionstring()` with `odbc query`. Either `dsn()` or `connectionstring()` is required with `odbc insert`, `odbc exec`, and `odbc sqlfile`.

load_options	Description
* `table("`*TableName*`")`	name of table stored in data source
* `exec("`*SqlStmt*`")`	SQL SELECT statement to generate a table to be read into Stata
`clear`	load dataset even if there is one in memory
`noquote`	alter Stata's internal use of SQL commands; seldom used
`lowercase`	read variable names as lowercase
`sqlshow`	show all SQL commands issued
`allstring`	read all variables as strings
`datestring`	read date-formatted variables as strings
`multistatement`	allow multiple SQL statements delimited by `;` when using `exec()`
`bigintasdouble`	store BIGINT columns as Stata doubles on 64-bit operating systems

*Either `table("`*TableName*`")` or `exec("`*SqlStmt*`")` must be specified with `odbc load`.

insert_options	Description
* `table("`*TableName*`")`	name of table stored in data source
`overwrite`	clear data in ODBC table before data in memory is written to the table
`insert`	default mode of operation for the `odbc insert` command
`quoted`	quote all values with single quotes as they are inserted in ODBC table
`sqlshow`	show all SQL commands issued
`as("`*varlist*`")`	ODBC variables on the data source that correspond to the variables in Stata's memory
`block`	use block inserts

*`table("`*TableName*`")` is required for `odbc insert`.

Options

`user(`*UserID*`)` specifies the user ID of the user attempting to establish the connection to the data source. By default, Stata assumes that the user ID is the same as the one specified in the previous `odbc` command or is empty if `user()` has never been specified in the current session of Stata.

`password(`*Password*`)` specifies the password of the user attempting to establish the connection to the data source. By default, Stata assumes that the password is the same as the one previously specified or is empty if the password has not been used during the current session of Stata. Typically, the `password()` option will not be specified apart from the `user()` option.

`dialog(noprompt | prompt | complete | required)` specifies the mode the ODBC Driver Manager uses to display the ODBC connection-information dialog to prompt for more connection information.

`noprompt` is the default value. The ODBC connection-information dialog is not displayed, and you are not prompted for connection information. If there is not enough information to establish a connection to the specified data source, an error is returned.

`prompt` causes the ODBC connection-information dialog to be displayed.

`complete` causes the ODBC connection-information dialog to be displayed only if there is not enough information, even if the information is not mandatory.

`required` causes the ODBC connection-information dialog to be displayed only if there is not enough mandatory information provided to establish a connection to the specified data source. You are prompted only for mandatory information; controls for information that is not required to connect to the specified data source are disabled.

`dsn("`*DataSourceName*`")` specifies the name of a data source, as listed by the `odbc list` command. If a name contains spaces, it must be enclosed in double quotes. By default, Stata assumes that the data source name is the same as the one specified in the previous `odbc` command. This option is not allowed with `odbc query`. Either the `dsn()` option or the `connectionstring()` option may be specified with `odbc describe` and `odbc load`, and one of these options must be specified with `odbc insert`, `odbc exec`, and `odbc sqlfile`.

`connectionstring("`*ConnectStr*`")` specifies a connection string rather than the name of a data source. Stata does not assume that the connection string is the same as the one specified in the previous `odbc` command. Either *DataSourceName* or the `connectionstring()` option may be specified with `odbc query`; either the `dsn()` option or the `connectionstring()` option can be specified with `odbc describe` and `odbc load`, and one of these options must be specified with `odbc insert`, `odbc exec`, and `odbc sqlfile`.

`table("`*TableName*`")` specifies the name of an ODBC table stored in a specified data source's system catalog, as listed by the `odbc query` command. If a table name contains spaces, it must be enclosed in double quotes. Either the `table()` option or the `exec()` option—but not both—is required with the `odbc load` command.

`exec("`*SqlStmt*`")` allows you to issue an SQL SELECT statement to generate a table to be read into Stata. An error message is returned if the SELECT statement is an invalid SQL statement. The statement must be enclosed in double quotes. Either the `table()` option or the `exec()` option—but not both—is required with the `odbc load` command.

`clear` permits the data to be loaded, even if there is a dataset already in memory, and even if that dataset has changed since the data were last saved.

`noquote` alters Stata's internal use of SQL commands, specifically those relating to quoted table names, to better accommodate various drivers. This option has been particularly helpful for DB2 drivers.

`lowercase` causes all the variable names to be read as lowercase.

`sqlshow` is a useful option for showing all SQL commands issued to the ODBC data source from the `odbc insert` or `odbc load` command. This can help you debug any issues related to inserting or loading.

`allstring` causes all variables to be read as string data types.

`datestring` causes all date- and time-formatted variables to be read as string data types.

`multistatement` specifies that multiple SQL statements delimited by `;` be allowed when using the `exec()` option. Some drivers do not support multiple SQL statements.

`bigintasdouble` specifies that data stored in 64-bit integer (BIGINT) database columns be converted to Stata doubles. If any integer value is larger than 9,007,199,254,740,965 or less than −9,007,199,254,740,992, this conversion is not possible, and `odbc load` will issue an error message.

`overwrite` allows data to be cleared from an ODBC table before the data in memory are written to the table. All data from the ODBC table are erased, not just the data from the variable columns that will be replaced.

`insert` appends data to an existing ODBC table and is the default mode of operation for the `odbc insert` command.

`quoted` is useful for ODBC data sources that require all inserted values to be quoted. This option specifies that all values be quoted with single quotes as they are inserted into an ODBC table.

`as("`*varlist*`")` allows you to specify the ODBC variables on the data source that correspond to the variables in Stata's memory. If this option is specified, the number of variables must equal the number of variables being inserted, even if some names are identical.

`loud` specifies that output be displayed for SQL commands.

`verbose` specifies that `odbc query` list any data source alias, nickname, typed table, typed view, and view along with tables so that you can load data from these table types.

`schema` specifies that `odbc query` return schema names with the table names from a data source. Note: The schema names returned from `odbc query` will also be used with the `odbc describe` and `odbc load` commands. When using `odbc load` with a schema name, you might also need to specify the `noquote` option because some drivers do not accept quotes around table or schema names.

`block` specifies that `odbc insert` use block inserts to speed up data-writing performance. Some drivers do not support block inserts.

`permanently` (`set odbcdriver` and `set odbcmgr` only) specifies that, in addition to making the change right now, the setting be remembered and become the default setting when you invoke Stata.

Remarks and examples

When possible, the examples in this manual entry are developed using the `Northwind` sample database that is automatically installed with Microsoft Access. If you do not have Access, you can still use `odbc`, but you will need to consult the documentation for your other ODBC sources to determine how to set them up.

Remarks are presented under the following headings:

Unicode and ODBC

Stata supports accessing databases with Unicode data through Unicode ODBC drivers on the following platforms:

- Microsoft Windows through ODBC driver manager (version 3.5 or higher).
- Unix through unixODBC driver manager with ODBC drivers compiled for unixODBC. Stata does not support Unicode drivers when using iODBC as your driver manager. Stata requires that the driver support UTF-8.
- macOS through unixODBC driver manager with ODBC drivers compiled for unixODBC. Stata does not support Unicode drivers when using iODBC as your driver manager. Stata requires that the driver support UTF-8.

Stata supports non-Unicode databases through ASCII drivers with all driver managers.

Setting up the data sources

Before using Stata's ODBC commands, you must register your ODBC database with the *ODBC Data Source Administrator*. This process varies depending on platform, but the following example shows the steps necessary for Windows.

Using Windows 10, follow these steps to create an ODBC User Data Source for the `Northwind` sample database:

1. On the Start page, type `ODBC Data Sources`. From the list that appears, select the **ODBC Data Sources Desktop App**.
2. In the *Data Sources (ODBC)* dialog box,

   a. click on the *User DSN* tab;

   b. click on **Add...**;

   c. choose *Microsoft Access Driver (*.mdb,*.accdb)* on the *Create New Data Source* dialog box; and

d. click on **Finish**.

3. In the *ODBC Microsoft Access Setup* dialog box, type `Northwind` in the *Data Source Name* field and click on **Select...**. Locate the `Northwind.mdb` database and click on **OK** to finish creating the data source.

Using Windows 7, follow these steps to create an ODBC User Data Source for the `Northwind` sample database:

1. From the *Start Menu*, select the *Control Panel*.
2. In the *Control Panel* window, click on *System and Security* > *Administrative Tools*.
3. In the *Data Sources (ODBC)* dialog box,

   a. click on the *User DSN* tab;

   b. click on **Add...**;

   c. choose *Microsoft Access Driver (*.mdb,*.accdb)* on the *Create New Data Source* dialog box; and

   d. click on **Finish**.

4. In the *ODBC Microsoft Access Setup* dialog box, type `Northwind` in the *Data Source Name* field and click on **Select...**. Locate the `Northwind.mdb` database and click on **OK** to finish creating the data source.

❑ Technical note

In earlier versions of Windows, the exact location of the *Data Source (ODBC)* dialog varies, but it is always somewhere within the *Control Panel*.

❑

Listing ODBC data source names

`odbc list` is used to produce a list of data source names to which Stata can connect. For a specific data source name to be shown in the list, the data source has to be registered with the *ODBC Data Source Administrator*. See *Setting up the data sources* for information on how to do this.

▷ Example 1

```
. odbc list
Data Source Name                   Driver
-------------------------------------------------------------------------------
dBASE Files                        Microsoft Access dBASE Driver (*.dbf, *.ndx
Excel Files                        Microsoft Excel Driver (*.xls, *.xlsx, *.xl
MS Access Database                 Microsoft Access Driver (*.mdb, *.accdb)
Northwind                          Microsoft Access Driver (*.mdb, *.accdb)
-------------------------------------------------------------------------------
```

In the above list, `Northwind` is one of the sample Microsoft Access databases that Access installs by default.

◁

Listing available table names from a specified data source's system catalog

`odbc query` is used to list table names available from a specified data source.

▷ Example 2

```
. odbc query "Northwind"
DataSource: Northwind
Path      : C:\Program Files\Microsoft Office\Office\Samples\Northwind.accdb
-------------------------------------------------------------------------------
Customers
Employee Privileges
Employees
Inventory Transaction Types
Inventory Transactions
Invoices
Order Details
Order Details Status
Orders
Orders Status
Orders Tax Status
Privileges
Products
Purchase Order Details
Purchase Order Status
Purchase Orders
Sales Reports
Shippers
Strings
Suppliers
-------------------------------------------------------------------------------
```

◁

Describing a specified table

odbc describe is used to list column (variable) names and their SQL data types that are associated with a specified table.

▷ Example 3

Here we specify that we want to list all variables in the Employees table of the Northwind data source.

```
. odbc describe "Employees", dsn("Northwind")

DataSource: Northwind (query)
Table:      Employees (load)
─────────────────────────────────────────────────────────────────────────
Variable Name                               Variable Type
─────────────────────────────────────────────────────────────────────────
ID                                          COUNTER
Company                                     VARCHAR
Last Name                                   VARCHAR
First Name                                  VARCHAR
E-mail Address                              VARCHAR
Job Title                                   VARCHAR
Business Phone                              VARCHAR
Home Phone                                  VARCHAR
Mobile Phone                                VARCHAR
Fax Number                                  VARCHAR
Address                                     LONGCHAR
City                                        VARCHAR
State/Province                              VARCHAR
ZIP/Postal Code                             VARCHAR
Country/Region                              VARCHAR
Web Page                                    LONGCHAR
Notes                                       LONGCHAR
Attachments                                 LONGCHAR
─────────────────────────────────────────────────────────────────────────
```

◁

Loading data from ODBC sources

odbc load is used to load an ODBC table into memory.

To load an ODBC table listed in the odbc query output, specify the table name in the table() option and the data source name in the dsn() option.

▷ Example 4

We want to load the Employees table from the Northwind data source.

```
. clear

. odbc load, table("Employees") dsn("Northwind")
E-mail_Address invalid name
 - converted E-mail_Address to var5
State/Province invalid name
 - converted State/Province to var13
ZIP/Postal_Code invalid name
 - converted ZIP/Postal_Code to var14
Country/Region invalid name
 - converted Country/Region to var15
```

```
. describe

Contains data
 Observations:             9
    Variables:            18
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
ID              long    %12.0g
Company         str17   %17s
Last_Name       str14   %14s                  Last Name
First_Name      str7    %9s                   First Name
var5            str28   %28s                  E-mail Address
Job_Title       str21   %21s                  Job Title
Business_Phone  str13   %13s                  Business Phone
Home_Phone      str13   %13s                  Home Phone
Mobile_Phone    str1    %9s                   Mobile Phone
Fax_Number      str13   %13s                  Fax Number
Address         strL    %9s
City            str8    %9s
var13           str2    %9s                   State/Province
var14           str5    %9s                   ZIP/Postal Code
var15           str3    %9s                   Country/Region
Web_Page        strL    %9s                   Web Page
Notes           strL    %9s
Attachments     strL    %9s
--------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

❑

❑ Technical note

When Stata loads the ODBC table, data are converted from SQL data types to Stata data types. Stata does not support all SQL data types. If the column cannot be read because of incompatible data types, Stata will issue a note and skip a column. The following table lists the supported SQL data types and their corresponding Stata data types:

SQL data type	Stata data type
SQL_BIT SQL_TINYINT	byte
SQL_SMALLINT	int
SQL_INTEGER	long
SQL_DECIMAL SQL_NUMERIC	double
SQL_FLOAT SQL_DOUBLE	double
SQL_REAL	double
SQL_BIGINT	string
SQL_CHAR SQL_VARCHAR SQL_LONGVARCHAR SQL_WCHAR SQL_WVARCHAR SQL_WLONGVARCHAR	string
SQL_TIME SQL_DATE SQL_TIMESTAMP SQL_TYPE_TIME SQL_TYPE_DATE SQL_TYPE_TIMESTAMP	double
SQL_BINARY SQL_VARBINARY SQL_LONGVARBINARY	

❑

You can also load an ODBC table generated by an SQL SELECT statement specified in the `exec()` option.

▷ Example 5

Suppose that, from the `Northwind` data source, we want a list of all the customers who have placed orders. We might use the SQL SELECT statement

```
SELECT DISTINCT c.ID, c.Company
FROM Customers c
INNER JOIN Orders o
        ON c.[Customer ID] = o.CustomerID
```

To load the table into Stata, we use `odbc load` with the `exec()` option.

```
. odbc load, exec(`"SELECT DISTINCT c.ID, c.Company FROM Customers c INNER JOIN
> Orders o ON c.ID = o.[Customer ID]"') dsn("Northwind") clear
. describe
Contains data
 Observations:            15
    Variables:             2
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
ID              long    %12.0g
Company         str10   %10s
-------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

◁

The *extvarlist* is optional. It allows you to choose which columns (variables) are to be read and to rename variables when they are read.

▷ Example 6

Suppose that we want to load the `ID` column and the `Last Name` column from the `Employees` table of the `Northwind` data source. Moreover, we want to rename `ID` as `id` and `Last Name` as `name`.

```
. odbc load id=ID name="Last Name", table("Employees") dsn("Northwind") clear
. describe
Contains data
 Observations:             9
    Variables:             2
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
id              long    %12.0g                ID
name            str14   %14s                  Last Name
-------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

◁

The `if` and `in` qualifiers allow you to choose which rows are to be read. You can also use a `WHERE` clause in the SQL `SELECT` statement to select the rows to be read.

▷ Example 7

Suppose that we want the information from the Order Details table, where Quantity is greater than 50. We can specify the if and in qualifiers,

```
. odbc load if Quantity>50, table("Order Details") dsn("Northwind") clear
. sum Quantity
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
    Quantity |         10       177.7    94.21966         87        300
```

or we can issue the SQL SELECT statement directly:

```
. odbc load, exec("SELECT * FROM [Order Details] WHERE Quantity>50")
> dsn("Northwind") clear
. sum Quantity
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
    Quantity |         10       177.7    94.21966         87        300
```

◁

▷ Example 8

To use odbc insert, you must have an SQL table already created in your data source. If you do not, you can use odbc exec to create a table in your data source. For example, one might create a table in an Oracle database with the SQL command below:

```
#delimit ;
local cols `"   ID  NUMBER(5,0),
               PAY NUMBER(8,2),
             TITLE NVARCHAR2(18),
          LOCATION VARCHAR(40)"' ;
#delimit cr
odbc exec(`"CREATE TABLE JOB_TYPES (`cols');"'), dsn(oracle_dsn) ///
        user(username) password(password)
```

You must create a table using the correct data type for each table column for your data to transfer correctly. Note that the SQL syntax to create a table differs across data sources, as do column data types.

◁

Reference

Crow, K. 2017. Importing WRDS data into Stata. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2017/09/19/importing-wrds-data-into-stata/.

Also see

[D] **jdbc** — Load, write, or view data from a database with a Java API

[D] **export** — Overview of exporting data from Stata

[D] **import** — Overview of importing data into Stata

order — Reorder variables in dataset

Description

`order` relocates *varlist* to a position depending on which option you specify. If no option is specified, `order` relocates *varlist* to the beginning of the dataset in the order in which the variables are specified.

Quick start

Move `v1` to the beginning of the dataset

```
order v1
```

Same as above, but instead move `v1` to the end of the dataset

```
order v1, last
```

Move `v3` before `v2`

```
order v3, before(v2)
```

Move `x` and `z` after `y`

```
order x z, after(y)
```

Alphabetize `y`, `x`, and `z`, and move them to the beginning of the dataset

```
order y x z, alphabetic
```

Alphabetize `x`, `y`, `z`, `v3`, `v2`, and `v1`, and sort numbers in sequential order

```
order x y z v*, sequential
```

Menu

Data > Data utilities > Change order of variables

Syntax

`order` *varlist* [, *options*]

options	Description
`first`	move *varlist* to beginning of dataset; the default
`last`	move *varlist* to end of dataset
`before(`*varname*`)`	move *varlist* before *varname*
`after(`*varname*`)`	move *varlist* after *varname*
`alphabetic`	alphabetize *varlist* and move it to beginning of dataset
`sequential`	alphabetize *varlist* keeping numbers sequential and move it to beginning of dataset

Options

`first` shifts *varlist* to the beginning of the dataset. This is the default.

`last` shifts *varlist* to the end of the dataset.

`before(`*varname*`)` shifts *varlist* before *varname*.

`after(`*varname*`)` shifts *varlist* after *varname*.

`alphabetic` alphabetizes *varlist* and moves it to the beginning of the dataset. For example, here is a varlist in `alphabetic` order: `a x7 x70 x8 x80 z`. If combined with another option, `alphabetic` just alphabetizes *varlist*, and the movement of *varlist* is controlled by the other option.

`sequential` alphabetizes *varlist*, keeping variables with the same ordered letters but with differing appended numbers in sequential order. *varlist* is moved to the beginning of the dataset. For example, here is a varlist in `sequential` order: `a x7 x8 x70 x80 z`.

Remarks and examples

▷ Example 1

When using `order`, you must specify a *varlist*, but you do not need to specify all the variables in the dataset. For example, we want to move the `make` and `mpg` variables to the front of the `auto` dataset.

```
. use https://www.stata-press.com/data/r19/auto4
(1978 automobile data)

. describe

Contains data from https://www.stata-press.com/data/r19/auto4.dta
 Observations:            74                  1978 automobile data
    Variables:             6                  6 Apr 2024 00:20
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
price           int     %8.0gc                Price
weight          int     %8.0gc                Weight (lbs.)
mpg             byte    %8.0g                 Mileage (mpg)
make            str17   %-17s                 Make and model
length          int     %8.0g                 Length (in.)
rep78           byte    %8.0g                 Repair record 1978
-------------------------------------------------------------------------------
Sorted by:

. order make mpg

. describe

Contains data from https://www.stata-press.com/data/r19/auto4.dta
 Observations:            74                  1978 automobile data
    Variables:             6                  6 Apr 2024 00:20
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
make            str17   %-17s                 Make and model
mpg             byte    %8.0g                 Mileage (mpg)
price           int     %8.0gc                Price
weight          int     %8.0gc                Weight (lbs.)
length          int     %8.0g                 Length (in.)
rep78           byte    %8.0g                 Repair record 1978
-------------------------------------------------------------------------------
Sorted by:
```

We now want `length` to be the last variable in our dataset, so we could type `order make mpg price weight rep78 length`, but it would be easier to use the `last` option:

```
. order length, last

. describe

Contains data from https://www.stata-press.com/data/r19/auto4.dta
 Observations:            74                  1978 automobile data
    Variables:             6                  6 Apr 2024 00:20
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
make            str17   %-17s                 Make and model
mpg             byte    %8.0g                 Mileage (mpg)
price           int     %8.0gc                Price
weight          int     %8.0gc                Weight (lbs.)
rep78           byte    %8.0g                 Repair record 1978
length          int     %8.0g                 Length (in.)
-------------------------------------------------------------------------------
Sorted by:
```

We now change our mind and decide that we prefer that the variables be alphabetized.

```
. order _all, alphabetic

. describe

Contains data from https://www.stata-press.com/data/r19/auto4.dta
 Observations:            74                  1978 automobile data
    Variables:             6                  6 Apr 2024 00:20
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
length          int     %8.0g                 Length (in.)
make            str17   %-17s                 Make and model
mpg             byte    %8.0g                 Mileage (mpg)
price           int     %8.0gc                Price
rep78           byte    %8.0g                 Repair record 1978
weight          int     %8.0gc                Weight (lbs.)
-------------------------------------------------------------------------------
Sorted by:
```

◁

❑ Technical note

If your data contain variables named `year1`, `year2`, ..., `year19`, `year20`, specify the `sequential` option to obtain this ordering. If you specify the `alphabetic` option, `year10` will appear between `year1` and `year11`.

❑

Also see

[D] **describe** — Describe data in memory or in a file

[D] **ds** — Compactly list variables with specified properties

[D] **edit** — Browse or edit data with Data Editor

[D] **rename** — Rename variable

outfile — Export dataset in text format

Description Quick start Menu Syntax
Options Remarks and examples Also see

Description

`outfile` writes data to a disk file in plain text format, which can be read by other programs. The new file is *not* in Stata format; see [D] **save** for instructions on saving data for later use in Stata.

The data saved by `outfile` can be read back by `infile`; see [D] **import**. If *filename* is specified without an extension, `.raw` is assumed unless the `dictionary` option is specified, in which case `.dct` is assumed. If your *filename* contains embedded spaces, remember to enclose it in double quotes.

Quick start

Export current dataset to space-separated `mydata.raw`

```
outfile using mydata
```

Same as above, but export only `v1`, `v2`, and `v3`

```
outfile v1 v2 v3 using mydata
```

Same as above, but export to comma-separated `mydata.csv`

```
outfile v1 v2 v3 using mydata.csv, comma
```

Export current dataset in Stata's dictionary format to `myfile.dct`

```
outfile v1 v2 v3 using mydata, dictionary
```

Do not allow observations to break across lines

```
outfile using mydata, wide
```

Menu

File > Export > Text data (fixed- or free-format)

Syntax

`outfile` [*varlist*] `using` *filename* [*if*] [*in*] [, *options*]

options	Description
Main	
`dictionary`	write the file in Stata's dictionary format
`nolabel`	output numeric values (not labels) of labeled variables; the default is to write labels in double quotes
`noquote`	do not enclose strings in double quotes
`comma`	write file in comma-separated (instead of space-separated) format
`wide`	force one observation per line (no matter how wide)
Advanced	
`rjs`	right-justify string variables; the default is to left-justify
`fjs`	left-justify if format width $<$ 0; right-justify if format width $>$ 0
`runtogether`	all on one line, no quotes, no space between, and ignore formats
`missing`	retain missing values; use only with `comma`
`replace`	overwrite the existing file

`replace` does not appear in the dialog box.

Options

Main

`dictionary` writes the file in Stata's data dictionary format. See [D] **infile (fixed format)** for a description of dictionaries. `comma`, `missing`, and `wide` are not allowed with `dictionary`.

`nolabel` causes Stata to write the numeric values of labeled variables. The default is to write the labels enclosed in double quotes.

`noquote` prevents Stata from placing double quotes around the contents of strings, meaning string variables and value labels.

`comma` causes Stata to write the file in comma-separated–value format. In this format, values are separated by commas rather than by blanks. Missing values are written as two consecutive commas unless `missing` is specified.

`wide` causes Stata to write the data with 1 observation per line. The default is to split observations into lines of 80 characters or fewer, but strings longer than 80 characters are never split across lines.

Advanced

`rjs` and `fjs` affect how strings are justified; you probably do not want to specify either of these options. By default, `outfile` outputs strings left-justified in their field.

If `rjs` is specified, strings are output right-justified. `rjs` stands for "right-justified strings".

If `fjs` is specified, strings are output left- or right-justified according to the variable's format: left-justified if the format width is negative and right-justified if the format width is positive. `fjs` stands for "format-justified strings".

`runtogether` is a programmer's option that is valid only when all variables of the specified *varlist* are of type `string`. `runtogether` specifies that the variables be output in the order specified, without quotes, with no spaces between, and ignoring the display format attached to each variable. Each observation ends with a new line character.

`missing`, valid only with `comma`, specifies that missing values be retained. When `comma` is specified without `missing`, missing values are changed to null strings (`""`).

The following option is available with `outfile` but is not shown in the dialog box:

`replace` permits `outfile` to overwrite an existing dataset.

Remarks and examples

`outfile` enables data to be sent to a disk file for processing by a non-Stata program. Each observation is written as one or more records that will not exceed 80 characters unless you specify the `wide` option. Each column other than the first is prefixed by two blanks.

`outfile` is careful to put the data in columns in case you want to read the data by using formatted input. String variables and value labels are output in left-justified fields by default. You can change this behavior by using the `rjs` or `fjs` options.

Numeric variables are output right-justified in the field width specified by their display format. A numeric variable with a display format of `%9.0g` will be right-justified in a nine-character field. Commas are not written in numeric variables, even if a comma format is used.

If you specify the `dictionary` option, the data are written in the same way, but preceding the data, `outfile` writes a data dictionary describing the contents of the file.

▷ Example 1: Basic usage

We have entered into Stata some data on seven employees in our firm. The data contain employee name, employee identification number, salary, and sex:

```
. list

     +------------------------------------------+
     | name            empno   salary   sex     |
     |------------------------------------------|
  1. | Carl Marks      57213   24,000   male    |
  2. | Irene Adler     47229   27,000   female  |
  3. | Adam Smith      57323   24,000   male    |
  4. | David Wallis    57401   24,500   male    |
  5. | Mary Rogers     57802   27,000   female  |
     |------------------------------------------|
  6. | Carolyn Frank   57805   24,000   female  |
  7. | Robert Lawson   57824   22,500   male    |
     +------------------------------------------+
```

The last variable in our data, `sex`, is really a numeric variable, but it has an associated value label.

If we now wish to use a program other than Stata with these data, we must somehow get the data over to that other program. The standard Stata-format dataset created by `save` will not do the job—it is written in a special format that only Stata understands. Most programs, however, understand plain text datasets, such as those produced by a text editor. We can tell Stata to produce such a dataset by using `outfile`. Typing `outfile using employee` creates a dataset called `employee.raw` that contains all the data. We can use the Stata `type` command to review the resulting file:

```
. outfile using employee
. type employee.raw
"Carl Marks"            57213      24000   "male"
"Irene Adler"           47229      27000   "female"
"Adam Smith"            57323      24000   "male"
"David Wallis"          57401      24500   "male"
"Mary Rogers"           57802      27000   "female"
"Carolyn Frank"         57805      24000   "female"
"Robert Lawson"         57824      22500   "male"
```

We see that the file contains the four variables and that Stata has surrounded the string variables with double quotes.

◁

❑ Technical note

The `nolabel` option prevents Stata from substituting value-label strings for the underlying numeric values; see [U] **12.6.3 Value labels**. The last variable in our data is really a numeric variable:

```
. outfile using employ2, nolabel
. type employ2.raw
"Carl Marks"            57213      24000           0
"Irene Adler"           47229      27000           1
"Adam Smith"            57323      24000           0
"David Wallis"          57401      24500           0
"Mary Rogers"           57802      27000           1
"Carolyn Frank"         57805      24000           1
"Robert Lawson"         57824      22500           0
```

❑

❑ Technical note

If you do not want Stata to place double quotes around the contents of string variables, you can specify the `noquote` option:

```
. outfile using employ3, noquote
. type employ3.raw
Carl Marks            57213      24000   male
Irene Adler           47229      27000   female
Adam Smith            57323      24000   male
David Wallis          57401      24500   male
Mary Rogers           57802      27000   female
Carolyn Frank         57805      24000   female
Robert Lawson         57824      22500   male
```

❑

▷ Example 2: Overwriting an existing file

Stata never writes over an existing file unless explicitly told to do so. For instance, if the file `employee.raw` already exists and we attempt to overwrite it by typing `outfile using employee`, here is what would happen:

```
. outfile using employee
file employee.raw already exists
r(602);
```

We can tell Stata that it is okay to overwrite a file by specifying the replace option:

```
. outfile using employee, replace
```

◁

❑ Technical note

Some programs prefer data to be separated by commas rather than by blanks. Stata produces such a dataset if you specify the comma option:

```
. outfile using employee, comma replace
. type employee.raw
"Carl Marks",57213,24000,"male"
"Irene Adler",47229,27000,"female"
"Adam Smith",57323,24000,"male"
"David Wallis",57401,24500,"male"
"Mary Rogers",57802,27000,"female"
"Carolyn Frank",57805,24000,"female"
"Robert Lawson",57824,22500,"male"
```

❑

▷ Example 3: Creating data dictionaries

Finally, outfile can create data dictionaries that infile can read. Dictionaries are perhaps the best way to organize your raw data. A dictionary describes your data so that you do not have to remember the order of the variables, the number of variables, the variable names, or anything else. The file in which you store your data becomes self-documenting so that you can understand the data in the future. See [D] **infile (fixed format)** for a full description of data dictionaries.

When you specify the dictionary option, Stata writes a .dct file:

```
. outfile using employee, dict replace
. type employee.dct
dictionary {
        str15  name              `"Employee name"'
        float  empno             `"Employee number"'
        float  salary            `"Annual salary"'
        float  sex      :sexlbl  `"Sex"'
}
"Carl Marks"            57213      24000   "male"
"Irene Adler"           47229      27000   "female"
"Adam Smith"            57323      24000   "male"
"David Wallis"          57401      24500   "male"
"Mary Rogers"           57802      27000   "female"
"Carolyn Frank"         57805      24000   "female"
"Robert Lawson"         57824      22500   "male"
```

◁

▷ Example 4: Working with dates

We have historical data on the S&P 500 for the month of January 2001.

```
. use https://www.stata-press.com/data/r19/outfilexmpl, clear
(S&P 500)

. describe

Contains data from https://www.stata-press.com/data/r19/outfilexmpl.dta
 Observations:            21                  S&P 500
    Variables:             6                  6 Apr 2024 16:02
                                              (_dta has notes)
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
date            int     %td                   Date
open            float   %9.0g                 Opening price
high            float   %9.0g                 High price
low             float   %9.0g                 Low price
close           float   %9.0g                 Closing price
volume          int     %12.0gc               Volume (thousands)
-------------------------------------------------------------------------------
Sorted by: date
```

The `date` variable has a display format of `%td` so that it is displayed as *ddmmmyyyy*.

```
. list

     +---------------------------------------------------------------+
     |      date      open      high       low     close    volume |
     |---------------------------------------------------------------|
  1. | 02jan2001   1320.28   1320.28   1276.05   1283.27    11,294 |
  2. | 03jan2001   1283.27   1347.76   1274.62   1347.56    18,807 |
  3. | 04jan2001   1347.56   1350.24   1329.14   1333.34    21,310 |
  4. | 05jan2001   1333.34   1334.77   1294.95   1298.35    14,308 |
  5. | 08jan2001   1298.35   1298.35   1276.29   1295.86    11,155 |
     |---------------------------------------------------------------|
  6. | 09jan2001   1295.86   1311.72   1295.14    1300.8    11,913 |
  7. | 10jan2001    1300.8   1313.76   1287.28   1313.27    12,965 |
  8. | 11jan2001   1313.27   1332.19   1309.72   1326.82    14,112 |
  9. | 12jan2001   1326.82   1333.21   1311.59   1318.55    12,760 |
 10. | 16jan2001   1318.32   1327.81   1313.33   1326.65    12,057 |
     |---------------------------------------------------------------|
 11. | 17jan2001   1326.65   1346.92   1325.41   1329.47    13,491 |
 12. | 18jan2001   1329.89   1352.71   1327.41   1347.97    14,450 |
 13. | 19jan2001   1347.97   1354.55   1336.74   1342.54    14,078 |
 14. | 22jan2001   1342.54   1353.62   1333.84    1342.9    11,640 |
 15. | 23jan2001    1342.9    1362.9   1339.63    1360.4    12,326 |
     |---------------------------------------------------------------|
 16. | 24jan2001    1360.4   1369.75   1357.28    1364.3    13,090 |
 17. | 25jan2001    1364.3   1367.35   1354.63   1357.51    12,580 |
 18. | 26jan2001   1357.51   1357.51   1342.75   1354.95    10,980 |
 19. | 29jan2001   1354.92   1365.54   1350.36   1364.17    10,531 |
 20. | 30jan2001   1364.17   1375.68    1356.2   1373.73    11,498 |
     |---------------------------------------------------------------|
 21. | 31jan2001   1373.73   1383.37   1364.66   1366.01    12,953 |
     +---------------------------------------------------------------+
```

We outfile our data and use the `type` command to view the result.

```
. outfile using sp
. type sp.raw
"02jan2001"    1320.28    1320.28    1276.05    1283.27          11294
"03jan2001"    1283.27    1347.76    1274.62    1347.56          18807
"04jan2001"    1347.56    1350.24    1329.14    1333.34          21310
"05jan2001"    1333.34    1334.77    1294.95    1298.35          14308
"08jan2001"    1298.35    1298.35    1276.29    1295.86          11155
"09jan2001"    1295.86    1311.72    1295.14     1300.8          11913
"10jan2001"     1300.8    1313.76    1287.28    1313.27          12965
"11jan2001"    1313.27    1332.19    1309.72    1326.82          14112
"12jan2001"    1326.82    1333.21    1311.59    1318.55          12760
"16jan2001"    1318.32    1327.81    1313.33    1326.65          12057
"17jan2001"    1326.65    1346.92    1325.41    1329.47          13491
"18jan2001"    1329.89    1352.71    1327.41    1347.97          14450
"19jan2001"    1347.97    1354.55    1336.74    1342.54          14078
"22jan2001"    1342.54    1353.62    1333.84     1342.9          11640
"23jan2001"     1342.9     1362.9    1339.63     1360.4          12326
"24jan2001"     1360.4    1369.75    1357.28     1364.3          13090
"25jan2001"     1364.3    1367.35    1354.63    1357.51          12580
"26jan2001"    1357.51    1357.51    1342.75    1354.95          10980
"29jan2001"    1354.92    1365.54    1350.36    1364.17          10531
"30jan2001"    1364.17    1375.68     1356.2    1373.73          11498
"31jan2001"    1373.73    1383.37    1364.66    1366.01          12953
```

The `date` variable, originally stored as an `int`, was outfiled as a string variable. Whenever Stata outfiles a variable with a date format, Stata outfiles the variable as a `string`.

◁

Also see

[D] **export** — Overview of exporting data from Stata

[D] **import** — Overview of importing data into Stata

[U] 22 Entering and importing data

pctile — Create variable containing percentiles

Description

`pctile` creates a new variable containing the percentiles of *exp*, where the expression *exp* is typically just another variable.

`xtile` creates a new variable that categorizes *exp* by its quantiles. If the `cutpoints(`*varname*`)` option is specified, it categorizes *exp* using the values of *varname* as category cutpoints. For example, *varname* might contain percentiles of another variable, generated by `pctile`.

`_pctile` is a programmer's command that computes up to 4,096 percentiles and places the results in `r()`; see **[U] 18.8 Accessing results calculated by other programs**. `summarize, detail` computes some percentiles (1, 5, 10, 25, 50, 75, 90, 95, and 99th); see [R] **summarize**.

Quick start

Create `qrt1` containing the quartiles of `v`

```
pctile qrt1 = v, nq(4)
```

Same as above, and create `percent` containing the percentages

```
pctile qrt1 = v, nq(4) genp(percent)
```

Same as above, but apply sampling weights `wvar1`

```
pctile qrt1 = v [pweight=wvar1], nq(4) genp(percent)
```

Create `dec1` containing the deciles of `v`

```
pctile dec1 = v, nq(10)
```

Same as above, but create `dec2` indicating to which decile each observation belongs

```
xtile dec2 = v, nq(10)
```

Same as above, but apply frequency weights `wvar2`

```
xtile dec2 = v [fweight=wvar2], nq(10)
```

Compute the 10th and 90th percentiles, and store them in `r(r1)` and `r(r2)`

```
_pctile v, percentiles(10 90)
```

Menu

pctile

Statistics > Summaries, tables, and tests > Summary and descriptive statistics > Create variable of percentiles

xtile

Statistics > Summaries, tables, and tests > Summary and descriptive statistics > Create variable of quantiles

Syntax

Create variable containing percentiles

`pctile` [*type*] *newvar* = *exp* [*if*] [*in*] [*weight*] [, *pctile_options*]

Create variable containing quantile categories

`xtile` *newvar* = *exp* [*if*] [*in*] [*weight*] [, *xtile_options*]

Compute percentiles and store them in r()

`_pctile` *varname* [*if*] [*in*] [*weight*] [, *_pctile_options*]

pctile_options	Description
Main	
`nquantiles(#)`	number of quantiles; default is `nquantiles(2)`
`genp(`*newvar*$_p$`)`	generate *newvar*$_p$ variable containing percentages
`altdef`	use alternative formula for calculating percentiles

xtile_options	Description
Main	
`nquantiles(#)`	number of quantiles; default is `nquantiles(2)`
`cutpoints(`*varname*`)`	use values of *varname* as cutpoints
`altdef`	use alternative formula for calculating percentiles

_pctile_options	Description
`nquantiles(#)`	number of quantiles; default is `nquantiles(2)`
`percentiles(`*numlist*`)`	calculate percentiles corresponding to the specified percentages
`altdef`	use alternative formula for calculating percentiles

`collect` is allowed with `pctile`; see **[U] 11.1.10 Prefix commands**.

`aweight`s, `fweight`s, and `pweight`s are allowed (see **[U] 11.1.6 weight**), except when the `altdef` option is specified, in which case no weights are allowed.

Options

Main

`nquantiles(#)` specifies the number of quantiles. It computes percentiles corresponding to percentages $100\,k/m$ for $k = 1, 2, \ldots, m-1$, where $m = \#$. For example, `nquantiles(10)` requests that the 10th, 20th, …, 90th percentiles be computed. The default is `nquantiles(2)`; that is, the median is computed.

`genp(`*newvar*$_p$`)` (`pctile` only) specifies a new variable to be generated containing the percentages corresponding to the percentiles.

`altdef` uses an alternative formula for calculating percentiles. The default method is to invert the empirical distribution function by using averages, $(x_i + x_{i+1})/2$, where the function is flat (the default is the same method used by `summarize`; see [R] **summarize**). The alternative formula uses an interpolation method. See *Methods and formulas* at the end of this entry. Weights cannot be used when `altdef` is specified.

`cutpoints(`*varname*`)` (`xtile` only) requests that `xtile` use the values of *varname*, rather than quantiles, as cutpoints for the categories. All values of *varname* are used, regardless of any `if` or `in` restriction; see the technical note in the `xtile` section below.

`percentiles(`*numlist*`)` (`_pctile` only) requests percentiles corresponding to the specified percentages. Percentiles are placed in `r(r1)`, `r(r2)`, ..., etc. For example, `percentiles(10(20)90)` requests that the 10th, 30th, 50th, 70th, and 90th percentiles be computed and placed into `r(r1)`, `r(r2)`, `r(r3)`, `r(r4)`, and `r(r5)`. Up to 4,096 (inclusive) percentiles can be requested. See [P] **numlist** for the syntax of a numlist.

Remarks and examples

Remarks are presented under the following headings:

pctile
xtile
_pctile

pctile

`pctile` creates a new variable containing percentiles. You specify the number of quantiles that you want, and `pctile` computes the corresponding percentiles. Here we use Stata's `auto` dataset and compute the deciles of `mpg`:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. pctile pct = mpg, nq(10)

. list pct in 1/10

     +-----+
     | pct |
     |-----|
  1. |  14 |
  2. |  17 |
  3. |  18 |
  4. |  19 |
  5. |  20 |
     |-----|
  6. |  22 |
  7. |  24 |
  8. |  25 |
  9. |  29 |
 10. |   . |
     +-----+
```

If we use the genp() option to generate another variable with the corresponding percentages, it is easier to distinguish between the percentiles.

```
. drop pct
. pctile pct = mpg, nq(10) genp(percent)
. list percent pct in 1/10

     +---------------+
     | percent   pct |
     |---------------|
  1. |      10    14 |
  2. |      20    17 |
  3. |      30    18 |
  4. |      40    19 |
  5. |      50    20 |
     |---------------|
  6. |      60    22 |
  7. |      70    24 |
  8. |      80    25 |
  9. |      90    29 |
 10. |       .     . |
     +---------------+
```

summarize, detail calculates standard percentiles.

```
. summarize mpg, detail
                        Mileage (mpg)
-------------------------------------------------------------
      Percentiles      Smallest
 1%           12             12
 5%           14             12
10%           14             14       Obs                  74
25%           18             14       Sum of wgt.          74

50%           20                      Mean            21.2973
                        Largest       Std. dev.      5.785503
75%           25             34
90%           29             35       Variance       33.47205
95%           34             35       Skewness       .9487176
99%           41             41       Kurtosis       3.975005
```

summarize, detail can calculate only these particular percentiles. The pctile and _pctile commands allow you to compute any percentile.

Weights can be used with `pctile`, `xtile`, and `_pctile`:

```
. drop pct percent

. pctile pct = mpg [w=weight], nq(10) genp(percent)
(analytic weights assumed)

. list percent pct in 1/10
```

	percent	pct
1.	10	14
2.	20	16
3.	30	17
4.	40	18
5.	50	19
6.	60	20
7.	70	22
8.	80	24
9.	90	28
10.	.	.

The result is the same, no matter which weight type you specify—`aweight`, `fweight`, or `pweight`.

xtile

`xtile` creates a categorical variable that contains categories corresponding to quantiles. We illustrate this with a simple example. Suppose that we have a variable, `bp`, containing blood pressure measurements:

```
. use https://www.stata-press.com/data/r19/bp1, clear

. list
```

	bp
1.	98
2.	100
3.	104
4.	110
5.	120
6.	120
7.	120
8.	120
9.	125
10.	130
11.	132

`xtile` can be used to create a variable, `quart`, that indicates the quartiles of `bp`.

```
. xtile quart = bp, nq(4)
. list bp quart, sepby(quart)
```

	bp	quart
1.	98	1
2.	100	1
3.	104	1
4.	110	2
5.	120	2
6.	120	2
7.	120	2
8.	120	2
9.	125	3
10.	130	4
11.	132	4

The categories created are

$$(-\infty, x_{[25]}\,], \quad (x_{[25]}, x_{[50]}\,], \quad (x_{[50]}, x_{[75]}\,], \quad (x_{[75]}, +\infty)$$

where $x_{[25]}$, $x_{[50]}$, and $x_{[75]}$ are, respectively, the 25th, 50th (median), and 75th percentiles of `bp`. We could use the `pctile` command to generate these percentiles:

```
. pctile pct = bp, nq(4) genp(percent)
. list bp quart percent pct, sepby(quart)
```

	bp	quart	percent	pct
1.	98	1	25	104
2.	100	1	50	120
3.	104	1	75	125
4.	110	2	.	.
5.	120	2	.	.
6.	120	2	.	.
7.	120	2	.	.
8.	120	2	.	.
9.	125	3	.	.
10.	130	4	.	.
11.	132	4	.	.

`xtile` can categorize a variable on the basis of any set of cutpoints, not just percentiles. Suppose that we wish to create the following categories for blood pressure:

$$(-\infty, 100\,], \quad (100, 110\,], \quad (110, 120\,], \quad (120, 130\,], \quad (130, +\infty)$$

To do this, we simply create a variable containing the cutpoints,

```
. input class

          class
  1. 100
  2. 110
  3. 120
  4. 130
  5. end
```

and then use `xtile` with the `cutpoints()` option:

```
. xtile category = bp, cutpoints(class)

. list bp class category, sepby(category)
```

	bp	class	category
1.	98	100	1
2.	100	110	1
3.	104	120	2
4.	110	130	2
5.	120	.	3
6.	120	.	3
7.	120	.	3
8.	120	.	3
9.	125	.	4
10.	130	.	4
11.	132	.	5

The cutpoints can, of course, come from anywhere. They can be the quantiles of another variable or the quantiles of a subgroup of the variable. Suppose that we had a variable, `case`, that indicated whether an observation represented a case (`case` = 1) or control (`case` = 0).

```
. use https://www.stata-press.com/data/r19/bp2, clear

. list in 1/11, sep(4)
```

	bp	case
1.	98	1
2.	100	1
3.	104	1
4.	110	1
5.	120	1
6.	120	1
7.	120	1
8.	120	1
9.	125	1
10.	130	1
11.	132	1

We can categorize the cases on the basis of the quantiles of the controls. To do this, we first generate a variable, pct, containing the percentiles of the controls' blood pressure data:

```
. pctile pct = bp if case==0, nq(4)
. list pct in 1/4

     +-----+
     | pct |
     |-----|
  1. | 104 |
  2. | 117 |
  3. | 124 |
  4. |   . |
     +-----+
```

Then we use these percentiles as cutpoints to classify bp: for all subjects.

```
. xtile category = bp, cutpoints(pct)
. gsort -case bp
. list bp case category in 1/11, sepby(category)

     +-----------------------+
     |  bp   case   category |
     |-----------------------|
  1. |  98      1          1 |
  2. | 100      1          1 |
  3. | 104      1          1 |
     |-----------------------|
  4. | 110      1          2 |
     |-----------------------|
  5. | 120      1          3 |
  6. | 120      1          3 |
  7. | 120      1          3 |
  8. | 120      1          3 |
     |-----------------------|
  9. | 125      1          4 |
 10. | 130      1          4 |
 11. | 132      1          4 |
     +-----------------------+
```

❑ Technical note

In the last example, if we wanted to categorize only cases, we could have issued the command

```
. xtile category = bp if case==1, cutpoints(pct)
```

Most Stata commands follow the logic that using an `if` *exp* is equivalent to dropping observations that do not satisfy the expression and running the command. This is not true of `xtile` when the `cutpoints()` option is used. (When the `cutpoints()` option is not used, the standard logic is true.) `xtile` uses all nonmissing values of the `cutpoints()` variable whether or not these values belong to observations that satisfy the `if` expression.

If you do not want to use all the values in the `cutpoints()` variable as cutpoints, simply set the ones that you do not need to missing. `xtile` does not care about the order of the values or whether they are separated by missing values.

❑

❑ Technical note

Quantiles are not always unique. If we categorize our blood pressure data by quintiles rather than quartiles, we get

```
. use https://www.stata-press.com/data/r19/bp1, clear
. xtile quint = bp, nq(5)
. pctile pct = bp, nq(5) genp(percent)
. list bp quint pct percent, sepby(quint)
```

	bp	quint	pct	percent
1.	98	1	104	20
2.	100	1	120	40
3.	104	1	120	60
4.	110	2	125	80
5.	120	2	.	.
6.	120	2	.	.
7.	120	2	.	.
8.	120	2	.	.
9.	125	4	.	.
10.	130	5	.	.
11.	132	5	.	.

The 40th and 60th percentile are the same; they are both 120. When two (or more) percentiles are the same, they are given the lower category number.

❑

_pctile

`_pctile` is a programmer's command. It computes percentiles and stores them in `r()`; see [U] 18.8 Accessing results calculated by other programs.

You can use _pctile to compute quantiles, just as you can with pctile:

```
. use https://www.stata-press.com/data/r19/auto, clear
(1978 automobile data)

. _pctile weight, nq(10)

. return list

scalars:
                  r(r1) =  2020
                  r(r2) =  2160
                  r(r3) =  2520
                  r(r4) =  2730
                  r(r5) =  3190
                  r(r6) =  3310
                  r(r7) =  3420
                  r(r8) =  3700
                  r(r9) =  4060
```

The percentiles() option (abbreviation p()) can be used to compute any percentile you wish:

```
. _pctile weight, p(10, 33.333, 45, 50, 55, 66.667, 90)

. return list

scalars:
                  r(r1) =  2020
                  r(r2) =  2640
                  r(r3) =  2830
                  r(r4) =  3190
                  r(r5) =  3250
                  r(r6) =  3400
                  r(r7) =  4060
```

_pctile, pctile, and xtile each have an option that uses an alternative definition of percentiles, based on an interpolation scheme; see *Methods and formulas* below.

```
. _pctile weight, p(10, 33.333, 45, 50, 55, 66.667, 90) altdef

. return list

scalars:
                  r(r1) =  2005
                  r(r2) =  2639.985
                  r(r3) =  2830
                  r(r4) =  3190
                  r(r5) =  3252.5
                  r(r6) =  3400.005
                  r(r7) =  4060
```

The default formula inverts the empirical distribution function. The default formula is more commonly used, although some consider the "alternative" formula to be the standard definition. One drawback of the alternative formula is that it does not have an obvious generalization to noninteger weights.

❑ Technical note

summarize, detail computes the 1st, 5th, 10th, 25th, 50th (median), 75th, 90th, 95th, and 99th percentiles. There is no real advantage in using _pctile to compute these percentiles. Both summarize, detail and _pctile use the same internal code. _pctile is slightly faster because summarize, detail computes a few extra things. The value of _pctile is its ability to compute percentiles other than these standard ones.

❑

Stored results

`pctile` and `_pctile` store the following in `r()`:

Scalars

`r(r#)`	value of #-requested percentile

Methods and formulas

The default formula for percentiles is as follows: Let $x_{(j)}$ refer to the x in ascending order for $j = 1, 2, \ldots, n$. Let $w_{(j)}$ refer to the corresponding weights of $x_{(j)}$; if there are no weights, $w_{(j)} = 1$. Let $N = \sum_{j=1}^{n} w_{(j)}$.

To obtain the pth percentile, which we will denote as $x_{[p]}$, let $P = Np/100$, and let

$$W_{(i)} = \sum_{j=1}^{i} w_{(j)}$$

Find the first index, i, such that $W_{(i)} > P$. The pth percentile is then

$$x_{[p]} = \begin{cases} \dfrac{x_{(i-1)} + x_{(i)}}{2} & \text{if } W_{(i-1)} = P \\ x_{(i)} & \text{otherwise} \end{cases}$$

When the `altdef` option is specified, the following alternative definition is used. Here weights are not allowed.

Let i be the integer floor of $(n+1)p/100$; that is, i is the largest integer $i \leq (n+1)p/100$. Let h be the remainder $h = (n+1)p/100 - i$. The pth percentile is then

$$x_{[p]} = (1-h)x_{(i)} + hx_{(i+1)}$$

where $x_{(0)}$ is taken to be $x_{(1)}$ and $x_{(n+1)}$ is taken to be $x_{(n)}$.

`xtile` produces the categories

$$(-\infty, x_{[p_1]}],\ (x_{[p_1]}, x_{[p_2]}],\ \ldots\ ,\ (x_{[p_{m-2}]}, x_{[p_{m-1}]}],\ (x_{[p_{m-1}]}, +\infty)$$

numbered, respectively, $1, 2, \ldots, m$, based on the m quantiles given by the p_kth percentiles, where $p_k = 100\,k/m$ for $k = 1, 2, \ldots, m-1$.

If $x_{[p_{k-1}]} = x_{[p_k]}$, the kth category is empty. All elements $x = x_{[p_{k-1}]} = x_{[p_k]}$ are put in the $(k-1)$th category: $(x_{[p_{k-2}]}, x_{[p_{k-1}]}]$.

If `xtile` is used with the `cutpoints(`*varname*`)` option, the categories are

$$(-\infty, y_{(1)}],\ (y_{(1)}, y_{(2)}],\ \ldots\ ,\ (y_{(m-1)}, y_{(m)}],\ (y_{(m)}, +\infty)$$

and they are numbered, respectively, $1, 2, \ldots, m+1$, based on the m nonmissing values of *varname*: $y_{(1)}, y_{(2)}, \ldots, y_{(m)}$.

Acknowledgment

`xtile` is based on a command originally posted on Statalist (see **[U] 3.2.4 The Stata Forum**) by Philip Ryan of the Discipline of Public Health at the University of Adelaide, Australia.

Also see

[R] **centile** — Report centile and confidence interval

[R] **summarize** — Summary statistics

[U] 18.8 Accessing results calculated by other programs

putmata — Put Stata variables into Mata and vice versa

Description

putmata exports the contents of Stata variables to Mata vectors and matrices.

getmata imports the contents of Mata vectors and matrices to Stata variables.

putmata and getmata are useful for creating solutions to problems more easily solved in Mata. The commands are also useful in teaching.

Quick start

Create a Mata vector for each Stata variable in memory

```
putmata *
```

Same as above, but create a vector only for nonmissing values of idvar, v1, and v2

```
putmata idvar v1 v2, omitmissing
```

Place variables v1 and v2 into column vectors x1 and x2

```
putmata idvar x1=v1 x2=v2
```

Create Mata matrix X from v1 and v2

```
putmata X=(v1 v2)
```

Create Stata variables newv1 and newv2 from Mata matrix X

```
getmata (newv1 newv2)=X
```

Replace v1 and v2 with columns from Mata matrix X

```
getmata (v1 v2)=X, replace
```

Same as above, and match observations using idvar Mata vector

```
getmata (v1 v2)=X, replace id(idvar)
```

Syntax

putmata *putlist* [*if*] [*in*] [, *putmata_options*]

getmata *getlist* [, *getmata_options*]

putmata_options	Description
`omitmissing`	omit observations with missing values
`view`	create vectors and matrices as views, not as copies
`replace`	replace existing Mata vectors and matrices

A *putlist* can be as simple as a list of Stata variable names. See below for details.

getmata_options	Description
`double`	create Stata variables as `double`s
`update`	update existing Stata variables
`replace`	replace existing Stata variables
`id(`*name*`)`	match observations with rows based on equal values of variable *name* and matrix *name*; `id(`*varname*=*vecname*`)` is also allowed
`force`	allow nonconformable matrices; usually, `id()` is preferable

A *getlist* can be as simple as a list of Mata vector names. See below for details.

`collect` is allowed with `putmata` and `getmata`; see **[U] 11.1.10 Prefix commands**.

Definition of *putlist* for use with `putmata`:

A *putlist* is one or more of any of the following:

*
varname
varlist
vecname=*varname*
matname=(*varlist*)
matname=([*varlist*] # [*varlist*] [...])

Example: `putmata *`
Creates a vector in Mata for each of the Stata variables in memory. Vectors contain the same data as Stata variables. Vectors have the same names as the corresponding variables.

Example: `putmata mpg weight displ`
Creates a vector in Mata for each variable specified. Vectors have the same names as the corresponding variables. In this example, `displ` is an abbreviation for the variable `displacement`; thus the vector will also be named `displacement`.

Example: `putmata mileage=mpg pounds=weight`
Creates a vector for each variable specified. Vector names differ from the corresponding variable names. In this example, vectors will be named `mileage` and `pounds`.

Example: `putmata y=mpg X=(weight displ)`
Creates $N \times 1$ Mata vector **y** equal to Stata variable `mpg`, and creates $N \times 2$ Mata matrix **X** containing the values of Stata variables `weight` and `displacement`.

Example: putmata y=mpg X=(weight displ 1)

Creates $N \times 1$ Mata vector **y** containing mpg, and creates $N \times 3$ Mata matrix **X** containing weight, displacement, and a column of 1s. After typing this example, you could enter Mata and type invsym(X'X)*X'y to obtain the regression coefficients.

Syntactical elements may be combined. It is valid to type

```
. putmata mpg foreign X=(weight displ) Z=(foreign 1)
```

No matter how you specify the *putlist*, you will need to specify the replace option if some or all vectors already exist in Mata:

```
. putmata mpg foreign X=(weight displ) Z=(foreign 1), replace
```

Definition of *getlist* for use with getmata:

A *getlist* is one or more of any of the following:

vecname
varname=*vecname*
(*varname varname* ... *varname*)=*matname*
(*varname**)=*matname*

Example: getmata x1 x2

Creates a Stata variable for each Mata vector specified. Variables will have the same names as the corresponding vectors. Names may not be abbreviated.

Example: getmata myvar1=x1 myvar2=x2

Creates a Stata variable for each Mata vector specified. Variable names will differ from the corresponding vector names.

Example: getmata (firstvar secondvar)=X

Creates one Stata variable corresponding to each column of the Mata matrix specified. In this case, the matrix has two columns, and corresponding variables will be named firstvar and secondvar. If the matrix had three columns, then three variable names would need to be specified.

Example: getmata (myvar*)=X

Creates one Stata variable corresponding to each column of the Mata matrix specified. Variables will be named myvar1, myvar2, etc. The matrix may have any number of columns, even zero!

Syntactical elements may be combined. It is valid to type

```
. getmata r1 r2 final=r3 (rplus*)=X
```

No matter how you specify the *getlist*, you will need to specify the replace or update option if some or all variables already exist in Stata:

```
. getmata r1 r2 final=r3 (rplus*)=X, replace
```

Options for putmata

omitmissing specifies that observations containing a missing value in any of the numeric variables specified be omitted from the vectors and matrices created in Mata. In

```
. putmata y=mpg X=(weight displ 1), omitmissing
```

rows would be omitted from y and X in which the corresponding observation contained missing in any of mpg, weight, or displ. In this case, specifying omitmissing would be equivalent to typing

```
. putmata y=mpg X=(weight displ 1) if !missing(mpg) & !missing(weight) ///
      & !missing(displ)
```

All vectors and matrices created by a single `putmata` command will have the same number of rows (observations). That is true whether you specify `if`, `in`, or the `omitmissing` option.

`view` specifies that `putmata` create views rather than copies of the Stata data in the Mata vectors and matrices. Views require less memory than copies and offer the advantage (and disadvantage) that changes in the Stata data are immediately reflected in the Mata vectors and matrices, and vice versa.

If you specify numeric constants using the *matname*`=(...)` syntax, *matname* is created as a copy even if the `view` option is specified. Other vectors and matrices created by the command, however, would be views.

Use of the `view` option with `putmata` often obviates the need to use `getmata` to import results back into Stata.

Warning 1: Mata records views as "this vector is a view onto variable 3, observations 2 through 5 and 7". If you change the order of the variables, the order of the observations, or drop variables once the views are created, then the contents of the views will change.

Warning 2: When assigning values in Mata to view vectors, code

```
v[] = ...
```

not `v = ...`.

To have changes reflected in the underlying Stata data, you must update the elements of the view `v`, not redefine it. To update all the elements of `v`, you literally code `v[.]`. In the matrix case, you code `X[.,.]`.

`replace` specifies that existing Mata vectors or matrices be replaced should that be necessary.

Options for getmata

`double` specifies that Stata numeric variables be created as `double`s. The default is that they be created as `float`s. Actually, variables start out as `float`s or `double`s, but then they are compressed (see [D] **compress**).

`update` and `replace` are alternatives. They have the same meaning unless the `id()` or `force` option is specified.

When `id()` or `force` is not specified, both `replace` and `update` specify that it is okay to replace the values in existing Stata variables. By default, vectors can be posted to new Stata variables only.

When `id()` or `force` is specified, `replace` and `update` allow posting of values of existing variables, just as usual. The options differ in how the posting is performed when the `id()` or `force` option causes only a subset of the observations of the variables to be updated. `update` specifies that the remaining values be left as they are. `replace` specifies that the remaining values be set to missing, just as if the existing variable(s) were being created for the first time.

`id(`*name*`)` and `id(`*varname*`=`*vecname*`)` specify how the rows in the Mata vectors and matrices match the observations in the Stata data. Observation i matches row j if variable *name*$[i]$ equals vector *name*$[j]$, or in the second syntax, if *varname*$[i] =$ *vecname*$[j]$. The ID variable (vector) must contain values that uniquely identify the observations (rows). Only in observations that contain matching values will the variable be modified. Values in observations that have no match will not be modified or will be set to missing, as appropriate; values in the ID vector that have no match will be ignored.

Example: You wish to run a regression of y on x1 and x2 on the males in the data and use that result to obtain the fitted values for the males. Stata already has commands that will do this, namely, `regress y x1 x2 if male` followed by `predict yhat if male`. For instructional purposes, let's say you wish to do this in Mata. You type

```
. putmata  myid y  X=(x1 x2 1) if male
. mata
: b = invsym(X'X)*X'y
: yhat = X*b
: end
. getmata yhat, id(myid)
```

The new Stata variable `yhat` will contain the predicted values for males and missing values for the females. If the `yhat` variable already existed, you would type

```
. getmata yhat, id(myid) replace
```

or

```
. getmata yhat, id(myid) update
```

The `replace` option would set the female observations to missing. The `update` option would leave the female observations unchanged.

If you do not have an identification variable, create one first by typing `generate myid = _n`.

`force` specifies that it is okay to post vectors and matrices with fewer or with more rows than the number of observations in the data. The `force` option is an alternative to `id()`, and usually, `id()` is the appropriate choice.

If you specify `force` and if there are fewer rows in the vectors and matrices than observations in the data, new variables will be padded with missing values. If there are more rows than observations, observations will be added to the data and previously existing variables will be padded with missing values.

Remarks and examples

Remarks are presented under the following headings:

Use of putmata
Use of putmata and getmata
Using putmata and getmata on subsets of observations
Using views
Constructing do-files

Use of putmata

In this example, we will use Mata to make a calculation and report the result, but we will not post results back to Stata. We will use `putmata` but not `getmata`.

Consider solving for **b** the set of linear equations

$$\mathbf{y} = \mathbf{X}\mathbf{b} \tag{1}$$

where $\mathbf{y}$: $N \times 1$, $\mathbf{X}$: $N \times k$, and $\mathbf{b}$: $k \times 1$. If $N = k$, then $\mathbf{y} = \mathbf{X}\mathbf{b}$ amounts to solving k equations for k unknowns, and the solution is

$$\mathbf{b} = \mathbf{X}^{-1}\mathbf{y} \tag{2}$$

That solution is obtained by premultiplying both sides of (1) by $\mathbf{X}^{-1}$.

When $N > k$, (2) can be used to obtain least-square results if matrix inversion is appropriately defined. Assume that you wish to demonstrate this when matrix inversion is defined as the Moore–Penrose generalized inverse for nonsquare matrices. The demonstration can be obtained by typing

```
. sysuse auto, clear
. regress mpg weight displacement
. putmata y=mpg X=(weight displacement 1)
. mata
: pinv(X)*y
: end
. _
```

The Mata expression `pinv(X)*y` will display a 3×1 column vector. The elements of the vector will equal the coefficients reported by `regress mpg weight displacement`.

For your information, the Moore–Penrose inverse of rectangular matrix $\mathbf{X}$: $N \times k$ is a $k \times N$ rectangular matrix. Among other properties, `pinv(`$\mathbf{X}$`)*`$\mathbf{X} = \mathbf{I}$, where $\mathbf{I}$ is the $k \times k$ identity matrix. You can demonstrate that using Mata, too:

```
. mata: pinv(X)*X
```

Use of putmata and getmata

In this example, we will use Mata to calculate a result that we wish to post back to Stata. We will use both `putmata` and `getmata`.

Some problems are more easily solved in Mata than in Stata. For instance, say that you need to create new Stata variable `D` from existing variable `C`, defined as

$$\texttt{D}[\,i\,] = \text{sum}(\texttt{C}[\,j\,] - \texttt{C}[\,i\,]) \text{ for all } \texttt{C}[\,j\,] > \texttt{C}[\,i\,]$$

where i and j index observations.

This problem can be solved in Stata, but the solution is elusive to most people. The solution is more natural in Mata because the Mata solution corresponds almost letter for letter with the mathematical statement of the problem. If `C` and `D` were Mata vectors rather than Stata variables, the solution would be

```
D = J(rows(C), 1, 0)
for (i=1; i<=rows(C); i++) {
        for (j=1; j<=rows(C); j++) {
                if (C[j]>C[i]) D[i] = D[i] + (C[j] - C[i])
        }
}
```

The most difficult part of this solution to understand is the first line, `D = J(rows(C), 1, 0)`, and that is because you may not be familiar with Mata's `J()` function. `D = J(rows(C), 1, 0)` creates a `rows(C)` $\times$ 1 column vector of 0s. The arguments of `J()` are in just that order.

`C` and `D` are not vectors in Mata, or at least they are not yet. Using `getmata`, we can create vector `C` from variable `C` and run our Mata solution. Then using `putmata`, we can post Mata vector `D` back to new Stata variable `D`. The solution includes these three steps, also shown in the do-file below:

(1) In Stata, use `putmata` to create vector `C` in Mata equal to variable `C` in Stata: `putmata C`.

(2) Use Mata to solve the problem, creating new Mata vector `D`.

(3) In Stata again, use `getmata` to create new variable `D` equal to Mata vector `D`.

Because of the typing involved in the solution, we would package the code in a do-file:

begin myfile.do

```
use mydata, clear
putmata C                                                        (1)
mata:                                                            (2)
D = J(rows(C), 1, 0)
for (i=1; i<=rows(C); i++) {
        for (j=1; j<=rows(C); j++) {
                if (C[j]>C[i]) D[i] = D[i] + (C[j] - C[i])
        }
}
end
getmata D                                                        (3)
save mydata, replace
```

end myfile.do

With myfile.do now in place, in Stata we would type

```
. do myfile
```

Notes:

(1) Our program might be better if we changed putmata C to read putmata C, replace and if we changed getmata D to read getmata D, replace. As things are right now, typing do myfile works, but if we were then to run it a second time, it would not work. Stata would encounter the putmata command and issue an error that matrix C already exists. Even if Stata got through that, it would encounter the getmata command and issue an error that variable D already exists. Perhaps that is an advantage. You cannot run myfile.do again without dropping matrix C and variable D. If you consider that a disadvantage, however, include the replace option.

(2) In our solution, we entered Mata by typing mata:, which is to say, mata with a colon. Interactively, we usually enter Mata by just typing mata. The colon affects how Mata treats errors. When working interactively, we want Mata to note errors but then to continue running so we can correct ourselves. In do-files, we want Mata to note the error and stop. That is the difference between mata without the colon and mata with the colon. Remember to use mata: when writing do-files.

(3) Rather than specify the replace option, you could modify the do-file to drop any preexisting Mata vector C and any preexisting variable D. To drop vector C, in Mata you can type mata drop C, or in Stata, you can type mata: mata drop C. To drop variable D, in Stata you can type drop D. You must worry that the variables do not exist, so in your do-file, you would code

```
capture mata: mata drop C
capture drop D
```

Rather than dropping vector C, you might prefer just to clear Mata:

```
clear mata
```

Using putmata and getmata on subsets of observations

putmata can be used to create Mata vectors that contain a subset of the observations in the Stata data, and getmata can be used to fetch such vectors back into Stata. Thus you can work with only the males or only outcomes in which failures are observed, and so on. Below we work with only the observations in which C does not contain missing values.

In the create-variable-D-from-C example above, we assumed that there were no missing values in C, or at least we did not consider the issue. It turns out that our code produces several missing values in the presence of just one missing value in C. Perhaps, if there are missing values, we want to exclude them from our calculation. We could complicate our Mata code to handle that. We could modify our Mata code to read

```
use mydata, clear
putmata C
D = J(rows(C), 1, 0)
for (i=1; i<=rows(C); i++) {
        if (C[i]>=.) D[i] = .                        // new
        else for (j=1; j<=rows(C); j++) {
                 if (C[j]<.) {                       // new
                         if (C[j]>C[i]) D[i] = D[i] + (C[j] - C[i])
                 }
        }
}
end
getmata D
save mydata, replace
```

Easier, however, is simply to restrict Mata vector C to the nonmissing elements of Stata variable C, which we could do by replacing `putmata C` with

```
putmata C if !missing(C)
```

or, equivalently,

```
putmata C, omitmissing
```

Whichever way we coded it, if the data contained 100 observations and variable C contained 82 nonmissing values, new Mata vector C would contain 82 rows rather than 100. The observations corresponding to `missing(C)` would be omitted from the vector, and that means we could run our original Mata solution without modification.

There is, however, an issue. At the end of our code when we post the Mata solution vector D to Stata variable D—`getmata D`—we will need to specify which of the 100 observations are to receive the 82 results stored in the vector. `getmata` has an option to handle this situation—`id(`*varname*`)`, where *varname* is the name of an identification variable.

An identification variable is a variable that takes on different values for each observation in the data. The values could be 1, 2, …, 100; or they could be 1.25, −2, …, 16.5; or they could be Nick, Bill, …, Mary. The values can be numeric or string, and they need not be in order. All that is important is that the variable contain a unique (different) value in each observation. Possibly, the data already contain such a variable. If not, you can create one by typing

```
generate fid = _n
```

When we use `putmata` to create vector C, we will need simultaneously to create vector `fid` containing the selected values of variable `fid`, which we can do by adding `fid` to the *putlist*:

```
putmata fid C if !missing(C)
```

The above command creates two vectors in Mata: `fid` and C. When we post the resulting vector D back to Stata, we will specify the `id(fid)` option to indicate into which observations `getmata` is to post the results:

```
getmata D, id(fid)
```

The id(fid) option is taken to mean that there exists a variable named fid and a vector named fid. It is by comparing the values in each that getmata determines how the rows of the vectors correspond to the observations of the data.

The entire solution is

begin myfile.do

```
use mydata, clear
putmata fid C if !missing(C)        // new: we put fid & add if !missing(C)

mata:
D = J(rows(C), 1, 0)
for (i=1; i<=rows(C); i++) {
        for (j=1; j<=rows(C); j++) {
                if (C[j]>C[i]) D[i] = D[i] + (C[j] - C[i])
        }
}
end

getmata D, id(fid)          // new: we add option id(fid)
save mydata, replace
```

end myfile.do

The above code will run on data with or without missing values. New variable D will be missing in observations where C is missing, but D will otherwise contain nonmissing values.

Using views

When you type or code putmata C, vector C is created as a copy of the Stata data. The variable and the vector are separate things. An alternative is to make the Mata vector a view onto the Stata variable. By that, we mean that both the variable and the vector share the same recording of the values. Views save memory but are slightly less efficient in terms of execution time. Views have other advantages and disadvantages, too.

For instance, if you type putmata mpg and then, in Mata, type mpg[1]=20, you will change not only the Mata vector but also the Stata data! Or if, after typing putmata mpg, you typed replace mpg = 20 in 1, that would modify both the data and the Mata vector! This is an advantage if you are fixing real errors and a disadvantage if you intend to do something else.

If in the middle of your Mata session where you are working with views you take a break and return to Stata, it is important that you do not modify the Stata data in certain ways. Rather than recording copies of the data, views record notes about the mapping. A view might record that this Mata vector corresponds to variable 3, observations 2 through 20 and 39. If you change the sort order of the data, the view will still be working with observations 2 through 20 and 39 even though those physical observations now contain different data. If you drop the first or second variable, the view will still be working with the third variable even though that will now be a different variable!

The memory savings offered by views are considerable, at least when working with large datasets. Say that you have a dataset containing 200 variables and 1,000,000 observations. Your data might be 1 GB in size. Even so, typing putmata *, view, and thus creating 200 vectors each with 1,000,000 rows, would consume only a few dozen kilobytes of memory.

All the examples shown above work equally well with copies or views. We have been working with copies, but in the previous example, where we coded

```
putmata fid C if !missing(C)
```

we could switch to working with views by coding

```
putmata fid C if !missing(C), view
```

With that one change, our code would still work and it would use less memory.

With that one change, we would still not be working with views everywhere we could, however. Vector `D`—the vector we create in Mata and then post back to Stata—would still be a regular vector. We can save additional memory by making `D` a view, too. Before we do that, let us warn you that we do not recommend doing this unless the memory savings is vitally important. The result, when complete, will be elegant and memory efficient, but the extra memory savings is seldom worth the debugging effort.

No extra changes are required to your code when the vectors you make into views contain values that are not modified in the code. Vector `C` is such a vector. We use the values stored in `C`, but we do not change them. Vector `D`, on the other hand, is a vector in which we change values. It is usually easier if you do not convert such vectors into views.

With that proviso, we are going to make `D` into a view, too, and in the process, we will drop the use of `fid` altogether:

begin `myfile.do`

```
use mydata, clear
generate D = .                       // new
putmata C D if !missing(C), view     // changed

mata:
D[.] = J(rows(C), 1, 0)              // changed
for (i=1; i<=rows(C); i++) {
             for (j=1; j<=rows(C); j++) {
                     if (C[j]>C[i]) D[i] = D[i] + (C[j] - C[i])
             }
}
end

                                     // we drop the getmata
save mydata, replace
```

end `myfile.do`

In this solution, we create new Stata variable `D` at the outset, and then we modify the `putmata` command to create view vectors for both `C` and `D`. Our code, which stores results in vector `D`, now simultaneously posts to variable `D` when we store results in vector `D`, so we can omit the `getmata D` at the end because results are already posted! Moreover, we no longer have to concern ourselves with matching observations to rows via `fid`. Rows of `D` now automatically align themselves with the selected observations in variable `D` by the mere fact of `D` being a view.

The beginning of our Mata code has an important change, however. We change

```
D = J(rows(C), 1, 0)
```

to

```
D[.] = J(rows(C), 1, 0)
```

That change is very important. What we coded previously created vector D. What we now code changes the values stored in existing vector D. If we left what we coded previously, Mata would discard the view currently stored in D and create a new D—a regular Mata vector unconnected to Stata—containing 0s.

Constructing do-files

putmata and getmata can be used interactively, but if you have much Mata code between the put and the get, you will be better off using a do-file because do-files can be easily edited when they have a mistake in them. We recommend the following outline for such do-files:

begin outline.do

```
version 19.5                        (1)
mata clear                          (2)
// Stata code for setup goes here   (3)
putmata ...                         (4)
mata:
// Mata code goes here              (5)
end
getmata                             (6)
mata clear                          (7)
```

end outline.do

Notes on do-file steps:

(1) A do-file should always start with a version statement; it ensures that the do-file continues to work in the years to come as new versions of Stata are released. See [P] **version**.

(2) The do-file should not depend on Mata having certain vectors, matrices, or programs already loaded and set up because if you attempt to run the do-file again later, what you assumed may not be true. A do-file should be self-contained. To ensure that is true the first time we write and run the do-file and to ensure on subsequent runs that nothing lying around in Mata gets in our way, we clear Mata.

(3) You may need to sort your data, create extra variables that your do-file will use, or drop variables that you are assuming do not already exist. In the last iteration of myfile.do, we needed to generate D = ., and it would not have been a bad idea to capture drop D before we did that. Our example did not depend on the sort order of the data, but if it had, we would have included the sort even if we were certain that the data would already be in the right order.

(4) Put the putmata command here. If putmata includes the omitmissing option, then put everything you need to put in a single putmata command. Otherwise, you can use multiple putmata commands if you find that more convenient. If you use multiple putmata commands, be sure to include the same if *expression* and in *range* qualifiers on each one.

(5) The Mata code goes here. Note that we type mata: (mata with a colon) to enter Mata. mata: ensures that errors stop Mata and thus our do-file.

(6) The getmata command goes here if you need it. Be sure to include getmata's id(*name*) or id(*vecname*=*varname*) option if, on the putmata command in step 4, you included the if *expression* qualifier or the in *range* qualifier or the omitmissing option. If you include id(), be sure you included the ID variable in the putmata command in step 4.

(7) We conclude by clearing Mata again to avoid leaving memory allocated needlessly and to avoid causing problems for poorly written do-files that we might subsequently run.

putmata and getmata are designed to work interactively and in do-files. The commands are not designed to work with ado-files. An ado-file is something like a do-file, but it defines a program that implements a new command of Stata, and well-written ado-files do not use globals such as the global vectors and matrices that putmata creates. Ado-files use local variables. Ado-file programmers should use the Mata functions st_data() and st_view() (see [M-5] **st_data()** and [M-5] **st_view()**) to create vectors and matrices, and if necessary, use st_store() (see [M-5] **st_store()**) to post the contents of those vectors and matrices back to Stata.

Stored results

putmata stores the following in r():

Scalars

r(N)	number of rows in created vectors and matrices
r(K_views)	number of vectors and matrices created as views
r(K_copies)	number of vectors and matrices created as copies

The total number of vectors and matrices created is r(K_views) + r(K_copies).

r(N)=. if r(K_views) + r(K_copies) = 0. r(N)=0 means that zero-observation vectors and matrices were created, which is to say, vectors and matrices dimensioned 0×1 and $0 \times k$.

getmata stores the following in r():

Scalars

r(K_new)	number of new variables created
r(K_existing)	number of existing variables modified

The total number of variables modified is r(K_new) + r(K_existing).

Reference

Gould, W. W. 2010. Mata Matters: Stata in Mata. *Stata Journal* 10: 125–142.

Also see

[M-4] **Stata** — Stata interface functions

[M-5] **st_data()** — Load copy of current Stata dataset

[M-5] **st_store()** — Modify values stored in current Stata dataset

[M-5] **st_view()** — Make matrix that is a view onto current Stata dataset

Description

range generates a numerical range, which is useful for evaluating and graphing functions.

Quick start

Generate newv1 that ranges from 0 to π

    range newv1 0 _pi

Same as above, but only for the first 50 observations in the dataset

    range newv1 0 _pi 50

Generate newv2 that ranges from the minimum to the maximum of v2 after summarize

    range newv2 r(min) r(max)

Menu

Data > Create or change data > Other variable-creation commands > Generate numerical range

Syntax

range *varname* $\#_{\text{first}}$ $\#_{\text{last}}$ $\left[\, \#_{\text{obs}} \,\right]$

Remarks and examples

range constructs the variable *varname*, taking on values $\#_{\text{first}}$ to $\#_{\text{last}}$, inclusive, over $\#_{\text{obs}}$. If $\#_{\text{obs}}$ is not specified, the number of observations in the current dataset is used.

range can be used to produce increasing sequences, such as

```
. range x 0 12.56 100
```

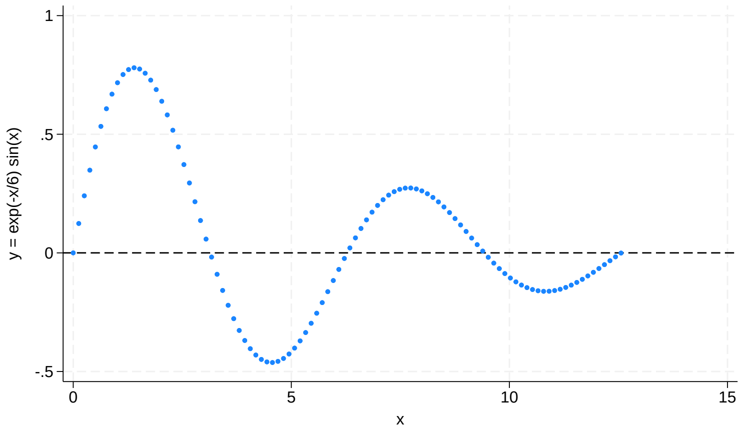
or it can be used to produce decreasing sequences:

```
. range z 100 1
```

▷ Example 1

To graph $y = e^{-x/6}\sin(x)$ over the interval $[\,0, 12.56\,]$, we can type

```
. range x 0 12.56 100
Number of observations (_N) was 0, now 100.
. generate y = exp(-x/6)*sin(x)
. scatter y x, yline(0) ytitle(y = exp(-x/6) sin(x))
```



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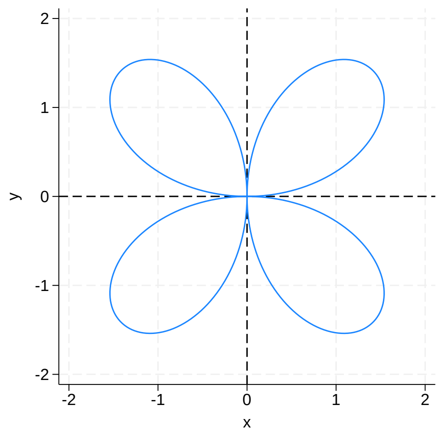
▷ Example 2

Stata is not limited solely to graphing functions—it can draw parameterized curves as well. For instance, consider the curve given by the polar coordinate relation $r = 2\sin(2\theta)$. The conversion of polar coordinates to parameterized form is $(y, x) = (r\sin\theta, r\cos\theta)$, so we can type

```
. clear
. range theta 0 2*_pi 400
Number of observations (_N) was 0, now 400.
. generate r = 2*sin(2*theta)
. generate y = r*sin(theta)
. generate x = r*cos(theta)
. line y x, c(l) m(i) yline(0) xline(0) aspectratio(1)
```



◁

Also see

[D] **egen** — Extensions to generate

[D] **obs** — Increase the number of observations in a dataset

recast — Change storage type of variable

Description Quick start Syntax Option
Remarks and examples Also see

Description

`recast` changes the storage type of variables.

Quick start

Recast numeric variable `v1` to type `double` from any other numeric type

```
recast double v1
```

Recast string variable `v2` to `str30` from any length less than 30

```
recast str30 v2
```

Same as above, but for length longer than 30

```
recast str30 v2, force
```

Syntax

`recast` *type varlist* [`, force`]

Variables in *varlist* are changed to *type*, where *type* is `byte`, `int`, `long`, `float`, `double`, `str1`, `str2`, ..., `str2045`, or `strL`. Alias variables in *varlist* are changed to *type* copies of the linked variables.

Option

`force` makes `recast` unsafe by causing the variables to be given the new storage type even if that will cause a loss of precision, introduction of missing values, or, for string variables, the truncation of strings.

`force` should be used with caution. `force` is for those instances where you have a variable saved as a `double` but would now be satisfied to have the variable stored as a `float`, even though that would lead to a slight rounding of its values.

Remarks and examples

See **[U] 12 Data** for a description of storage types. Also see [D] **compress**, [D] **destring**, and [D] **frunalias** for alternatives to `recast`.

Note that `recast` is not a command to change, or to map, string variables to numeric variables or numeric variables to string variables. For that, one of `encode`, `decode`, `destring`, or `tostring` is likely to be appropriate.

▷ Example 1

`recast` refuses to change a variable's type if that change is inappropriate for the values actually stored, so it is always safe to try:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. describe headroom

Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
headroom        float   %6.1f                 Headroom (in.)

. recast int headroom
headroom:  37 values would be changed; not changed
```

Our attempt to change `headroom` from a `float` to an `int` was ignored—if the change had been made, 37 values would have changed. Here is an example where the type can be changed:

```
. describe mpg

Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
mpg               int   %8.0g                 Mileage (mpg)

. recast byte mpg

. describe mpg

Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
mpg              byte   %8.0g                 Mileage (mpg)
```

`recast` works with string variables as well as numeric variables, and it provides all the same protections:

```
. describe make

Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
make            str18   %-18s                 Make and model

. recast str16 make
make:  2 values would be changed; not changed
```

`recast` can be used both to promote and to demote variables:

```
. recast str20 make

. describe make

Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
make            str20   %-20s                 Make and model
```

◁

Also see

[D] **compress** — Compress data in memory

[D] **destring** — Convert string variables to numeric variables and vice versa

[D] **frunalias** — Change storage type of alias variables

[U] **12.2.2 Numeric storage types**

[U] **12.4 Strings**

Description

`recode` changes the values of numeric variables according to the rules specified. Values that do not meet any of the conditions of the rules are left unchanged, unless an *otherwise* rule is specified.

A range *#1*`/`*#2* refers to all (real and integer) values between *#1* and *#2*, including the boundaries *#1* and *#2*. This interpretation of *#1*`/`*#2* differs from that in numlists.

`min` and `max` provide a convenient way to refer to the minimum and maximum for each variable in *varlist* and may be used in both the from-value and the to-value parts of the specification. Combined with `if` and `in`, the minimum and maximum are determined over the restricted dataset.

The keyword rules specify transformations for values not changed by the previous rules:

`nonmissing`	all nonmissing values not changed by the rules
`missing`	all missing values (`.`, `.a`, `.b`, ..., `.z`) not changed by the rules
`else`	all nonmissing and missing values not changed by the rules
`*`	synonym for `else`

`recode` provides a convenient way to define value labels for the generated variables during the definition of the transformation, reducing the risk of inconsistencies between the definition and value labeling of variables. Value labels may be defined for integer values and for the extended missing values (`.a`, `.b`, ..., `.z`), but not for noninteger values or for sysmiss (`.`).

Although this is not shown in the syntax diagram, the parentheses around the *rules* and keyword clauses are optional if you transform only one variable and if you do not define value labels.

Quick start

Recode 3 to 0, 4 to −1, and 5 to −2 in `v1`, and store result in `newv1`

```
recode v1 (3=0) (4=-1) (5=-2), generate(newv1)
```

Same as above, and recode missing values to 9

```
recode v1 (3=0) (4=-1) (5=-2) (missing=9), gen(newv1)
```

Also recode `v2` using the same rule and store result in `newv2`

```
recode v1 v2 (3=0) (4=-1) (5=-2) (missing=9), gen(newv1 newv2)
```

Same as above when adding a prefix to the old variable name

```
recode v1 v2 (3=0) (4=-1) (5=-2) (missing=9), prefix(new)
```

Recode 3 through 5 to 0 and 1 through 2 to 1, and create value label `mylabel`

```
recode v1 (3/5=0 "Value 0") (1/2=1 "Value 1"), gen(newv1) ///
   label(mylabel)
```

Same as above, but set all other values to 9 and label them “Invalid”

```
recode v1 (3/5=0 "Value 0") (1/2=1 "Value 1")    ///
   (else=9 "Invalid"), gen(newv1) label(mylabel)
```

Menu

Data > Create or change data > Other variable-transformation commands > Recode categorical variable

Syntax

Basic syntax

recode *varlist* (*rule*) [(*rule*) ...] [, generate(*newvar*)]

Full syntax

recode *varlist* (*erule*) [(*erule*) ...] [*if*] [*in*] [, *options*]

where the most common forms for *rule* are

rule	Example	Meaning
# = #	3 = 1	3 recoded to 1
# # = #	2 . = 9	2 and . recoded to 9
#/# = #	1/5 = 4	1 through 5 recoded to 4
nonmissing = #	nonmiss = 8	all other nonmissing to 8
missing = #	miss = 9	all other missings to 9

where *erule* has the form

element [*element* ...] = *el* ["*label*"]

nonmissing = *el* ["*label*"]

missing = *el* ["*label*"]

else | * = *el* ["*label*"]

element has the form

el | *el*/*el*

and *el* is

| min | max

The keyword rules missing, nonmissing, and else must be the last rules specified. else may not be combined with missing or nonmissing.

options	Description
Options	
generate(*newvar*)	generate *newvar* containing transformed variables; default is to replace existing variables
prefix(*str*)	generate new variables with *str* prefix
label(*name*)	specify a name for the value label defined by the transformation rules
copyrest	copy out-of-sample values from original variables
test	test that rules are invoked and do not overlap

recode does not allow alias variables; see [D] **frunalias** for advice on how to get around this restriction.

Options

Options

generate(*newvar*) specifies the names of the variables that will contain the transformed variables. into() is a synonym for generate(). Values outside the range implied by if or in are set to missing (.), unless the copyrest option is specified.

If generate() is not specified, the input variables are overwritten; values outside the if or in range are not modified. Overwriting variables is dangerous (you cannot undo changes, value labels may be wrong, etc.), so we strongly recommend specifying generate().

prefix(*str*) specifies that the recoded variables be returned in new variables formed by prefixing the names of the original variables with *str*.

label(*name*) specifies a name for the value label defined from the transformation rules. label() may be defined only with generate() (or its synonym, into()) and prefix(). If a variable is recoded, the label name defaults to *newvar* unless a label with that name already exists.

copyrest specifies that out-of-sample values be copied from the original variables. In line with other data management commands, recode defaults to setting *newvar* to missing (.) outside the observations selected by if *exp* and in *range*.

test specifies that Stata test whether rules are ever invoked or that rules overlap; for example, (1/5=1) (3=2).

Remarks and examples

Remarks are presented under the following headings:

Simple examples

Many users experienced with other statistical software use the recode command often, but easier and faster solutions in Stata are available. On the other hand, recode often provides simple ways to manipulate variables that are not easily accomplished otherwise. Therefore, we show other ways to perform a series of tasks with and without recode.

We want to change 1 to 2, leave all other values unchanged, and store the results in the new variable nx.

```
. recode x (1 = 2), gen(nx)
```

or

```
. generate nx = x
. replace nx = 2 if nx==1
```

or

```
. generate nx = cond(x==1,2,x)
```

We want to swap 1 and 2, saving them in nx.

```
. recode x (1 = 2) (2 = 1), gen(nx)
```

or

```
. generate nx = cond(x==1,2,cond(x==2,1,x))
```

We want to recode item by collapsing 1 and 2 into 1, 3 into 2, and 4 to 7 (boundaries included) into 3.

```
. recode item (1 2 = 1) (3 = 2) (4/7 = 3), gen(Ritem)
```

or

```
. generate Ritem = item
. replace Ritem = 1 if inlist(item,1,2)
. replace Ritem = 2 if item==3
. replace Ritem = 3 if inrange(item,4,7)
```

We want to change the "direction" of the $1,\ldots,5$ valued variables x1, x2, x3, storing the transformed variables in nx1, nx2, and nx3 (that is, we form new variable names by prefixing old variable names with an "n").

```
. recode x1 x2 x3 (1=5) (2=4) (3=3) (4=2) (5=1), pre(n) test
```

or

```
. generate nx1 = 6-x1
. generate nx2 = 6-x2
. generate nx3 = 6-x3

. forvalues i = 1/3 {
      generate nx`i' = 6-x`i'
  }
```

In the categorical variable religion, we want to change 1, 3, and the real and integer numbers 3 through 5 into 6; we want to set 2, 8, and 10 to 3 and leave all other values unchanged.

```
. recode religion 1 3/5 = 6 2 8 10 = 3
```

or

```
. replace religion = 6 if religion==1 | inrange(religion,3,5)
. replace religion = 3 if inlist(religion,2,8,10)
```

This example illustrates two features of recode that were included for backward compatibility with previous versions of recode but that we do not recommend. First, we omitted the parentheses around the rules. This is allowed if you recode one variable and you do not plan to define value labels with recode (see below for an explanation of this feature). Personally, we find the syntax without parentheses hard to read, although we admit that we could have used blanks more sensibly. Because difficulties in reading may cause us to overlook errors, we recommend always including parentheses. Second, because we did not specify a generate() option, we overwrite the religion variable. This is often dangerous, especially for "original" variables in a dataset. We recommend that you always specify generate() unless you want to overwrite your data.

Setting up value labels with recode

The `recode` command is most often used to transform categorical variables, which are many times value labeled. When a value-labeled variable is overwritten by `recode`, it may well be that the value label is no longer appropriate. Consequently, output that is labeled using these value labels may be misleading or wrong.

When `recode` creates one or more new variables with a new classification, you may want to put value labels on these new variables. It is possible to do this in three steps:

1. Create the new variables (`recode ..., gen()`).
2. Define the value label (`label define ...`).
3. Link the value label to the variables (`label value ...`).

Inconsistencies may emerge from mistakes between steps 1 and 2. Especially when you make a change to the recode 1, it is easy to forget to make a similar adjustment to the value label 2. Therefore, `recode` can perform steps 2 and 3 itself.

Consider recoding a series of items with values

1 = strongly agree
2 = agree
3 = neutral
4 = disagree
5 = strongly disagree

into three items:

1 = positive (= "strongly agree" or "agree")
2 = neutral
3 = negative (= "strongly disagree" or "disagree")

This is accomplished by typing

```
. recode item* (1 2 = 1 positive) (3 = 2 neutral) (4 5 = 3 negative), pre(R)
> label(Item3)
```

which is much simpler and safer than

```
. recode item1-item7 (1 2 = 1) (3 = 2) (4 5 = 3), pre(R)
. label define Item3  1 positive 2 neutral 3 negative
. forvalues i = 1/7 {
        label value Ritem`i' Item3
}
```

▷ Example 1

As another example, let's recode vote (voting intentions) for 12 political parties in the Dutch parliament into left, center, and right parties. We then tabulate the original and new variables so that we can check that everything came out correctly.

```
. use https://www.stata-press.com/data/r19/recodexmpl
. label list pparty
pparty:
           1 pvda
           2 cda
           3 d66
           4 vvd
           5 groenlinks
           6 sgp
           7 rpf
           8 gpv
           9 aov
          10 unie55
          11 sp
          12 cd
. recode polpref (1 5 11 = 1 left) (2 3 = 2 center) (4 6/10 12 = 3 right),
> gen(polpref3)
(2,020 differences between polpref and polpref3)
. tabulate polpref polpref3
```

pol party choice if elections	RECODE of polpref (pol party choice if elections) left	center	right	Total
pvda	622	0	0	622
cda	0	525	0	525
d66	0	634	0	634
vvd	0	0	930	930
groenlinks	199	0	0	199
sgp	0	0	54	54
rpf	0	0	63	63
gpv	0	0	30	30
aov	0	0	17	17
unie55	0	0	23	23
sp	45	0	0	45
cd	0	0	25	25
Total	866	1,159	1,142	3,167

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Referring to the minimum and maximum in rules

`recode` allows you to refer to the minimum and maximum of a variable in the transformation rules. The keywords `min` and `max` may be included as a from-value, as well as a to-value.

For example, we might divide age into age categories, storing in `iage`.

```
. recode age (0/9=1) (10/19=2) (20/29=3) (30/39=4) (40/49=5) (50/max=6),
> gen(iage)
```

or

```
. generate iage = 1 + irecode(age,9,19,29,39,49)
```

or

```
. generate iage = min(6, 1+int(age/10))
```

As another example, we could set all incomes less than 10,000 to 10,000 and those more than 200,000 to 200,000, storing the data in `ninc`.

```
. recode inc (min/10000 = 10000) (200000/max = 200000), gen(ninc)
```

or

```
. generate ninc = inc
. replace ninc = 10000 if ninc<10000
. replace ninc = 200000 if ninc>200000 & !missing(ninc)
```

or

```
. generate ninc = max(min(inc,200000),10000)
```

or

```
. generate ninc = clip(inc,10000,200000)
```

Recoding missing values

You can also set up rules in terms of missing values, either as from-values or as to-values. Here `recode` mimics the functionality of `mvdecode` and `mvencode` (see [D] **mvencode**), although these specialized commands execute much faster.

Say that we want to change missing (`.`) to 9, storing the data in `X`:

```
. recode x (.=9), gen(X)
```

or

```
. generate X = cond(x==., 9, x)
```

or

```
. mvencode x, mv(.=9) gen(X)
```

We want to change 9 to `.a` and 8 to `.`, storing the data in `z`.

```
. recode x (9=.a) (8=.), gen(z)
```

or

```
. generate z = cond(x==9, .a, cond(x==8, ., x))
```

or

```
. mvdecode x, mv(9=.a, 8=.) gen(z)
```

Recoding subsets of the data

We want to swap in `x` the values 1 and 2 only for those observations for which `age>40`, leaving all other values unchanged. We issue the command

```
. recode x (1=2) (2=1) if age>40, gen(y)
```

or

```
. generate y = cond(x==1,2,cond(x==2,1,x)) if age>40
```

We are in for a surprise. `y` is missing for observations that do not satisfy the `if` condition. This outcome is in accordance with how Stata's data manipulation commands usually work. However, it may not be what you intend. The `copyrest` option specifies that `x` be copied into `y` for all nonselected observations:

```
. recode x (1=2) (2=1) if age>40, gen(y) copy
```

or

```
. generate y = x
. recode y (1=2) (2=1) if age>40
```

or

```
. generate y = cond(age>40,cond(x==1,2,cond(x==2,1,x),x))
```

Otherwise rules

In all our examples so far, `recode` had an implicit rule that specified that values that did not meet the conditions of any of the rules were to be left unchanged. `recode` also allows you to use an "otherwise rule" to specify how untransformed values are to be transformed. `recode` supports three kinds of otherwise conditions:

nonmissing	all nonmissing not yet transformed
missing	all missing values not yet transformed
else	all values, missing or nonmissing, not yet transformed

The otherwise rules are to be specified *after* the standard transformation rules. `nonmissing` and `missing` may be combined with each other, but not with `else`.

Consider a recode that swaps the values 1 and 2, transforms all other nonmissing values to 3, and transforms all missing values (that is, sysmiss and the extended missing values) to `.` (sysmiss). We could type

```
. recode x (1=2) (2=1) (nonmissing=3) (missing=.), gen(z)
```

or

```
. generate z = cond(x==1,2,cond(x==2,1,cond(!missing(x),3),.))
```

As a variation, if we had decided to recode all extended missing values to `.a` but to keep sysmiss `.` distinct at `.`, we could have typed

```
. recode x (1=2) (2=1) (.=.) (nonmissing=3) (missing=.a), gen(z)
```

Test for overlapping rules

`recode` evaluates the rules from left to right. Once a value has been transformed, it will not be transformed again. Thus if rules "overlap", the first matching rule is applied, and further matches are ignored. A common form of overlapping is illustrated in the following example:

```
... (1/5 = 1) (5/10 = 2)
```

Here 5 occurs in the condition parts of both rules. Because rules are matched left to right, 5 matches the first rule, and the second rule will not be tested for 5, unless `recode` is instructed to test for rule overlap with the `test` option.

Other instances of overlapping rules usually arise because you mistyped the rules. For instance, you are recoding voting intentions for parties in elections into three groups of parties (left, center, right), and you type

```
... (1/5 = 1) ... (3 = 2)
```

Party 3 matches the conditions 1/5 and 3. Because `recode` applies the first matching rule, party 3 will be mapped into party category 1. The second matching rule is ignored. It is not clear what was wrong in this example. You may have included party 3 in the range 1/5 or mistyped 3 in the second rule. Either way, `recode` did not notice the problem and your data analysis is in jeopardy. The `test` option specifies that `recode` display a warning message if values are matched by more than one rule. With the `test` option specified, `recode` also tests whether all rules were applied at least once and displays a warning message otherwise. Rules that never matched any data may indicate that you mistyped a rule, although some conditions may not have applied to (a selection of) your data.

Video example

How to create a categorical variable from a continuous variable

Acknowledgment

This version of `recode` was written by Jeroen Weesie of the Department of Sociology at Utrecht University, The Netherlands.

Also see

[D] **frunalias** — Change storage type of alias variables

[D] **generate** — Create or change contents of variable

[D] **mvencode** — Change missing values to numeric values and vice versa

rename — Rename variable

Description Quick start Menu Syntax Remarks and examples Also see

Description

rename changes the name of an existing variable *old_varname* to *new_varname*; the contents of the variable are unchanged. Also see [D] **rename group** for renaming groups of variables.

Quick start

Change the name of v1 to var1

```
rename v1 var1
```

Also change the name of v2 to var2

```
rename v2 var2
```

Menu

Data > Data utilities > Rename groups of variables

Syntax

<u>ren</u>ame *old_varname new_varname*

collect is allowed; see [U] **11.1.10 Prefix commands**.

Remarks and examples

▷ Example 1

rename allows you to change variable names. Say that we have labor market data for siblings.

```
. use https://www.stata-press.com/data/r19/renamexmpl

. describe

Contains data from https://www.stata-press.com/data/r19/renamexmpl.dta
 Observations:           277
    Variables:             6                  9 Jan 2024 11:57
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
famid           float   %9.0g
edu             float   %9.0g
exp             float   %9.0g
promo           float   %9.0g
sex             float   %9.0g      sex
inc             float   %9.0g
-------------------------------------------------------------------------------
Sorted by: famid
```

We decide to rename the exp and inc variables.

```
. rename exp experience
. rename inc income
. describe
Contains data from https://www.stata-press.com/data/r19/renamexmpl.dta
 Observations:           277
    Variables:             6                  9 Jan 2024 11:57
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
famid           float   %9.0g
edu             float   %9.0g
experience      float   %9.0g
promo           float   %9.0g
sex             float   %9.0g      sex
income          float   %9.0g
-------------------------------------------------------------------------------
Sorted by: famid
     Note: Dataset has changed since last saved.
```

The exp variable is now called experience, and the inc variable is now called income.

◁

Also see

[D] **rename group** — Rename groups of variables

[D] **generate** — Create or change contents of variable

[D] **varmanage** — Manage variable labels, formats, and other properties

Description

`rename` changes the names of existing variables to the new names specified. See [D] **rename** for the base `rename` syntax. Documented here is the advanced syntax for renaming groups of variables.

Quick start

Change the name of `v1` to `var1` and `v2` to `var2`

```
rename (v1 v2) (var1 var2)
```

Change the name of `V1` to `v1` and `V2` to `v2`

```
rename V1 V2, lower
```

Add suffix `old` to variables `v1`, `v2`, ... for one or more digits

```
rename v# =old
```

Remove suffix `old` from all variables ending in `old`

```
rename *old *
```

Remove prefix `old` from all variables beginning with `old`

```
rename old* *
```

Note: A complete list of rules for renaming groups of variables appears below the syntax diagram.

Menu

Data > Data utilities > Rename groups of variables

Syntax

Rename a single variable

`rename` *old new* [, *options*$_1$]

Rename groups of variables

`rename (`*old*$_1$ *old*$_2$ ...`)` `(`*new*$_1$ *new*$_2$ ...`)` [, *options*$_1$]

Change the case of groups of variable names

`rename` *old*$_1$ *old*$_2$ ..., { `upper` | `lower` | `proper` } [*options*$_2$]

where *old* and *new* specify the existing and the new variable names. The rules for specifying them are

1. `rename stat status`: Renames `stat` to `status`.

   Rule 1: This is the same `rename` command documented in [D] **rename**, with which you are familiar.

2. `rename (stat inc) (status income)`: Renames `stat` to `status` and `inc` to `income`.

   Rule 2: Use parentheses to specify multiple variables for *old* and *new*.

3. `rename (v1 v2) (v2 v1)`: Swaps `v1` and `v2`.

   Rule 3: Variable names may be interchanged.

4. `rename (a b c) (b c a)`: Swaps names. Renames `a` to `b`, `b` to `c`, and `c` to `a`.

   Rule 4: There is no limit to how many names may be interchanged.

5. `rename (a b c) (c b a)`: Renames `a` to `c` and `c` to `a`, but leaves `b` as is.

   Rule 5: Renaming variables to themselves is allowed.

6. `rename jan* *1`: Renames all variables starting with `jan` to instead end with `1`, for example, `janstat` to `stat1`, `janinc` to `inc1`, etc.

   Rule 6.1: `*` in *old* selects the variables to be renamed. `*` means that zero or more characters go here.

   Rule 6.2: `*` in *new* corresponds with `*` in *old* and stands for the text that `*` in *old* matched.

   `*` in *new* or *old* is called a wildcard character, or just a wildcard.

   `rename jan* *`: Removes prefix `jan`.

   `rename *jan *`: Removes suffix `jan`.

7. `rename jan? ?1`: Renames all variables starting with `jan` and ending in one character by removing `jan` and adding `1` to the end; for example, `jans` is renamed to `s1`, but `janstat` remains unchanged. `?` means that exactly one character goes here, just as `*` means that zero or more characters go here.

   Rule 7: `?` means exactly one character, `??` means exactly two characters, etc.

8. `rename *jan* **`: Removes prefix, midfix, and suffix `jan`, for example, `janstat` to `stat`, `injanstat` to `instat`, and `subjan` to `sub`.

    Rule 8: You may specify more than one wildcard in *old* and in *new*. They correspond in the order given.

    `rename jan*s* *s*1`: Renames all variables that start with `jan` and contain `s` to instead end in `1`, dropping the `jan`, for example, `janstat` to `stat1` and `janest` to `est1`, but not `janinc` to `inc1`.

9. `rename *jan* *`: Removes `jan` and whatever follows from variable names, thereby renaming `statjan` to `stat`, `incjan71` to `inc`, ...

    Rule 9: You may specify more wildcards in *old* than in *new*.

10. `rename *jan* .*`: Removes `jan` and whatever precedes it from variable names, thereby renaming `midjaninc` to `inc`, ...

    Rule 10: Wildcard `.` (dot) in *new* skips over the corresponding wildcard in *old*.

11. `rename *pop jan=`: Adds prefix `jan` to all variables ending in `pop`, for example, `age1pop` to `janage1pop`, ...

    `rename (status bp time) admit=`: Renames `status` to `admitstatus`, `bp` to `admitbp`, and `time` to `admittime`.

    `rename` *whatever* `pre=`: Adds prefix `pre` to all variables selected by *whatever*, however *whatever* is specified.

    Rule 11: Wildcard `=` in *new* specifies the original variable name.

    `rename` *whatever* `=jan`: Adds suffix `jan` to all variables selected by *whatever*.

    `rename` *whatever* `pre=fix`: Adds prefix `pre` and suffix `fix` to all variables selected by *whatever*.

12. `rename v# stat#`: Renames `v1` to `stat1`, `v2` to `stat2`, ..., `v10` to `stat10`, ...

    Rule 12.1: `#` is like `*` but for digits. `#` in *old* selects one or more digits.

    Rule 12.2: `#` in *new* copies the digits just as they appear in the corresponding *old*.

13. `rename v(#) stat(#)`: Renames `v1` to `stat1`, `v2` to `stat2`, ..., but does not rename `v10`, ...

    Rule 13.1: `(#)` in *old* selects exactly one digit. Similarly, `(##)` selects exactly two digits, and so on, up to ten `#` symbols.

    Rule 13.2: `(#)` in *new* means reformat to one or more digits. Similarly, `(##)` reformats to two or more digits, and so on, up to ten `#` symbols.

    `rename v(##) stat(##)`: Renames `v01` to `stat01`, `v02` to `stat02`, ..., `v10` to `stat10`, ..., but does not rename `v0`, `v1`, `v2`, ..., `v9`, `v100`, ...

14. `rename v# v(##)`: Renames `v1` to `v01`, `v2` to `v02`, ..., `v10` to `v10`, `v11` to `v11`, ..., `v100` to `v100`, `v101` to `v101`, ...

    Rule 14: You may combine `#`, `(#)`, `(##)`, ... in *old* with any of `#`, `(#)`, `(##)`, ... in *new*.

    `rename v(##) v(#)`: Renames `v01` to `v1`, `v02` to `v2`, ..., `v10` to `v10`, ..., but does not rename `v001`, etc.

    `rename stat(##) stat_20(##)`: Renames `stat10` to `stat_2010`, `stat11` to `stat_2011`, ..., but does not rename `stat1`, `stat2`, ...

    `rename stat(#) to stat_200(#)`: Renames `stat1` to `stat_2001`, `stat2` to `stat_2002`, ..., but does not rename `stat10` or `stat_2010`.

15. `rename v# (a b c)`: Renames `v1` to `a`, `v10` to `b`, and `v2` to `c` if variables `v1`, `v10`, `v2` appear in that order in the data. Because three variables were specified in *new*, `v#` in *old* must select three variables or `rename` will issue an error.

    Rule 15.1: You may mix syntaxes. Note that the explicit and implied numbers of variables must agree.

    `rename v# (a b c), sort`: Renames (for instance) `v1` to `a`, `v2` to `b`, and `v10` to `c`.

    Rule 15.2: The `sort` option places the variables selected by *old* in order and does so smartly. In the case where `#`, `(#)`, `(##)`, ... appear in *old*, `sort` places the variables in numeric order.

    `rename v* (a b c), sort`: Renames (for instance) `valpha` to `a`, `vbeta` to `b`, and `vgamma` to `c` regardless of the order of the variables in the data.

    Rule 15.3: In the case where `*` or `?` appears in *old*, `sort` places the variables in alphabetical order.

16. `rename v# v#, renumber`: Renames (for instance) `v9` to `v1`, `v10` to `v2`, `v8` to `v3`, ..., assuming that variables `v9`, `v10`, `v8`, ... appear in that order in the data.

    Rule 16.1: The `renumber` option resequences the numbers.

    `rename v# v#, renumber sort`: Renames (for instance) `v8` to `v1`, `v9` to `v2`, `v10` to `v3`, ... Concerning option `sort`, see rule 15.2 above.

    `rename v# v#, renumber(10) sort`: Renames (for instance) `v8` to `v10`, `v9` to `v11`, `v10` to `v12`, ...

    Rule 16.2: The `renumber(#)` option allows you to specify the starting value.

17. `rename v* v#, renumber`: Renames (for instance) `valpha` to `v1`, `vgamma` to `v2`, `vbeta` to `v3`, ..., assuming variables `valpha`, `vgamma`, `vbeta`, ... appear in that order in the data.

    Rule 17: `#` in *new* may correspond to `*`, `?`, `#`, `(#)`, `(##)`, ... in *old*.

    `rename v* v#, renumber sort`: Renames (for instance) `valpha` to `v1`, `vbeta` to `v2`, `vgamma` to `v3`, ... Also see rule 15.3 above concerning the `sort` option.

    `rename *stat stat#, renumber`: Renames, for instance, `janstat` to `stat1`, `febstat` to `stat2`, ... Note that `#` in *new* corresponds to `*` in *old*, just as in the previous example.

    `rename *stat stat(##), renumber`: Renames, for instance, `janstat` to `stat01`, `febstat` to `stat02`, ...

`rename *stat stat#, renumber(0)`: Renames, for instance, `janstat` to `stat0`, `febstat` to `stat1`, ...

`rename *stat stat#, renumber sort`: Renames, for instance, `aprstat` to `stat1`, `augstat` to `stat2`, ...

18. `rename (a b c) v#, addnumber`: Renames `a` to `v1`, `b` to `v2`, and `c` to `v3`.

    Rule 18: The `addnumber` option allows you to add numbering. More formally, if you specify `addnumber`, you may specify one more wildcard in *new* than is specified in *old*, and that extra wildcard must be `#`, `(#)`, `(##)`, ...

19. `rename a(#)(#) a(#)[2](#)[1]`: Renames `a12` to `a21`, `a13` to `a31`, `a14` to `a41`, ..., `a21` to `a12`, ...

    Rule 19.1: You may specify explicit subscripts with wildcards in *new* to make explicit its matching wildcard in *old*. Subscripts are specified in square brackets after a wildcard in *new*. The number refers to the number of the wildcard in *old*.

    `rename *stat* *[2]stat*[1]`: Swaps prefixes and suffixes; it renames `bpstata` to `astatbp`, `rstater` to `erstatr`, etc.

    `rename *stat* *[2]stat*`: Does the same as above; it swaps prefixes and suffixes.

    Rule 19.2: After specifying a subscripted wildcard, subsequent unsubscripted wildcards correspond to the same wildcards in *old* as they would if you had removed the subscripted wildcards altogether.

    `rename v#a# v#_#[1]_a#[2]`: Renames `v1a1` to `v1_1_a1`, `v1a2` to `v1_1_a2`, ..., `v2a1` to `v2_2_a1`, ...

    Rule 19.3: Using subscripts, you may refer to the same wildcard in *old* more than once.

    Subscripts are commonly used to interchange suffixes at the ends of variable names. For instance, you have districts and schools within them, and many of the variable names in your data match `*_#_#`. The first number records district and the second records school within district. To reverse the ordering, you type `rename *_#_# *_#[3]_#[2]`. When specifying subscripts, you refer to them by the position number in the original name. For example, our original name was `*_#_#` so `[1]` refers to `*`, `[2]` refers to the first `#`, and `[3]` refers to the last `#`.

Specifier	Meaning in *old*
`*`	0 or more characters
`?`	1 character exactly
`#`	1 or more digits
`(#)`	1 digit exactly
`(##)`	2 digits exactly
`(###)`	3 digits exactly
...	
`(##########)`	10 digits exactly

Specifier	May correspond in *old* with	Meaning in *new*
`*`	`*`, `?`, `#`, `(#)`, ...	copies matched text
`?`	`?`	copies a character
`#`	`#`, `(#)`, ...	copies a number as is
`(#)`	`#`, `(#)`, ...	reformats to 1 or more digits
`(##)`	`#`, `(#)`, ...	reformats to 2 or more digits
...		
`(##########)`	`#`, `(#)`, ...	reformats to 10 digits
`.`	`*`, `?`, `#`, `(#)`, ...	skip
`=`	*nothing*	copies entire variable name

Specifier `#` in any of its guises may also correspond with `*` or `?` if the `renumber` option is specified.

options$_1$	Description
`addnumber`	add sequential numbering to end
`addnumber(#)`	`addnumber`, starting at #
`renumber`	renumber sequentially
`renumber(#)`	`renumber`, starting at #
`sort`	sort before numbering
`dryrun`	do not rename, but instead produce a report
`r`	store variable names in `r()` for programming use

These options correspond to the first and second syntaxes.

options$_2$	Description
`upper`	uppercase ASCII letters in variable names (UPPERCASE)
`lower`	lowercase ASCII letters in variable names (lowercase)
`proper`	propercase ASCII letters in variable names (Propercase)
`dryrun`	do not rename, but instead produce a report
`r`	store variable names in `r()` for programming use

These options correspond to the third syntax. One of `upper`, `lower`, or `proper` must be specified.

Options for renaming variables

`addnumber` and `addnumber(#)` specify to add a sequence number to the variable names. See item 18 of *Syntax*. If # is not specified, the sequence number begins with 1.

`renumber` and `renumber(#)` specify to replace existing numbers or text in a set of variable names with a sequence number. See items 16 and 17 of *Syntax*. If # is not specified, the sequence number begins with 1.

`sort` specifies that the existing names be placed in order before the renaming is performed. See item 15 of *Syntax* for details. This ordering matters only when `addnumber` or `renumber` is also specified or when specifying a list of variable names for *old* or *new*.

`dryrun` specifies that the requested renaming not be performed but instead that a table be displayed showing the old and new variable names. It is often a good idea to specify this option before actually renaming the variables.

r is a programmer's option that requests that old and new variable names be stored in r(). This option may be specified with or without dryrun.

Options for changing the case of groups of variable names

upper, lower, and proper specify how the variables are to be renamed. upper specifies that ASCII letters in variable names be changed to uppercase; lower, to lowercase; and proper, to having the first ASCII letter capitalized and the remaining ASCII letters in lowercase. One of these three options must be specified. Note that these options do not handle Unicode characters beyond the plain ASCII range. To change Unicode characters in the variable names to uppercase, lowercase, or titlecase, use functions ustrupper(), ustrlower(), and ustrtitle(). See the technical note in *Remarks and examples*.

dryrun and r are the same options as documented directly above.

Remarks and examples

Remarks are presented under the following headings:

Advice

1. Read [D] **rename** before reading this entry.
2. Read items 1–19 (the Rules) under *Syntax* above before reading the rest of these remarks.
3. Specify the dryrun option when using complicated patterns. dryrun presents a table of the old and new variable names rather than actually renaming the variables, so you can check that the patterns you have specified produce the desired result.

Explanation

The rename command has three syntaxes; see *Syntax*. See [D] **rename** for details on the first syntax, renaming a single variable. The remaining two syntaxes are for renaming groups of variables and for changing the case of groups of variables. These two syntaxes are the ones we will focus on for the remainder of this manual entry. Here they are again:

rename (old_1 old_2 ...) (new_1 new_2 ...)

rename old_1 old_2 ..., { upper | lower | proper }

The second syntax shown above merely changes the case of variables, such as MPG or mpg or Mpg. For instance, to rename all variables to be lowercase, type

```
rename *, lower
```

The first syntax shown above is more daunting and more powerful. The first syntax has two styles, with and without parentheses:

```
rename (bp_0 bp_1) (bp_1 bp_0)

rename pop*80 pop_*_1980
```

You can combine the two styles whenever it is convenient.

```
rename v* (mpg weight displacement)

rename (mpg weight displacement) v#, addnumber

rename (bp_0 bp_1 pop*80) (bp_1 bp_0 pop_*_1980)
```

We summarize all of this by simply writing the syntax as

`rename` *old new*`, ...`

and referring to *old* and *new*.

Wildcards play different but related roles in *old* and *new*. When you type

```
rename pop*80 pop_*_1980
```

the wildcard (`*` in this case) in *old* specifies which variables are to be renamed, and in *new* the wildcard stands for the text that appears in the variables to be renamed. In this case, there is just one wildcard, but sometimes there are more.

In *old*, `*` means zero or more characters go here. Specifying `pop*80` means find all variables that begin with `pop` and end in `80`. Say that doing so results in three variables being found: `poplt2080`, `pop204080`, and `pop41plus80`. To understand how `*` is interpreted in *new*, it is useful to write the three found variables like this:

pop*80	=	pop	+	*	+	80
poplt2080	=	pop	+	lt20	+	80
pop204080	=	pop	+	2040	+	80
pop41plus80	=	pop	+	41plus	+	80

`*` in *new* refers to what was found by `*` in *old*. So the new pattern `pop_*_1980` will assemble the following new variable names for each of the old names:

old variable	`*` is	→	`pop_*_1980` is
poplt2080	lt20	→	pop_lt20_1980
pop204080	2040	→	pop_2040_1980
pop41plus80	41plus	→	pop_41plus_1980

Thus typing `rename pop*80 pop_*_1980` is equivalent to typing

```
rename poplt2080  pop_lt20_1980

rename pop204080  pop_2040_1980

rename pop41plus80 pop_41plus_1980
```

There are three basic wildcard characters for specification in *old*, and they filter the variables to be renamed:

`*`	0 or more characters go here
`?`	exactly 1 character goes here
`#`	number goes here (this one comes in 11 flavors!)

The generic `#` listed above collects all the digits. The other 10 flavors are `(#)`, which means exactly 1 digit goes here; `(##)`, which means exactly 2 digits go here; and so on, up to exactly 10 digits go here.

All the above, the $3 + 10 = 13$ wildcard characters, can appear in *new*, where each has a different but related meaning:

`*`	copy corresponding text from *old* as is
`?`	copy corresponding character from *old*
`#`	copy corresponding number from *old* as is
`(#)`	reformat corresponding number from *old* to 1 or more digits
`(##)`	reformat corresponding number from *old* to 2 or more digits
...	

In addition, *new* allows two special wildcard characters of its own:

`=`	copy the entire original variable name
`.`	skip the corresponding text in *old*

With the above information and the definitions of the options, you can derive on your own the first eighteen rules given in *Syntax*. The nineteenth rule concerns subscripting. In *new*, you can specify explicitly to which wildcard in *old* you are referring. You can type

```
rename pop*80 pop_*_1980
```

or you can type

```
rename pop*80 pop_*[1]_1980
```

thus making it explicit that the `*` in *new* is referring to the text matched by the first wildcard in *old*. That `*` corresponds to `*` is hardly surprising, especially when there is only one `*` in *old*, so let's complicate the example:

```
rename v*_* outcome_*_*
```

You can type that command, or you can type

```
rename v*_* outcome_*[1]_*[2]
```

More importantly, you can specify the subscripts in whatever order you wish, so you could type

```
rename v*_* outcome_*[2]_*[1]
```

That command would interchange the text in *old* matched by the two wildcards.

* matches 0 or more characters; use ?* to match 1 or more

`l*a` in *old* matches `louisiana` and it matches `la` because `*` means zero or more characters. What if you want to match `louisiana` and `lymphoma` but not `la`?

For instance, say you have from–to variables named `from*to*` and from variables named `from*`. The problem is that variable `fromtoledo` would match `from*to*`. To avoid that, rather than describing the from–to pattern `from*to*`, you use `from?*to?*`. Thus you could type

```
rename from?*to?* from_?*_to_?*
```

`?*` is not a secret wildcard we have yet to tell you about—it is merely the two wildcards `?` and `*` in sequence. `?` means exactly one character goes here, and `*` means zero or more characters go here, so `?*` means one or more characters go here. In the same way, `??*` means two or more characters go here, and so on.

* is greedy

Consider the existing variable `assessment` and pattern `*s*` in *old*. Clearly, `*s*` matches `assessment`, but how? That is, among these possibilities,

```
assessment  =  *        s   *
               ---------------------
               a      + s + sessment
               as     + s + essment
               asse   + s + sment
               asses  + s + ment
```

which one is true? We need to know the answer to know what each of the corresponding wildcards in *new* will mean. The answer is that `*` is greedy, and the pattern is matched from left to right. As we move through the variable name from left to right, at each step `*` takes the most characters possible, subject to the pattern working out.

```
                *       s   *
               ------------------
assessment  =  asses  + s + ment
```

Thus the first `*` in *new* would stand for `asses` and the second would stand for `ment`.

The "subject to the pattern working out" part is important. Variable `sunglasses` would be broken out by `*s*` as

```
               *            s   *
              ------------------------
sunglasses  =  sunglasse  + s + nothing
```

But by `*s?*`, the breakout would be

```
               *          s   ?   *
              ----------------------
sunglasses  =  sunglas  + s + e + s
```

is greedier

Wildcard `#` in *old* is greedier than `*`, which means that when `*` and `#` are up against each other, `#` wins.

Consider the pattern *# and the variable name v1234. Given that * is greedy and that the # specifies one or more digits, the possible solutions are

v1234 =	*		#
	v123	+	4
	v12	+	34
	v1	+	234
	v	+	1234

The solution chosen by rename is the last one, v + 1234. Thus you can type

```
rename *# period_#[2]
```

without concern that some digits might be lost.

❑ Technical note

You cannot directly use functions ustrupper(), ustrlower(), and ustrtitle() in your rename command. You must first create a local macro with the new variable name and then use that macro in your rename command. For example,

```
. local new = ustrlower(Ubicación)
. rename Ubicación ‘new’
```

You can use multiple local macros in a varlist. For example,

```
. local new1 = ustrlower(Ubicación1)
. local new2 = ustrlower(Ubicación2)
. rename (Ubicación1 Ubicación2) (‘new1’ ‘new2’)
```

For more information about local macros, see [U] 18.3.1 Local macros.

❑

Stored results

rename stores nothing in r() by default. If the r option is specified, then rename stores the following in r():

Scalars

r(n)	number of variables to be renamed

Macros

r(oldnames)	original variable names
r(newnames)	new variable names

Variables that are renamed to themselves are omitted from the recorded lists.

Also see

[D] **rename** — Rename variable

[D] **generate** — Create or change contents of variable

[D] **varmanage** — Manage variable labels, formats, and other properties

Description

`reshape` converts data from *wide* to *long* form and vice versa.

`set reshape_favor` specifies whether, when performing the data conversion, `reshape` should favor conserving memory (`memory`) or running quickly (`speed`). Historically, `reshape` favored conserving memory. Switching to `speed` will make `reshape` run faster at the cost of consuming more memory. You can easily revert to the default method for reshaping the data (`default`).

Quick start

Create `v` from 2 time periods stored in `v1` and `v2` for observations identified by `idvar` and add `tvar` identifying time period

```
reshape long v, i(idvar) j(tvar)
```

Create `v` from 2 subobservations stored in `v1` and `v2` for observations identified by `idvar` and add `subobs` identifying each subobservation

```
reshape long v, i(idvar) j(subobs)
```

Same as above, but allow `subobs` to contain strings

```
reshape long v, i(idvar) j(subobs) string
```

Undo results from above

```
reshape wide
```

Create `v1` and `v2` from `v` with observations identified by `idvar` and time period identified by `tvar`

```
reshape wide v, i(idvar) j(tvar)
```

Undo results from above

```
reshape long
```

Create `var` and time identifier `tvar` from `v1ar` and `v2ar` with observation identifier `idvar`

```
reshape long v@ar, i(idvar) j(tvar)
```

Menu

Data > Create or change data > Other variable-transformation commands > Convert data between wide and long

Syntax

Overview

long

i	*j*	*stub*
1	1	4.1
1	2	4.5
2	1	3.3
2	2	3.0

$\xleftrightarrow{\text{reshape}}$

wide

i	*stub*1	*stub*2
1	4.1	4.5
2	3.3	3.0

To go from long to wide:

```
                  j existing variable
                 /
reshape wide stub, i(i) j(j)
```

To go from wide to long:

```
reshape long stub, i(i) j(j)
                 \
                  j new variable
```

To go back to long after using `reshape wide`:

```
reshape long
```

To go back to wide after using `reshape long`:

```
reshape wide
```

Basic syntax

Convert data from wide form to long form

`reshape long` *stubnames* `, i(`*varlist*`)` [*options*]

Convert data from long form to wide form

`reshape wide` *stubnames* `, i(`*varlist*`)` [*options*]

Convert data back to long form after using reshape wide

`reshape long`

Convert data back to wide form after using reshape long

`reshape wide`

List problem observations when reshape fails

`reshape error`

Specify default method for reshaping the data

`set reshape_favor` { `default` | `memory` | `speed` } [`, permanently`]

options	Description
* `i(`*varlist*`)`	use *varlist* as the ID variables
`j(`*varname* [*values*]`)`	long→wide: *varname*, existing variable wide→long: *varname*, new variable optionally specify values to subset *varname*
`string`	*varname* is a string variable (default is numeric)
`favor(`*favor*`)`	specify reshape method; *favor* may be `memory` or `speed`

* `i(`*varlist*`)` is required.

`reshape` does not allow alias variables; see [D] **frunalias** for advice on how to get around this restriction.

values is #[-#] [#[-#] [...]] if *varname* is numeric (default)

"*string*" ["*string*" [...]] if *varname* is string

stubnames are variable names (long→wide), or stubs of variable names (wide→long), and either way, may contain `@`, denoting where *j* appears or is to appear in the name.

In the example above, when we wrote "`reshape wide` *stub*", we could have written "`reshape wide` *stub*`@`" because *j* by default ends up as a suffix. Had we written *stu*`@`*b*, then the wide variables would have been named *stu*1*b* and *stu*2*b*.

Advanced syntax

`reshape i` *varlist*

`reshape j` *varname* [*values*] [, `string`]

`reshape xij` *fvarnames* [, `atwl(`*chars*`)`]

`reshape xi` [*varlist*]

`reshape favor` {`memory`|`speed`}

`reshape` [`query`]

`reshape clear`

Options

`i(`*varlist*`)` specifies the variables whose unique values denote a logical observation. `i()` is required.

`j(`*varname* [*values*]`)` specifies the variable whose unique values denote a subobservation. *values* lists the unique values to be used from *varname*, which typically are not explicitly stated because `reshape` will determine them automatically from the data.

`string` specifies that `j()` may contain string values.

`atwl(`*chars*`)`, available only with the advanced syntax and not shown in the dialog box, specifies that plain ASCII *chars* be substituted for the `@` character when converting the data from wide to long form.

`favor(`*favor*`)` specifies the method for reshaping the data. Historically, `reshape` was coded to minimize its use of memory; this is `favor(memory)`. With `favor(speed)`, the focus is to accomplish the reshape faster at the cost of using more memory.

`permanently` specifies that, in addition to making the change right now, the setting be remembered and become the default setting when you invoke Stata.

Remarks and examples

Remarks are presented under the following headings:

See Mitchell (2020, chap. 9) for information and examples using `reshape`.

Description of basic syntax

Before using `reshape`, you need to determine whether the data are in long or wide form. You also must determine the logical observation (`i`) and the subobservation (`j`) by which to organize the data. Suppose that you had the following data, which could be organized in wide or long form as follows:

i		.... X_{ij}	....	
id	sex	inc80	inc81	inc82
1	0	5000	5500	6000
2	1	2000	2200	3300
3	0	3000	2000	1000

i	j		X_{ij}
id	year	sex	inc
1	80	0	5000
1	81	0	5500
1	82	0	6000
2	80	1	2000
2	81	1	2200
2	82	1	3300
3	80	0	3000
3	81	0	2000
3	82	0	1000

Given these data, you could use `reshape` to convert from one form to the other:

```
. reshape long inc, i(id) j(year)        /* goes from left form to right */
. reshape wide inc, i(id) j(year)        /* goes from right form to left */
```

Because we did not specify `sex` in the command, Stata assumes that it is constant within the logical observation, here `id`.

Wide and long data forms

Think of the data as a collection of observations X_{ij}, where i is the logical observation, or group identifier, and j is the subobservation, or within-group identifier.

Wide-form data are organized by logical observation, storing all the data on a particular observation in one row. Long-form data are organized by subobservation, storing the data in multiple rows.

▷ Example 1

For example, we might have data on a person's ID, gender, and annual income over the years 1980–1982. We have two X_{ij} variables with the data in wide form:

```
. use https://www.stata-press.com/data/r19/reshape1
. list
```

	id	sex	inc80	inc81	inc82	ue80	ue81	ue82
1.	1	0	5000	5500	6000	0	1	0
2.	2	1	2000	2200	3300	1	0	0
3.	3	0	3000	2000	1000	0	0	1

To convert these data to the long form, we type

```
. reshape long inc ue, i(id) j(year)
(j = 80 81 82)
Data                               Wide   ->   Long
-----------------------------------------------------------------------------
Number of observations                3   ->   9
Number of variables                   8   ->   5
j variable (3 values)                     ->   year
xij variables:
                      inc80 inc81 inc82   ->   inc
                         ue80 ue81 ue82   ->   ue
-----------------------------------------------------------------------------
```

There is no variable named year in our original, wide-form dataset. year will be a new variable in our long dataset. After this conversion, we have

```
. list, sep(3)
```

	id	year	inc	ue	sex
1.	1	80	5000	0	0
2.	1	81	5500	1	0
3.	1	82	6000	0	0
4.	2	80	2000	1	1
5.	2	81	2200	0	1
6.	2	82	3300	0	1
7.	3	80	3000	0	0
8.	3	81	2000	0	0
9.	3	82	1000	1	0

We can return to our original, wide-form dataset by using `reshape wide`.

```
. reshape wide inc ue, i(id) j(year)
(j = 80 81 82)
Data                               Long   ->   Wide
-----------------------------------------------------------------------------

Number of observations                9   ->   3
Number of variables                   5   ->   8
j variable (3 values)              year   ->   (dropped)
xij variables:
                                    inc   ->   inc80 inc81 inc82
                                     ue   ->   ue80 ue81 ue82
-----------------------------------------------------------------------------

. list
```

	id	inc80	ue80	inc81	ue81	inc82	ue82	sex
1.	1	5000	0	5500	1	6000	0	0
2.	2	2000	1	2200	0	3300	0	1
3.	3	3000	0	2000	0	1000	1	0

Converting from wide to long creates the `j` (`year`) variable. Converting back from long to wide drops the `j` (`year`) variable.

◁

❑ Technical note

If your data are in wide form and you do not have a group identifier variable (the `i(`*varlist*`)` required option), you can create one easily by using `generate`; see [D] **generate**. For instance, in the last example, if we did not have the `id` variable in our dataset, we could have created it by typing

```
. generate id = _n
```

❑

Avoiding and correcting mistakes

`reshape` often detects when the data are not suitable for reshaping; an error is issued, and the data remain unchanged.

▷ Example 2

The following wide data contain a mistake:

```
. use https://www.stata-press.com/data/r19/reshape2, clear
. list
```

	id	sex	inc80	inc81	inc82
1.	1	0	5000	5500	6000
2.	2	1	2000	2200	3300
3.	3	0	3000	2000	1000
4.	2	0	2400	2500	2400

```
. reshape long inc, i(id) j(year)
variable id does not uniquely identify the observations
    Your data are currently wide. You are performing a reshape long. You
    specified i(id) and j(year). In the current wide form, variable id should
    uniquely identify the observations. Remember this picture:

         long                                wide
        +---------------+                   +------------------+
        | i   j   a   b |                   | i   a1  a2  b1 b2|
        |---------------|   <--- reshape --->|------------------|
        | 1   1   1   2 |                   | 1   1   3   2  4 |
        | 1   2   3   4 |                   | 2   5   7   6  8 |
        | 2   1   5   6 |                   +------------------+
        | 2   2   7   8 |
        +---------------+

    Type reshape error for a list of the problem observations.
r(9);
```

The i variable must be unique when the data are in the wide form; we typed i(id), yet we have 2 observations for which id is 2. (Is person 2 a male or female?)

◁

▷ Example 3

It is not a mistake when the i variable is repeated when the data are in long form, but the following data have a similar mistake:

```
. use https://www.stata-press.com/data/r19/reshapexp1
. list
```

	id	year	sex	inc
1.	1	80	0	5000
2.	1	81	0	5500
3.	1	81	0	5400
4.	1	82	0	6000

```
. reshape wide inc, i(id) j(year)
values of variable year not unique within id
    Your data are currently long. You are performing a reshape wide. You
    specified i(id) and j(year). There are observations within i(id) with the
    same value of j(year). In the long data, variables i() and j() together
    must uniquely identify the observations.

         long                                wide
        +---------------+                   +------------------+
        | i   j   a   b |                   | i   a1  a2  b1 b2|
        |---------------|   <--- reshape --->|------------------|
        | 1   1   1   2 |                   | 1   1   3   2  4 |
        | 1   2   3   4 |                   | 2   5   7   6  8 |
        | 2   1   5   6 |                   +------------------+
        | 2   2   7   8 |
        +---------------+

    Type reshape error for a list of the problem variables.
r(9);
```

In the long form, i(id) does not have to be unique, but j(year) must be unique within i; otherwise, what is the value of inc in 1981 for which id==1?

reshape told us to type reshape error to view the problem observations.

```
. reshape error
(j = 80 81 82)

i (id) indicates the top-level grouping such as subject id.
j (year) indicates the subgrouping such as time.
The data are in the long form; j should be unique within i.

There are multiple observations on the same year within id.

The following 2 of 4 observations have repeated year values:
```

	id	year
2.	1	81
3.	1	81

```
(data now sorted by id year)
```

Example 4

Consider some long-form data that have no mistakes. We list the first 4 observations.

```
. use https://www.stata-press.com/data/r19/reshape6
. list in 1/4
```

	id	year	sex	inc	ue
1.	1	80	0	5000	0
2.	1	81	0	5500	1
3.	1	82	0	6000	0
4.	2	80	1	2000	1

Say that when converting the data to wide form, however, we forget to mention the ue variable (which varies within person).

```
. reshape wide inc, i(id) j(year)
(j = 80 81 82)
variable ue not constant within id
    Your data are currently long.  You are performing a reshape wide.  You
    typed something like

        . reshape wide a b, i(id) j(year)

    There are variables other than a, b, id, year in your data.  They must be
    constant within id because that is the only way they can fit into wide
    data without loss of information.

    The variable or variables listed above are not constant within id.
    Perhaps the values are in error.  Type reshape error for a list of the
    problem observations.

    Either that, or the values vary because they should vary, in which case
    you must either add the variables to the list of xij variables to be
    reshaped, or drop them.
r(9);
```

Here reshape observed that ue was not constant within id and so could not restructure the data so that there were single observations on id. We should have typed

```
. reshape wide inc ue, i(id) j(year)
```

◁

In summary, there are three cases in which reshape will refuse to convert the data:

1. The data are in wide form and i is not unique.
2. The data are in long form and j is not unique within i.
3. The data are in long form and an unmentioned variable is not constant within i.

▷ Example 5

With some mistakes, reshape will probably convert the data and produce a surprising result. Suppose that we forget to mention that the ue variable varies within id in the following wide data:

```
. use https://www.stata-press.com/data/r19/reshape1
. list
```

	id	sex	inc80	inc81	inc82	ue80	ue81	ue82
1.	1	0	5000	5500	6000	0	1	0
2.	2	1	2000	2200	3300	1	0	0
3.	3	0	3000	2000	1000	0	0	1

```
. reshape long inc, i(id) j(year)
(j = 80 81 82)
Data                                   Wide   ->   Long
-----------------------------------------------------------------------------
Number of observations                    3   ->   9
Number of variables                       8   ->   7
j variable (3 values)                         ->   year
xij variables:
                          inc80 inc81 inc82   ->   inc
-----------------------------------------------------------------------------
. list, sep(3)
```

	id	year	inc	sex	ue80	ue81	ue82
1.	1	80	5000	0	0	1	0
2.	1	81	5500	0	0	1	0
3.	1	82	6000	0	0	1	0
4.	2	80	2000	1	1	0	0
5.	2	81	2200	1	1	0	0
6.	2	82	3300	1	1	0	0
7.	3	80	3000	0	0	0	1
8.	3	81	2000	0	0	0	1
9.	3	82	1000	0	0	0	1

We did not state that ue varied within i, so the variables ue80, ue81, and ue82 were left as is. reshape did not complain. There is no real problem here because no information has been lost. In fact, this may actually be the result we wanted. Probably, however, we simply forgot to include ue among the X_{ij} variables.

If you obtain an unexpected result, here is how to undo it:

1. If you typed `reshape long ...` to produce the result, type `reshape wide` (without arguments) to undo it.
2. If you typed `reshape wide ...` to produce the result, type `reshape long` (without arguments) to undo it.

So, we can type

```
. reshape wide
```

to get back to our original, wide-form data and then type the `reshape long` command that we intended:

```
. reshape long inc ue, i(id) j(year)
```

◁

reshape long and reshape wide without arguments

Whenever you type a `reshape long` or `reshape wide` command with arguments, `reshape` remembers it. Thus you might type

```
. reshape long inc ue, i(id) j(year)
```

and work with the data like that. You could then type

```
. reshape wide
```

to convert the data back to the wide form. Then later you could type

```
. reshape long
```

to convert them back to the long form. If you save the data, you can even continue using `reshape wide` and `reshape long` without arguments during a future Stata session.

Be careful. If you create new X_{ij} variables, you must tell `reshape` about them by typing the full `reshape` command, although no real damage will be done if you forget. If you are converting from long to wide form, `reshape` will catch your error and refuse to make the conversion. If you are converting from wide to long, `reshape` will convert the data, but the result will be surprising: remember what happened when we forgot to mention the `ue` variable and ended up with `ue80`, `ue81`, and `ue82` in our long data; see example 5. You can `reshape long` to undo the unwanted change and then try again.

Missing variables

When converting data from wide form to long form, `reshape` does not demand that all the variables exist. Missing variables are treated as variables with missing observations.

▷ Example 6

Let's drop ue81 from the wide form of the data:

```
. use https://www.stata-press.com/data/r19/reshape1, clear

. drop ue81

. list
```

	id	sex	inc80	inc81	inc82	ue80	ue82
1.	1	0	5000	5500	6000	0	0
2.	2	1	2000	2200	3300	1	0
3.	3	0	3000	2000	1000	0	1

```
. reshape long inc ue, i(id) j(year)
(j = 80 81 82)
(variable ue81 not found)
Data                               Wide   ->   Long
-----------------------------------------------------------------------------

Number of observations                3   ->   9
Number of variables                   7   ->   5
j variable (3 values)                     ->   year
xij variables:
                      inc80 inc81 inc82   ->   inc
                         ue80 ue81 ue82   ->   ue
-----------------------------------------------------------------------------

. list, sep(3)
```

	id	year	inc	ue	sex
1.	1	80	5000	0	0
2.	1	81	5500	.	0
3.	1	82	6000	0	0
4.	2	80	2000	1	1
5.	2	81	2200	.	1
6.	2	82	3300	0	1
7.	3	80	3000	0	0
8.	3	81	2000	.	0
9.	3	82	1000	1	0

reshape placed missing values where ue81 values were unavailable. If we reshaped these data back to wide form by typing

```
. reshape wide inc ue, i(id) j(year)
```

the ue81 variable would be created and would contain all missing values.

◁

Advanced issues with basic syntax: i()

The i() option can indicate one i variable (as our past examples have illustrated) or multiple variables. An example of multiple i variables would be hospital ID and patient ID within each hospital.

```
. reshape ... , i(hid pid)
```

Unique pairs of values for hid and pid in the data define the grouping variable for reshape.

Advanced issues with basic syntax: j()

The j() option takes a variable name (as our past examples have illustrated) or a variable name and a list of values. When the values are not provided, reshape deduces them from the data. Specifying the values with the j() option is rarely needed.

reshape never makes a mistake when the data are in long form and you type reshape wide. The values are easily obtained by tabulating the j variable.

reshape can make a mistake when the data are in wide form and you type reshape long if your variables are poorly named. Say that you have the inc80, inc81, and inc82 variables, recording income in each of the indicated years, and you have a variable named inc2, which is not income but indicates when the area was reincorporated. You type

```
. reshape long inc, i(id) j(year)
```

reshape sees the inc2, inc80, inc81, and inc82 variables and decides that there are four groups in which j = 2, 80, 81, and 82.

The easiest way to solve the problem is to rename the inc2 variable to something other than "inc" followed by a number; see [D] **rename**.

You can also keep the name and specify the j values. To perform the reshape, you can type

```
. reshape long inc, i(id) j(year 80-82)
```

or

```
. reshape long inc, i(id) j(year 80 81 82)
```

You can mix the dash notation for value ranges with individual numbers. reshape would understand 80 82-87 89 91-95 as a valid values specification.

At the other extreme, you can omit the j() option altogether with reshape long. If you do, the j variable will be named _j.

Advanced issues with basic syntax: xij

When specifying variable names, you may include @ characters to indicate where the numbers go.

▷ Example 7

Let's reshape the following data from wide to long form:

```
. use https://www.stata-press.com/data/r19/reshape3, clear
. list
```

	id	sex	inc80r	inc81r	inc82r	ue80	ue81	ue82
1.	1	0	5000	5500	6000	0	1	0
2.	2	1	2000	2200	3300	1	0	0
3.	3	0	3000	2000	1000	0	0	1

```
. reshape long inc@r ue, i(id) j(year)
(j = 80 81 82)
Data                                  Wide   ->   Long
-----------------------------------------------------------------------------
Number of observations                   3   ->   9
Number of variables                      8   ->   5
j variable (3 values)                        ->   year
xij variables:
                       inc80r inc81r inc82r  ->   incr
                             ue80 ue81 ue82  ->   ue
-----------------------------------------------------------------------------

. list, sep(3)

     +-------------------------------+
     | id   year   incr   ue     sex |
     |-------------------------------|
  1. |  1     80   5000    0       0 |
  2. |  1     81   5500    1       0 |
  3. |  1     82   6000    0       0 |
     |-------------------------------|
  4. |  2     80   2000    1       1 |
  5. |  2     81   2200    0       1 |
  6. |  2     82   3300    0       1 |
     |-------------------------------|
  7. |  3     80   3000    0       0 |
  8. |  3     81   2000    0       0 |
  9. |  3     82   1000    1       0 |
     +-------------------------------+
```

At most one `@` character may appear in each name. If no `@` character appears, results are as if the `@` character appeared at the end of the name. So, the equivalent `reshape` command to the one above is

```
. reshape long inc@r ue@, i(id) j(year)
```

`inc@r` specifies variables named `inc#r` in the wide form and `incr` in the long form. The `@` notation may similarly be used for converting data from long to wide format:

```
. reshape wide inc@r ue, i(id) j(year)
```

◁

Advanced issues with basic syntax: String identifiers for j()

The `string` option allows `j` to take on string values.

▷ Example 8

Consider the following wide data on husbands and wives. In these data, `incm` is the income of the man and `incf` is the income of the woman.

```
. use https://www.stata-press.com/data/r19/reshape4, clear

. list

     +--------------------------+
     | id   kids   incm    incf |
     |--------------------------|
  1. |  1      0   5000    5500 |
  2. |  2      1   2000    2200 |
  3. |  3      2   3000    2000 |
     +--------------------------+
```

These data can be reshaped into separate observations for males and females by typing

```
. reshape long inc, i(id) j(sex) string
(j = f m)
Data                                   Wide   ->   Long
-----------------------------------------------------------------------------
Number of observations                    3   ->   6
Number of variables                       4   ->   4
j variable (2 values)                         ->   sex
xij variables:
                                  incf incm   ->   inc
-----------------------------------------------------------------------------
```

The `string` option specifies that `j` take on nonnumeric values. The result is

```
. list, sep(2)

     +------------------------+
     | id   sex    inc   kids |
     |------------------------|
  1. |  1     f   5500      0 |
  2. |  1     m   5000      0 |
     |------------------------|
  3. |  2     f   2200      1 |
  4. |  2     m   2000      1 |
     |------------------------|
  5. |  3     f   2000      2 |
  6. |  3     m   3000      2 |
     +------------------------+
```

`sex` will be a string variable. Similarly, these data can be converted from long to wide form by typing

```
. reshape wide inc, i(id) j(sex) string
```

◁

Strings are not limited to being single characters or even having the same length. You can specify the location of the string identifier in the variable name by using the `@` notation.

▷ Example 9

Suppose that our variables are named `id`, `kids`, `incmale`, and `incfem`.

```
. use https://www.stata-press.com/data/r19/reshapexp2, clear
. list

     +---------------------------------+
     | id   kids   incmale    incfem   |
     |---------------------------------|
  1. |  1      0      5000      5500   |
  2. |  2      1      2000      2200   |
  3. |  3      2      3000      2000   |
     +---------------------------------+

. reshape long inc, i(id) j(sex) string
(j = fem male)
Data                                   Wide   ->   Long
-----------------------------------------------------------------------------
Number of observations                    3   ->   6
Number of variables                       4   ->   4
j variable (2 values)                         ->   sex
xij variables:
                             incfem incmale   ->   inc
-----------------------------------------------------------------------------
```

```
. list, sep(2)
```

	id	sex	inc	kids
1.	1	fem	5500	0
2.	1	male	5000	0
3.	2	fem	2200	1
4.	2	male	2000	1
5.	3	fem	2000	2
6.	3	male	3000	2

If the wide data had variables named `minc` and `finc`, the appropriate `reshape` command would have been

```
. reshape long @inc, i(id) j(sex) string
```

The resulting variable in the long form would be named `inc`.

We can also place strings in the middle of the variable names. If the variables were named `incMome` and `incFome`, the `reshape` command would be

```
. reshape long inc@ome, i(id) j(sex) string
```

Be careful with string identifiers because it is easy to be surprised by the result. Say that we have wide data having variables named `incm`, `incf`, `uem`, `uef`, `agem`, and `agef`. To make the data long, we might type

```
. reshape long inc ue age, i(id) j(sex) string
```

Along with these variables, we also have the variable `agenda`. `reshape` will decide that the sexes are `m`, `f`, and `nda`. This would not happen without the `string` option if the variables were named `inc0`, `inc1`, `ue0`, `ue1`, `age0`, and `age1`, even with the `agenda` variable present in the data.

◁

Advanced issues with basic syntax: Second-level nesting

Sometimes the data may have more than one possible `j` variable for reshaping. Suppose that your data have both a year variable and a sex variable. One logical observation in the data might be represented in any of the following four forms:

```
. list in 1/4    // The long-long form
```

	hid	sex	year	inc
1.	1	f	90	3200
2.	1	f	91	4700
3.	1	m	90	4500
4.	1	m	91	4600

```
. list in 1/2     // The long-year wide-sex form

     +---------------------------+
     | hid   year   minc   finc  |
     |---------------------------|
  1. |   1     90   4500   3200  |
  2. |   1     91   4600   4700  |
     +---------------------------+

. list in 1/2     // The wide-year long-sex form

     +----------------------------+
     | hid   sex   inc90   inc91  |
     |----------------------------|
  1. |   1     f    3200    4700  |
  2. |   1     m    4500    4600  |
     +----------------------------+

. list in 1       // The wide-wide form

     +---------------------------------------------+
     | hid   minc90   minc91   finc90   finc91     |
     |---------------------------------------------|
  1. |   1     4500     4600     3200     4700     |
     +---------------------------------------------+
```

`reshape` can convert any of these forms to any other. Converting data from the long–long form to the wide–wide form (or any of the other forms) takes two `reshape` commands. Here is how we would do it:

From year	From sex	To year	To sex	Command
long	long	long	wide	`reshape wide @inc, i(hid year) j(sex) string`
long	wide	long	long	`reshape long @inc, i(hid year) j(sex) string`
long	long	wide	long	`reshape wide inc, i(hid sex) j(year)`
wide	long	long	long	`reshape long inc, i(hid sex) j(year)`
long	wide	wide	wide	`reshape wide minc finc, i(hid) j(year)`
wide	wide	long	wide	`reshape long minc finc, i(hid) j(year)`
wide	long	wide	wide	`reshape wide @inc90 @inc91, i(hid) j(sex) string`
wide	wide	wide	long	`reshape long @inc90 @inc91, i(hid) j(sex) string`

Description of advanced syntax

The advanced syntax is simply a different way of specifying the `reshape` command, and it has one seldom-used feature that provides extra control. Rather than typing one `reshape` command to describe the data and perform the conversion, such as

```
. reshape long inc, i(id) j(year)
```

you type a sequence of `reshape` commands. The initial commands describe the data, and the last command performs the conversion:

```
. reshape i id
. reshape j year
. reshape xij inc
. reshape long
```

`reshape i` corresponds to `i()` in the basic syntax.

`reshape j` corresponds to `j()` in the basic syntax.

reshape xij corresponds to the variables specified in the basic syntax. reshape xij also accepts the atwl() option for use when @ characters are specified in the *fvarnames*. atwl stands for at-when-long. When you specify names such as inc@r or ue@, in the long form the names become incr and ue, and the @ character is ignored. atwl() allows you to change @ into whatever you specify. For example, if you specify atwl(X), the long-form names become incXr and ueX.

There is also one more specification, which has no counterpart in the basic syntax:

```
. reshape xi  varlist
```

In the basic syntax, Stata assumes that all unspecified variables are constant within i. The advanced syntax works the same way, unless you specify the reshape xi command, which names the constant-within-i variables. If you specify reshape xi, any variables that you do not explicitly specify are dropped from the data during the conversion.

As a practical matter, you should explicitly drop the unwanted variables before conversion. For instance, suppose that the data have variables inc80, inc81, inc82, sex, age, and age2 and that you no longer want the age2 variable. You could specify

```
. reshape xi sex age
```

or

```
. drop age2
```

and leave reshape xi unspecified.

reshape xi does have one minor advantage. It saves reshape the work of determining which variables are unspecified. This saves a relatively small amount of computer time.

Another advanced-syntax feature is reshape query, which is equivalent to typing reshape by itself. reshape query reports which reshape parameters have been defined. reshape i, reshape j, reshape xij, and reshape xi specifications may be given in any order and may be repeated to change or correct what has been specified.

Finally, reshape clear clears the definitions. reshape definitions are stored with the dataset when you save it. reshape clear allows you to erase these definitions.

The basic syntax of reshape is implemented in terms of the advanced syntax, so you can mix basic and advanced syntaxes.

Why favor memory over speed?

The original code for reshape was written in a time when computer memory was not as abundantly available as it is today and Stata could not handle multiple datasets in memory at the same time. This code uses the commands preserve, save, use, append, and merge to reshape the data between forms. Incrementally reshaping the data this way accommodated the memory limitations of the time at the cost of being slow for bigger datasets. This is the method used with favor(memory).

With favor(speed), reshape preallocates a data frame with the target form and fills it with the data from the current frame. This method of data conversion is typically much faster but requires double the memory used for the original data.

reshape's default behavior is set by

```
. set reshape_favor default
```

and is determined by the current "user version". If the user version is 19 or greater, the default is to favor speed. If the user version is less than 19, then the default is to favor memory.

If reshape is favoring speed, you may experience Mata runtime failures with reshape for datasets that are larger than half the available memory on your computer. If your data are larger than half the available memory, use the favor(memory) option to avoid this memory constraint.

Video examples

How to reshape data from long format to wide format

How to reshape data from wide format to long format

Stored results

reshape stores the following characteristics with the data (see [P] **char**):

_dta[ReS_i]	i variable names
_dta[ReS_j]	j variable name
_dta[ReS_jv]	j values, if specified
_dta[ReS_Xij]	X_{ij} variable names
_dta[ReS_Xij_n]	number of X_{ij} variables
_dta[ReS_Xij_long#]	name of #th X_{ij} variable in long form
_dta[ReS_Xij_wide#]	name of #th X_{ij} variable in wide form
_dta[ReS_Xi]	X_i variable names, if specified
_dta[ReS_atwl]	atwl() value, if specified
_dta[ReS_str]	1 if option string specified, 0 otherwise
_dta[ReS_favor]	favor() value, if specified

Acknowledgment

This version of reshape was based in part on the work of Jeroen Weesie (1997) of the Department of Sociology at Utrecht University, The Netherlands.

References

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Simons, K. L. 2016. A sparser, speedier reshape. *Stata Journal* 16: 632–649.

Weesie, J. 1997. dm48: An enhancement of reshape. *Stata Technical Bulletin* 38: 2–4. Reprinted in *Stata Technical Bulletin Reprints*, vol. 7, pp. 40–43. College Station, TX: Stata Press.

Also see

[D] **frunalias** — Change storage type of alias variables

[D] **save** — Save Stata dataset

[D] **stack** — Stack data

[D] **xpose** — Interchange observations and variables

[P] **char** — Characteristics

rmdir — Remove directory

Description Quick start Syntax Remarks and examples Also see

Description

`rmdir` removes an empty directory (folder).

Quick start

Remove empty `myfolder` from the current working directory

`rmdir myfolder`

Remove `myfolder` from `C:\mydir` using Stata for Windows

`rmdir c:\mydir\myfolder`

Remove `myfolder` from `~/mydir` using Stata for Mac or Unix

`rmdir ~/mydir/myfolder`

Remove `my folder` from `C:\my dir` using Stata for Windows

`rmdir "c:\my dir\my folder"`

Syntax

`rmdir` *directory_name*

Double quotes may be used to enclose the directory name, and the quotes must be used if the directory name contains embedded blanks.

Remarks and examples

Examples:

Windows

```
. rmdir myproj
. rmdir c:\projects\myproj
. rmdir "c:\My Projects\Project 1"
```

Mac and Unix

```
. rmdir myproj
. rmdir ~/projects/myproj
```

Also see

[D] **cd** — Change directory

[D] **copy** — Copy file from disk or URL

[D] **dir** — Display filenames

[D] **erase** — Erase a disk file

[D] **mkdir** — Create directory

[D] **shell** — Temporarily invoke operating system

[D] **type** — Display contents of a file

[U] 11.6 Filenaming conventions

sample — Draw random sample

Description

sample draws random samples of the data in memory. “Sampling” here is defined as drawing observations without replacement; see [R] **bsample** for sampling with replacement.

The size of the sample to be drawn can be specified as a percentage or as a count:

- sample without the count option draws a #% pseudorandom sample of the data in memory, thus discarding (100 − #)% of the observations.
- sample with the count option draws a #-observation pseudorandom sample of the data in memory, thus discarding _N − # observations. # can be larger than _N, in which case all observations are kept.

In either case, observations not meeting the optional if and in criteria are kept (sampled at 100%).

If you are interested in reproducing results, you must first set the random-number seed; see [R] **set seed**.

Quick start

Draw 10% pseudorandom sample without replacement from data in memory

```
sample 10
```

Same as above, but perform sampling within strata identified by svar

```
sample 10, by(svar)
```

Sample 100 observations from data in memory

```
sample 100, count
```

Same as above, but only sample observations where catvar equals 5

```
sample 100 if catvar==5, count
```

Menu

Statistics > Resampling > Draw random sample

Syntax

sample # [*if*] [*in*] [, count by(*groupvars*)]

by is allowed; see [D] **by**.

Options

count specifies that # in sample # be interpreted as an observation count rather than as a percentage. Typing sample 5 without the count option means that a 5% sample be drawn; typing sample 5, count, however, would draw a sample of 5 observations.

Specifying # as greater than the number of observations in the dataset is not considered an error.

by(*groupvars*) specifies that a #% sample be drawn within each set of values of *groupvars*, thus maintaining the proportion of each group.

count may be combined with by(). For example, typing sample 50, count by(sex) would draw a sample of size 50 for men and 50 for women.

Specifying by *varlist*: sample # is equivalent to specifying sample #, by(*varlist*); use whichever syntax you prefer.

Remarks and examples

▷ Example 1

We have NLSY data on young women aged 14–24 years in 1968 and wish to draw a 10% sample of the data in memory.

```
. use https://www.stata-press.com/data/r19/nlswork
(National Longitudinal Survey of Young Women, 14-24 years old in 1968)
. describe, short
Contains data from https://www.stata-press.com/data/r19/nlswork.dta
 Observations:        28,534                  National Longitudinal Survey of
                                                Young Women, 14-24 years old in
                                                1968
    Variables:            21                  27 Nov 2024 08:14
Sorted by: idcode  year
. sample 10
(25,681 observations deleted)
. describe, short
Contains data from https://www.stata-press.com/data/r19/nlswork.dta
 Observations:         2,853                  National Longitudinal Survey of
                                                Young Women, 14-24 years old in
                                                1968
    Variables:            21                  27 Nov 2024 08:14
Sorted by:
     Note: Dataset has changed since last saved.
```

Our original dataset had 28,534 observations. The sample-10 dataset has 2,853 observations, which is the nearest number to 0.10×28534.

◁

▷ Example 2

Among the variables in our data is race. By typing label list, we see that race = 1 denotes whites, race = 2 denotes blacks, and race = 3 denotes other races. We want to keep 100% of the nonwhite women but only 10% of the white women.

```
. use https://www.stata-press.com/data/r19/nlswork, clear
(National Longitudinal Survey of Young Women, 14-24 years old in 1968)

. tab race

       Race |      Freq.     Percent        Cum.
------------+-----------------------------------
      White |     20,180       70.72       70.72
      Black |      8,051       28.22       98.94
      Other |        303        1.06      100.00
------------+-----------------------------------
      Total |     28,534      100.00

. sample 10 if race == 1
(18,162 observations deleted)

. describe, short

Contains data from https://www.stata-press.com/data/r19/nlswork.dta
 Observations:        10,372                  National Longitudinal Survey of
                                                Young Women, 14-24 years old in
                                                1968
    Variables:            21                  27 Nov 2024 08:14
Sorted by:
     Note: Dataset has changed since last saved.

. display .10*20180 + 8051 + 303
10372
```

◁

▷ Example 3

Now let's suppose that we want to keep 10% of each of the three categories of race.

```
. use https://www.stata-press.com/data/r19/nlswork, clear
(National Longitudinal Survey of Young Women, 14-24 years old in 1968)

. sample 10, by(race)
(25,681 observations deleted)

. tab race

       Race |      Freq.     Percent        Cum.
------------+-----------------------------------
      White |      2,018       70.73       70.73
      Black |        805       28.22       98.95
      Other |         30        1.05      100.00
------------+-----------------------------------
      Total |      2,853      100.00
```

This differs from simply typing sample 10 in that with by(), sample holds constant the percentages of white, black, and other women.

◁

❑ Technical note

We have a large dataset on disk containing 125,235 observations. We wish to draw a 10% sample of this dataset without loading the entire dataset (perhaps because the dataset will not fit in memory). `sample` will not solve this problem—the dataset must be loaded first—but it is rather easy to solve it ourselves. Say that `bigdata.dct` contains the dictionary for this dataset; see [D] **import**. One solution is to type

```
. infile using bigdata if runiform()<=.1
dictionary {
    etc.
}
(12,580 observations read)
```

The `if` qualifier on the end of `infile` drew uniformly distributed random numbers over the interval 0 and 1 and kept each observation if the random number was less than or equal to 0.1. This, however, did not draw an exact 10% sample—the sample was expected to contain only 10% of the observations, and here we obtained just more than 10%. This is probably a reasonable solution.

If the sample must contain precisely 12,524 observations, however, after getting too many observations, we could type

```
. generate u=runiform()

. sort u

. keep in 1/12524
(56 observations deleted)
```

That is, we put the resulting sample in random order and keep the first 12,524 observations. Now our only problem is making sure that, at the first step, we have more than 12,524 observations. Here we were lucky, but half the time we will not be so lucky—after typing `infile ... if runiform()<=.1`, we will have less than a 10% sample. The solution, of course, is to draw more than a 10% sample initially and then cut it back to 10%.

How much more than 10% do we need? That depends on the number of records in the original dataset, which in our example is 125,235.

A little experimentation with `bitesti` (see [R] **bitest**) provides the answer:

```
. bitesti 125235 12524 .102

Binomial probability test

            N   Observed k   Expected k   Assumed p   Observed p
-----------------------------------------------------------------
      125,235       12,524    12,773.97     0.10200      0.10000

  Pr(k >= 12,524)                 = 0.990466  (one-sided test)
  Pr(k <= 12,524)                 = 0.009777  (one-sided test)
  Pr(k <= 12,524 or k >= 13,025) = 0.019584  (two-sided test)
```

Initially drawing a 10.2% sample will yield a sample larger than 10% 99 times of 100. If we draw a 10.4% sample, we are virtually assured of having enough observations (type `bitesti 125235 12524 .104` for yourself).

❑

References

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Also see

[D] **splitsample** — Split data into random samples

[R] **bsample** — Sampling with replacement

save — Save Stata dataset

Description | Quick start | Menu | Syntax
Options for save | Options for saveold | Remarks and examples | Also see

Description

save stores the dataset currently in memory on disk under the name *filename*. If *filename* is not specified, the name under which the data were last known to Stata (c(filename)) is used. If *filename* is specified without an extension, .dta is used. If your *filename* contains embedded spaces, remember to enclose it in double quotes.

Stata 14 through 17 have the same dataset format so long as the dataset has 32,767 variables or less. Stata 18 and 19 have the same format too, unless the data have alias variables in them; see below. Since Stata/MP 15, Stata/MP has supported more than 32,767 variables and thus has a slightly different dataset format when there are that many variables. If you are using Stata 18 or later, do not have alias variables, and you want to save a dataset so that it may be read by someone using Stata 15, Stata 16, or Stata 17, simply use the save command; those older versions will be able to read it. If the dataset has more than 32,767 variables, it can be read by Stata/MP 15, Stata/MP 16, Stata/MP 17, and Stata/MP 18. If you want to save a dataset so that it may be read by someone using Stata 14, again simply use the save command; Stata 14 will be able to read it so long as it does not have more than 32,767 variables. Stata 14 supports at most 32,767 variables.

saveold saves the dataset currently in memory on disk under the name *filename* in previous .dta formats, namely, those for Stata 13, 12, or 11. If you are using Stata 19 and want to save a file so that it may be read by someone using an older version of Stata, use the saveold command.

Alias variables, introduced in Stata 18, are variables that reference other variables in a linked frame; see [D] **fralias**. If your dataset does not contain alias variables, then you can use commands save and saveold as mentioned above. For datasets with alias variables, Stata 18 and later use a new format to accommodate this new variable type. In addition, Stata/MP has a new format to accommodate datasets with alias variables and more than 32,767 variables. If you are using data with alias variables and want to save a dataset so that it may be read by someone using an older version of Stata, then you must either drop the alias variables or use command frunalias to change the alias variables into copies of the variables they reference. Then you use commands save or saveold as mentioned above. The same is true for datasets with alias variables and more than 32,767 variables and older versions of Stata/MP.

Quick start

Save data in memory to mydata.dta in the current directory

```
save mydata
```

Same as above, but overwrite mydata.dta if it exists

```
save mydata, replace
```

Also save value labels that have not been applied to variables

```
save mydata, replace orphans
```

Save data in Stata 13 format

```
saveold mydata
```

Menu

File > Save as...

Syntax

Save data in memory to file

save [*filename*] [, *save_options*]

Save data in memory to file in Stata 13, 12, or 11 format

saveold *filename* [, *saveold_options*]

save_options	Description
nolabel	omit value labels from the saved dataset
replace	overwrite existing dataset
all	save e(sample) with the dataset; programmer's option
orphans	save all value labels
emptyok	save dataset even if zero observations and zero variables

saveold_options	Description
version(#)	specify version 11 $\leq$ # $\leq$ 18; default is version(13), meaning Stata 13 format
nolabel	omit value labels from the saved dataset
replace	overwrite existing dataset
all	save e(sample) with the dataset; programmer's option

Options for save

nolabel omits value labels from the saved dataset. The associations between variables and value-label names, however, are saved along with the dataset label and the variable labels.

replace permits save to overwrite an existing dataset.

all is for use by programmers. If specified, e(sample) will be saved with the dataset. You could run a regression; save mydata, all; drop _all; use mydata; and predict yhat if e(sample).

orphans saves all value labels, including those not attached to any variable.

emptyok is a programmer's option. It specifies that the dataset be saved, even if it contains zero observations and zero variables. If emptyok is not specified and the dataset is empty, save responds with the message "no variables defined".

Options for saveold

version(#) specifies which previous .dta file format is to be used. # may be 18, 17, 16, 15, 14, 13, 12, or 11. The default is version(13), meaning Stata 13 format. To save datasets in the modern, Stata 18 and later format, use the save command, not saveold. Stata 14 through Stata 19 share the same format, provided that there are no alias variables, so you do not have to use saveold to save a Stata 14, 15, 16, 17, or 18 dataset; simply use save.

`nolabel` omits value labels from the saved dataset. The associations between variables and value-label names, however, are saved along with the dataset label and the variable labels.

`replace` permits `saveold` to overwrite an existing dataset.

`all` is for use by programmers. If specified, `e(sample)` will be saved with the dataset. You could run a regression; `save mydata, all`; `drop _all`; `use mydata`; and `predict yhat if e(sample)`.

Remarks and examples

Stata keeps the data on which you are currently working in your computer's memory. You put the data there in the first place; see **[U] 22 Entering and importing data**. Thereafter, you can `save` the dataset on disk so that you can `use` it easily in the future. Stata stores your data on disk in a compressed format that only Stata understands. This does not mean, however, that you are locked into using only Stata. Any time you wish, you can export the data to a format other software packages understand; see **[D] export**.

Stata goes to a lot of trouble to keep you from accidentally losing your data. When you attempt to leave Stata by typing `exit`, Stata checks that your data have been safely stored on disk. If not, Stata refuses to let you leave. (You can tell Stata that you want to leave anyway by typing `exit, clear`.) Similarly, when you `save` your data in a disk file, Stata ensures that the disk file does not already exist. If it does exist, Stata refuses to save it. You can use the `replace` option to tell Stata that it is okay to overwrite an existing file.

▷ Example 1

We have entered data into Stata for the first time. We have the following data:

```
. describe

Contains data
 Observations:            39
    Variables:             5
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
acc_rate        float   %9.0g                 Accident rate
spdlimit        float   %9.0g                 Speed limit
acc_pts         float   %9.0g                 Access points per mile
rate            float   %9.0g      rcat       Accident rate per million vehicle
                                                miles
spdcat          float   %9.0g      scat       Speed limit category
--------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

We have a dataset containing 39 observations on five variables, and, evidently, we have gone to a lot of trouble to prepare this dataset. We have used the `label data` command to label the data `Minnesota Highway Data`, the `label variable` command to label all the variables, and the `label define` and `label values` commands to attach value labels to the last two variables. (See **[U] 12.6.3 Value labels** for information about doing this.)

At the end of the `describe`, Stata notes that the "dataset has changed since last saved". This is Stata's way of gently reminding us that these data need to be saved. Let's `save` our data:

```
. save hiway
file hiway.dta saved
```

We type `save hiway`, and Stata stores the data in a file named `hiway.dta`. (Stata automatically added the `.dta` suffix.) Now when we `describe` our data, we no longer get the warning that our dataset has not been saved; instead, we are told the name of the file in which the data are saved:

```
. describe

Contains data from hiway.dta
 Observations:            39                  Minnesota Highway Data, 1973
    Variables:             5                  21 Jul 2000 11:42
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
acc_rate        float   %9.0g                 Accident rate
spdlimit        float   %9.0g                 Speed limit
acc_pts         float   %9.0g                 Access points per mile
rate            float   %9.0g      rcat       Accident rate per million vehicle
                                                miles
spdcat          float   %9.0g      scat       Speed limit category
-------------------------------------------------------------------------------
Sorted by:
```

Just to prove to you that the data have really been saved, let's eliminate the copy of the data in memory by typing `drop _all`:

```
. drop _all

. describe

Contains data
 Observations:             0
    Variables:             0
Sorted by:
```

We now have no data in memory. Because we saved our dataset, we can retrieve it by typing `use hiway`:

```
. use hiway
(Minnesota Highway Data, 1973)

. describe

Contains data from hiway.dta
 Observations:            39                  Minnesota Highway Data, 1973
    Variables:             5                  21 Jul 2000 11:42
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
acc_rate        float   %9.0g                 Accident rate
spdlimit        float   %9.0g                 Speed limit
acc_pts         float   %9.0g                 Access points per mile
rate            float   %9.0g      rcat       Accident rate per million vehicle
                                                miles
spdcat          float   %9.0g      scat       Speed limit category
-------------------------------------------------------------------------------
Sorted by:
```

◁

▷ Example 2

Continuing with our previous example, we have saved our data in the file `hiway.dta`. We continue to work with our data and discover an error; we made a mistake when we typed one of the values for the `spdlimit` variable:

```
. list in 1/3

     +----------------------------------------------------+
     | acc_rate   spdlimit   acc_pts      rate     spdcat |
     |----------------------------------------------------|
  1. |     1.61         50       2.2   Below 4   Above 60 |
  2. |     1.81         60       6.8   Below 4   55 to 60 |
  3. |     1.84         55        14   Below 4   55 to 60 |
     +----------------------------------------------------+
```

In the first observation, the `spdlimit` variable is 50, whereas the `spdcat` variable indicates that the speed limit is more than 60 miles per hour. We check our original copy of the data and discover that the `spdlimit` variable ought to be 70. We can fix it with the `replace` command:

```
. replace spdlimit=70 in 1
(1 real change made)
```

If we were to `describe` our data now, Stata would warn us that our data have changed since they were last saved:

```
. describe

Contains data from hiway.dta
 Observations:            39                  Minnesota Highway Data, 1973
    Variables:             5                  21 Jul 2000 11:42
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
acc_rate        float   %9.0g                 Accident rate
spdlimit        float   %9.0g                 Speed limit
acc_pts         float   %9.0g                 Access points per mile
rate            float   %9.0g      rcat       Accident rate per million vehicle
                                                miles
spdcat          float   %9.0g      scat       Speed limit category
-------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

We take our cue and attempt to `save` the data again:

```
. save hiway
file hiway.dta already exists
r(602);
```

Stata refuses to honor our request, telling us instead that “file hiway.dta already exists”. Stata will not let us accidentally overwrite an existing dataset. To `replace` the data, we must do so explicitly by typing `save hiway, replace`. If we want to save the file under the same name as it was last known to Stata, we can omit the filename:

```
. save, replace
file hiway.dta saved
```

Now our data are saved.

◁

Also see

[D] **compress** — Compress data in memory

[D] **export** — Overview of exporting data from Stata

[D] **fralias** — Alias variables from linked frames

[D] **frunalias** — Change storage type of alias variables

[D] **import** — Overview of importing data into Stata

[D] **use** — Load Stata dataset

[P] **File formats .dta** — Description of .dta file format

[U] 11.6 Filenaming conventions

Description

`separate` creates new variables containing values from *varname*.

Quick start

Create one variable for each level of `catvar` containing value of `v1` or missing

`separate v1, by(catvar)`

Same as above, but treat missing values of `catvar` as a valid category

`separate v1, by(catvar) missing`

Create `v10` as the value of `v1` when `v2` $\geq$ 20 or missing and missing otherwise and `v11` as the value of `v1` when `v2` $<$ 20 and missing otherwise

`separate v1, by(v2 < 20)`

Same as above, but name new variables `newv1` and `newv2`

`separate v1, by(v2 < 20) generate(newv) sequential`

Menu

Data > Create or change data > Other variable-transformation commands > Create separate variables

Syntax

`separate` *varname* [*if*] [*in*] , `by(`*groupvar* | *exp*`)` [*options*]

options	Description
Main	
* `by(`*groupvar*`)`	categorize observations into groups defined by *groupvar*
* `by(`*exp*`)`	categorize observations into two groups defined by *exp*
Options	
`generate(`*stubname*`)`	name new variables by suffixing values to *stubname*; default is to use *varname* as prefix
`sequential`	use as name suffix categories numbered sequentially from 1
`missing`	create variables for the missing values
`shortlabel`	create shorter variable labels

* Either `by(`*groupvar*`)` or `by(`*exp*`)` must be specified.

`collect` is allowed; see **[U] 11.1.10 Prefix commands**.

Options

Main

`by(`*groupvar* | *exp*`)` specifies one variable defining the categories or a logical expression that categorizes the observations into two groups.

If `by(`*groupvar*`)` is specified, *groupvar* may be a numeric or string variable taking on any values.

If `by(`*exp*`)` is specified, the expression must evaluate to true (1), false (0), or missing.

`by()` is required.

Options

`generate(`*stubname*`)` specifies how the new variables are to be named. If `generate()` is not specified, `separate` uses the name of the original variable, shortening it if necessary. If `generate()` is specified, `separate` uses *stubname*. If any of the resulting names is too long when the values are suffixed, it is not shortened and an error message is issued.

`sequential` specifies that categories be numbered sequentially from 1. By default, `separate` uses the actual values recorded in the original variable, if possible, and sequential numbers otherwise. `separate` can use the original values if they are all nonnegative integers smaller than 10,000.

`missing` also creates a variable for the category *missing* if missing occurs (*groupvar* takes on the value missing or *exp* evaluates to missing). The resulting variable is named in the usual manner but with an appended underscore, for example, `bp_`. By default, `separate` creates no such variable. The contents of the other variables are unaffected by whether `missing` is specified.

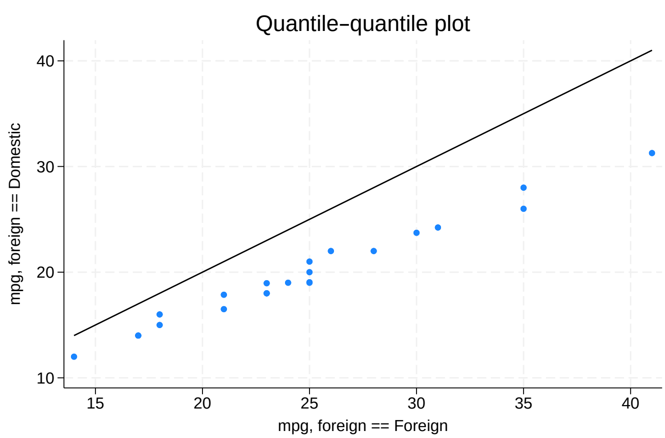
`shortlabel` creates a variable label that is shorter than the default. By default, when `separate` generates the new variable labels, it includes the name of the variable being separated. `shortlabel` specifies that the variable name be omitted from the new variable labels.

Remarks and examples

▷ Example 1

We have data on the miles per gallon (mpg) and country of manufacture of 74 automobiles. We want to compare the distributions of mpg for domestic and foreign automobiles by plotting the quantiles of the two distributions (see [R] **Diagnostic plots**).

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. separate mpg, by(foreign)

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
mpg0            byte    %8.0g                 mpg, foreign == Domestic
mpg1            byte    %8.0g                 mpg, foreign == Foreign

. list mpg* foreign

     +----------------------------------+
     | mpg   mpg0   mpg1        foreign |
     |----------------------------------|
  1. |  22     22      .       Domestic |
  2. |  17     17      .       Domestic |
  3. |  22     22      .       Domestic |
          (output omitted)
 22. |  16     16      .       Domestic |
 23. |  17     17      .       Domestic |
 24. |  28     28      .       Domestic |
          (output omitted)
 73. |  25      .     25        Foreign |
 74. |  17      .     17        Foreign |
     +----------------------------------+

. qqplot mpg0 mpg1
```



In our auto dataset, the foreign cars have better gas mileage.

◁

Stored results

`separate` stores the following in `r()`:

Macros

`r(varlist)`	names of the newly created variables

Acknowledgment

`separate` was originally written by Nicholas J. Cox of the Department of Geography at Durham University, UK, who is coeditor of the *Stata Journal* and author of *Speaking Stata Graphics*.

Reference

Baum, C. F. 2016. *An Introduction to Stata Programming*. 2nd ed. College Station, TX: Stata Press.

Also see

[R] **tabulate oneway** — One-way table of frequencies

[R] **tabulate twoway** — Two-way table of frequencies

[R] **tabulate, summarize()** — One- and two-way tables of summary statistics

shell — Temporarily invoke operating system

Description Syntax Remarks and examples Reference Also see

Description

`shell` (synonym: "`!`") allows you to send commands to your operating system or to enter your operating system for interactive use. Stata will wait for the shell to close or the *operating_system_command* to complete before continuing.

`winexec` allows you to start other programs (such as browsers) from Stata's command line. Stata will continue without waiting for the program to complete.

`xshell` (Stata for Mac and Unix(GUI) only) brings up an `xterm` window in which the command is to be executed.

Syntax

{ `shell` | `!` } [*operating_system_command*]

`winexec` *program_name* [*program_args*]

{ `xshell` | `!!` } [*operating_system_command*]

Command availability:

Command	Stata for ... Windows	Mac	Unix(GUI)	Unix(console)
`shell`	X	X	X	X
`winexec`	X	X	X	–
`xshell`	–	X	X	–

Remarks and examples

Remarks are presented under the following headings:

Stata for Windows

`shell`, without arguments, preserves your session and invokes the operating system. Stata's Command window will disappear, and a Windows command prompt will appear, indicating that you may not continue in Stata until you exit the Windows command prompt. To reenter Stata, type `exit` at your operating system's prompt. Your Stata session is reestablished just as if you had never left.

Say that you are using Stata for Windows and you suddenly realize you need to do two things. You need to enter your operating system for a few minutes. Rather than exiting Stata, doing what you have to do, and then restarting Stata, you type `shell` in the Command window. A Windows command prompt appears:

```
C:\data>
```

You can now do whatever you need to do in Windows, and Stata will wait until you exit the Windows command prompt before continuing.

Experienced Stata users seldom type out the word `shell`. They type "`!`". Also you do not have to enter your operating system, issue a command, and then exit back to Stata. If you want to execute one command, you can type the command right after the word `shell` or the exclamation point:

```
. !rename try15.dta final.dta
```

If you do this, the Windows command prompt will open and close as the command is executed.

Stata for Windows users can also use the `winexec` command, which allows you to launch any Windows application from within Stata. You can think of it as a shortcut for clicking on the Windows **Start** button, choosing **Run...**, and typing a command.

Assume that you are working in Stata and decide that you want to run a text editor:

```
. winexec notepad
```
(*The Windows application Notepad will start and run at the same time as Stata*)

You could even pass a filename to your text editor:

```
. winexec notepad c:\docs\myfile.txt
```

You may need to specify a complete path to the executable that you wish to launch:

```
. winexec c:\windows\notepad c:\docs\myfile.txt
```

The important difference between `winexec` and `shell` is that Stata does not wait for whatever program `winexec` launches to complete before continuing. Stata will wait for the program `shell` launches to complete before performing any further commands.

Stata for Mac

`shell`, with arguments, invokes your operating system, executes one command, and redirects the output to the Results window. The command must complete before you can enter another command in the Command window.

Say that you are using Stata for Mac and suddenly realize that there are two things you have to do. You need to switch to the Finder or enter commands from a terminal for a few minutes. Rather than exiting Stata, doing what you have to do, and then switching back to Stata, you type `shell` and the command in the Command window to execute one command. You then repeat this step for each command that you want to execute from the shell.

Experienced Stata users seldom type out the word `shell`. They type "`!`".

```
. !mv try15.dta final.dta
```

Be careful not to execute commands, such as `vi`, that require interaction from you. Because all output is redirected to Stata's Results window, you will not be able to interact with the command from Stata. This will effectively lock up Stata because the command will never complete.

When you type `xshell vi myfile.do`, Stata invokes an `xterm` window (which in turn invokes a `shell`) and executes the command there. Typing `!!vi myfile.do` is equivalent to typing `xshell vi myfile.do`.

❑ Technical note

On macOS, `xterm` is available when *X11* is installed. To install *X11*, you must first download XQuartz from https://www.xquartz.org/.

❑

Stata for Mac users can also use the `winexec` command, which allows you to launch any native application from within Stata. You may, however, have to specify the absolute path to the application. If the application you wish to launch is a macOS application bundle, you must specify an absolute path to the executable in the bundle.

Assume that you are working in Stata and decide that you want to run a text editor:

```
. winexec /Applications/TextEdit.app/Contents/MacOS/TextEdit
```

(*The macOS application TextEdit will start and run at the same time as Stata*)

You could even pass a filename to your text editor:

```
. winexec /Applications/TextEdit.app/Contents/MacOS/TextEdit
> /Users/cnguyen/myfile.do
```

If you specify a file path as an argument to the program to be launched, you must specify an absolute path. Also using ~ in the path will not resolve to a home directory. If an application cannot be launched from a terminal window, it cannot be launched by `winexec`.

The important difference between `winexec` and `shell` is that Stata does not wait for whatever program `winexec` launches to complete before continuing. Stata will wait for the program `shell` launches to complete before performing any further commands. `shell` is appropriate for executing shell commands; `winexec` is appropriate for launching applications.

Stata for Unix(GUI)

`shell`, without arguments, preserves your session and invokes the operating system. The Command window will disappear, and an `xterm` window will appear, indicating that you may not do anything in Stata until you exit the `xterm` window. To reenter Stata, type `exit` at the Unix prompt. Your Stata session is reestablished just as if you had never left.

Say that you are using Stata for Unix(GUI) and suddenly realize that you need to do two things. You need to enter your operating system for a few minutes. Rather than exiting Stata, doing what you have to do, and then restarting Stata, you type `shell` in the Command window. An `xterm` window will appear:

```
mycomputer$ _
```

You can now do whatever you need to do, and Stata will wait until you exit the window before continuing.

Experienced Stata users seldom type out the word `shell`. They type "`!`". Also you do not have to enter your operating system, issue a command, and then exit back to Stata. If you want to execute one command, you can type the command right after the word `shell` or the exclamation point:

```
. !mv try15.dta final.dta
```

Be careful because sometimes you will want to type

```
. !!vi myfile.do
```

and in other cases,

```
. winexec xedit myfile.do
```

`!!` is a synonym for `xshell`—a command different from, but related to, `shell`—and `winexec` is a different and related command, too.

Before we get into this, understand that if all you want is a shell from which you can issue Unix commands, type `shell` or `!`:

```
. !
mycomputer$ _
```

When you are through, type `exit` to the Unix prompt, and you will return to Stata:

```
mycomputer$ exit
. _
```

If, on the other hand, you want to specify in Stata the Unix command that you want to execute, you need to decide whether you want to use `shell`, `xshell`, or `winexec`. The answer depends on whether the command you want to execute requires a terminal window or is an X application:

... does not need a terminal window:	use `shell` ... (synonym: `!`...)
... needs a terminal window:	use `xshell` ... (synonym: `!!`...)
... is an X application:	use `winexec` ... (no synonym)

When you type `shell mv try15.dta final.dta`, Stata invokes your shell (`/bin/sh`, `/bin/csh`, etc.) and executes the specified command (`mv` here), routing the standard output and standard error back to Stata. Typing `!mv try15.dta final.dta` is the same as typing `shell mv try15.dta final.dta`.

When you type `xshell vi myfile.do`, Stata invokes an `xterm` window (which in turn invokes a shell) and executes the command there. Typing `!!vi myfile.do` is equivalent to typing `xshell vi myfile.do`.

When you type `winexec xedit myfile.do`, Stata directly invokes the command specified (`xedit` here). No `xterm` window is brought up nor is a shell invoked because, here, `xterm` does not need it. `xterm` is an X application that will create its own window in which to run. You could have typed `!!xedit myfile.do`. That would have brought up an unnecessary `xterm` window from which `xedit` would have been executed, and that would not matter. You could even have typed `!xedit myfile.do`. That would have invoked an unnecessary shell from which `xedit` would have been executed, and that would not matter, either. The important difference, however, is that `shell` and `xshell` wait until the process completes before allowing Stata to continue, and `winexec` does not.

❑ Technical note

You can set Stata global macros to control the behavior of `shell` and `xshell`. The macros are

`$S_SHELL`	defines the shell to be used by `shell` when you type a command following `shell`. The default is something like "`/bin/sh -c`", although this can vary, depending on how your Unix environment variables are set.
`$S_XSHELL`	defines shell to be used by `shell` and `xshell` when they are typed without arguments. The default is "`xterm`".
`$S_XSHELL2`	defines shell to be used by `xshell` when it is typed with arguments. The default is "`xterm -e`".

For instance, if you type in Stata

```
. global S_XSHELL2 "/usr/X11R6/bin/xterm -e"
```

and then later type

```
. !!vi myfile.do
```

then Stata would issue the command `/usr/X11R6/bin/xterm -e vi myfile.do` to Unix.

If you do make changes, we recommend that you record the changes in your `profile.do` file.

❑

Stata for Unix(console)

`shell`, without arguments, preserves your session and then invokes your operating system. Your Stata session will be suspended until you `exit` the shell, at which point your Stata session is reestablished just as if you had never left.

Say that you are using Stata and you suddenly realize that you need to do two things. You need to enter your operating system for a few minutes. Rather than exiting Stata, doing what you have to do, and then restarting Stata, you type `shell`. A Unix prompt appears:

```
. shell
(Type exit to return to Stata)
$ _
```

You can now do whatever you need to do and type `exit` when you finish. You will return to Stata just as if you had never left.

Experienced Stata users seldom type out the word `shell`. They type '`!`'. Also you do not have to enter your operating system, issue a command, and then exit back to Stata. If you want to execute one command, you can type the command right after the word `shell` or the exclamation point. If you want to edit the file `myfile.do`, and if `vi` is the name of your favorite editor, you could type

```
. !vi myfile.do
            Stata opens your editor.
            When you exit your editor:
. _
```

Reference

Huber, C. 2014. How to create animated graphics using Stata. *The Stata Blog: Not Elsewhere Classified*. https://blog.stata.com/2014/03/24/how-to-create-animated-graphics-using-stata/.

Also see

[D] **cd** — Change directory

[D] **copy** — Copy file from disk or URL

[D] **dir** — Display filenames

[D] **erase** — Erase a disk file

[D] **mkdir** — Create directory

[D] **rmdir** — Remove directory

[D] **type** — Display contents of a file

snapshot — Save and restore data snapshots

Description

`snapshot` saves to disk and restores from disk copies of the data in memory. `snapshot`'s main purpose is to allow the Data Editor to save and restore data snapshots during an interactive editing session. A more popular alternative for programmers is `preserve`; see [P] **preserve**.

Snapshots are referred to by a *snapshot#*. If no snapshots currently exist, the next snapshot saved will receive a *snapshot#* of 1. If snapshots do exist, the next snapshot saved will receive a *snapshot#* one greater than the highest existing *snapshot#*.

`snapshot save` creates a temporary file containing a copy of the data currently in memory and attaches an optional label (up to 80 characters) to the saved snapshot. Up to 1,000 snapshots may be saved.

`snapshot label` changes the label on the specified snapshot.

`snapshot restore` replaces the data in memory with the data from the specified snapshot.

`snapshot list` lists specified snapshots.

`snapshot erase` erases specified snapshots.

Quick start

Save a temporary copy of the data to disk, and label the snapshot `mylabel1`

```
snapshot save, label(mylabel1)
```

List snapshot numbers and labels

```
snapshot list _all
```

Restore snapshot `mylabel1` with number 1

```
snapshot restore 1
```

Change label of snapshot 1 to `mylabel2`

```
snapshot label 1 "mylabel2"
```

Delete all current snapshots, and begin renumbering new snapshots from 1

```
snapshot erase _all
```

Menu

Data > Data Editor > Data Editor (Edit)

Syntax

Save snapshot

`snapshot save` [, `label("`*label*`")`]

Change snapshot label

`snapshot label` *snapshot#* `"`*label*`"`

Restore snapshot

`snapshot restore` *snapshot#*

List snapshots

`snapshot list` [`_all` | *numlist*]

Erase snapshots

`snapshot erase` `_all` | *numlist*

`collect` is allowed with `snapshot save`; see **[U] 11.1.10 Prefix commands**.

Option

`label("`*label*`")` is for use with `snapshot save` and allows you to label a snapshot when saving it.

Remarks and examples

`snapshot` was created to allow a user using the Data Editor to save and restore snapshots of their data while editing them interactively. It is similar to a checkpoint save in a video game, where after you have made a certain amount of progress, you wish to make sure you will be able to return to that point no matter what may happen in the future.

`snapshot` does not overwrite any copies of your data that you may have saved to disk. It saves a copy of the data currently in memory to a temporary file and allows you to later restore that copy to memory.

`snapshot` saves the date and time at which you create a snapshot. It is a good idea to also give a snapshot a label so that you will be better able to distinguish between multiple snapshots should you need to restore one.

❑ Technical note

Although we mention above the use of the Data Editor and we demonstrate below the use of `snapshot`, we recommend that data cleaning not be done interactively. Instead, we recommend that data editing and cleaning be done in a reproducible manner through the use of do-files; see **[U] 16 Do-files**.

❑

▷ Example 1

You decide to make some changes to auto.dta. You make a snapshot of the data before you begin making changes, and you make another snapshot after the changes:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. snapshot save, label("before changes")
snapshot 1 (before changes) created at 19 Apr 2024 21:32

. generate gpm = 1/mpg

. label variable gpm "Gallons per mile"

. snapshot save, label("after changes")
snapshot 2 (after changes) created at 19 Apr 2024 21:34
```

You go on to do some analyses, but then, for some reason, you accidentally drop the variable you previously created:

```
. drop gpm
```

Luckily, you made some snapshots of your work:

```
. snapshot list
snapshot 1 (before changes) created at 19 Apr 2024 21:32
snapshot 2 (after changes) created at 19 Apr 2024 21:34

. snapshot restore 2

. describe gpm

Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
gpm             float   %9.0g                 Gallons per mile
```

◁

Stored results

snapshot save stores the following in r():

Scalars
    r(snapshot)   sequence number of snapshot saved

Also see

[D] **edit** — Browse or edit data with Data Editor

[P] **preserve** — Preserve and restore data

Description Quick start Menu Syntax
Option Remarks and examples References Also see

Description

`sort` arranges the observations of the current data into ascending order based on the values of the variables in *varlist*. There is no limit to the number of variables in *varlist*. Missing numeric values are interpreted as being larger than any other number, so they are placed last with `.` $<$ `.a` $<$ `.b` $< \cdots <$ `.z`. When you sort on a string variable, however, null strings are placed first and uppercase letters come before lowercase letters.

The dataset is marked as being sorted by *varlist* unless `in` *range* is specified. If `in` *range* is specified, only those observations are rearranged. The unspecified observations remain in the same place.

Quick start

Sort dataset in memory by ascending values of `v1`

```
sort v1
```

Same as above, and order within `v1` by ascending values of `v2` and within `v2` by `v3`

```
sort v1 v2 v3
```

Same as above, and keep observations with the same values of `v1`, `v2`, and `v3` in the same presort order

```
sort v1 v2 v3, stable
```

Menu

Data > Sort

Syntax

`sort varlist [in] [, stable]`

Option

`stable` specifies that observations with the same values of the variables in *varlist* keep the same relative order in the sorted data that they had previously. For instance, consider the following data:

x	b
3	1
1	2
1	1
1	3
2	4

Typing `sort x` without the `stable` option produces one of the following six orderings:

x b	x b	x b	x b	x b	x b
1 2	1 2	1 1	1 1	1 3	1 3
1 1	1 3	1 3	1 2	1 1	1 2
1 3	1 1	1 2	1 3	1 2	1 1
2 4	2 4	2 4	2 4	2 4	2 4
3 1	3 1	3 1	3 1	3 1	3 1

Without the `stable` option, the ordering of observations with equal values of *varlist* is randomized. With `sort x, stable`, you will always get the first ordering and never the other five.

If your intent is to have the observations sorted first on `x` and then on `b` within tied values of `x` (the fourth ordering above), you should type `sort x b` rather than `sort x, stable`.

`stable` is seldom used and, when specified, causes `sort` to execute more slowly.

Remarks and examples

Sorting data is one of the more common tasks involved in processing data. Often, before Stata can perform some task, the data must be in a specific order. For the `merge` command to create a new dataset that matches records from two datasets on a common key, both of those datasets must be sorted by that key. Either you will sort the data or `merge` will sort it for you. If you want to use the `by` *varlist*`:` prefix, the data must be sorted in order of *varlist*. You even sort data to put it into a more convenient order when using `list`.

Remarks are presented under the following headings:

Finding the smallest values (and the largest)

Sorting data can be informative. Suppose that we have data on automobiles, and each car's make and mileage rating (called make and mpg) are included among the variables in the data. We want to list the five cars with the lowest mileage rating in our data:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. keep make mpg weight

. sort mpg, stable

. list make mpg in 1/5

     +---------------------------+
     | make                  mpg |
     |---------------------------|
  1. | Linc. Continental      12 |
  2. | Linc. Mark V           12 |
  3. | Cad. Deville           14 |
  4. | Cad. Eldorado          14 |
  5. | Linc. Versailles       14 |
     +---------------------------+
```

We can also list the five cars with the highest mileage.

```
. list in -5/l

     +---------------------------------+
     | make              mpg   weight |
     |---------------------------------|
 70. | Toyota Corolla     31    2,200 |
 71. | Plym. Champ        34    1,800 |
 72. | Datsun 210         35    2,020 |
 73. | Subaru             35    2,050 |
 74. | VW Diesel          41    2,040 |
     +---------------------------------+
```

Tracking sort order

Stata keeps track of the order of your data. For instance, we just sorted the above data on mpg. When we ask Stata to describe the data in memory, it tells us how the dataset is sorted:

```
. describe

Contains data from https://www.stata-press.com/data/r19/auto.dta
 Observations:            74                  1978 automobile data
    Variables:             3                  13 Apr 2024 17:45
                                              (_dta has notes)
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
make            str18   %-18s                 Make and model
mpg             int     %8.0g                 Mileage (mpg)
weight          int     %8.0gc                Weight (lbs.)
--------------------------------------------------------------------------------
Sorted by: mpg
     Note: Dataset has changed since last saved.
```

Stata keeps track of changes in sort order. If we were to make a change to the mpg variable, Stata would know that the data are no longer sorted. Remember that the first observation in our data has mpg equal to 12, as does the second. Let's change the value of the first observation:

```
. replace mpg=13 in 1
(1 real change made)

. describe

Contains data from https://www.stata-press.com/data/r19/auto.dta
 Observations:            74                  1978 automobile data
    Variables:             3                  13 Apr 2024 17:45
                                              (_dta has notes)
--------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
--------------------------------------------------------------------------------
make            str18   %-18s                 Make and model
mpg             int     %8.0g                 Mileage (mpg)
weight          int     %8.0gc                Weight (lbs.)
--------------------------------------------------------------------------------
Sorted by:
     Note: Dataset has changed since last saved.
```

After making the change, Stata indicates that our dataset is "Sorted by:" nothing. Let's put the dataset back as it was:

```
. replace mpg=12 in 1
(1 real change made)

. sort mpg
```

❑ Technical note

Stata is limited in how it tracks changes in the sort order and will sometimes decide that a dataset is not sorted when, in fact, it is. For instance, if we were to change the first observation of our automobile dataset from 12 miles per gallon to 10, Stata would decide that the dataset is "Sorted by:" nothing, just as it did above when we changed mpg from 12 to 13. Our change in example 2 did change the order of the data, so Stata was correct. Changing mpg from 12 to 10, however, does not really affect the sort order.

As far as Stata is concerned, any change to the variables on which the data are sorted means that the data are no longer sorted, even if the change actually leaves the order unchanged. Stata may be dumb, but it is also fast. It sorts already-sorted datasets instantly, so Stata's ignorance costs us little.

❑

Sorting on multiple variables

Data can be sorted by more than one variable, and in such cases, the sort order is lexicographic. If we `sort` the data by two variables, for instance, the data are placed in ascending order of the first variable, and then observations that share the same value of the first variable are placed in ascending order of the second variable. Let's order our automobile data by `mpg` and within `mpg` by `weight`:

```
. sort mpg weight
. list in 1/8, sep(4)
```

	make	mpg	weight
1.	Linc. Mark V	12	4,720
2.	Linc. Continental	12	4,840
3.	Peugeot 604	14	3,420
4.	Linc. Versailles	14	3,830
5.	Cad. Eldorado	14	3,900
6.	Merc. Cougar	14	4,060
7.	Merc. XR-7	14	4,130
8.	Cad. Deville	14	4,330

The data are in ascending order of `mpg`, and within each `mpg` category, the data are in ascending order of `weight`. The lightest car that achieves 14 miles per gallon in our data is the Peugeot 604.

❑ Technical note

The sorting technique used by Stata is fast, but the order of variables not included in *varlist* is not maintained. If you wish to maintain the order of additional variables, include them at the end of *varlist*. There is no limit to the number of variables by which you may `sort`.

❑

Descending sorts

Sometimes, you may want to order a dataset by descending sequence of something. Perhaps we wish to obtain a list of the five cars achieving the best mileage rating. The `sort` command orders the data only into ascending sequences. Another command, `gsort`, orders the data in ascending or descending sequences; see [D] **gsort**. You can also create the negative of a variable and achieve the desired result:

```
. generate negmpg = -mpg
. sort negmpg
. list in 1/5
```

	make	mpg	weight	negmpg
1.	VW Diesel	41	2,040	-41
2.	Datsun 210	35	2,020	-35
3.	Subaru	35	2,050	-35
4.	Plym. Champ	34	1,800	-34
5.	Toyota Corolla	31	2,200	-31

We find that the VW Diesel tops our list.

Sorting on string variables

sort may also be used on string variables. The data are sorted alphabetically:

```
. sort make
. list in 1/5
```

	make	mpg	weight	negmpg
1.	AMC Concord	22	2,930	-22
2.	AMC Pacer	17	3,350	-17
3.	AMC Spirit	22	2,640	-22
4.	Audi 5000	17	2,830	-17
5.	Audi Fox	23	2,070	-23

❑ Technical note

Bear in mind that Stata takes "alphabetically" to mean "in order by byte value". This means that all uppercase letters come before lowercase letters; for example, Z $<$ a. As far as Stata is concerned, the following list is sorted alphabetically:

```
. list, sep(0)
```

	myvar
1.	ALPHA
2.	Alpha
3.	BETA
4.	Beta
5.	alpha
6.	beta

For most purposes, this method of sorting is sufficient. It is possible to override Stata's sort logic. See [U] **12.4.2.5 Sorting strings containing Unicode characters** for information about ordering strings in a language-sensitive way. We do not recommend that you do this.

❑

Sorting with ties

Sorting when your list of sort variables does not uniquely identify an observation, that is to say when you have ties, is usually dangerous and should be avoided. Consider using sort to find the average mpg for the five cars with the smallest gear ratio.

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)
. sort gear_ratio
. summarize mpg in 1/5
```

Variable	Obs	Mean	Std. dev.	Min	Max
mpg	5	17	3.674235	14	21

So the answer is 17.

We go on and do some other work.

We forgot to write down the answer from earlier, and silly us, we were not logging our results. So we run our commands again:

```
. use https://www.stata-press.com/data/r19/auto
(1978 automobile data)

. sort gear_ratio

. summarize mpg in 1/5

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
         mpg |          5        15.8    2.949576         14         21
```

So the answer is 15.8.

What happened? The title of this section is a clue. Let's list some of the data:

```
. list gear_ratio mpg  in 1/10

     +----------------+
     | gear_r~o   mpg |
     |----------------|
  1. |     2.19    14 |
  2. |     2.24    21 |
  3. |     2.26    15 |
  4. |     2.28    14 |
  5. |     2.41    15 |
     |----------------|
  6. |     2.41    16 |
  7. |     2.41    21 |
  8. |     2.43    18 |
  9. |     2.47    16 |
 10. |     2.47    14 |
     +----------------+
```

The first four observations look fine; each value of gear_ratio is unique. But the fifth, sixth, and seventh observations all have a gear_ratio of 2.41, whereas the values of mpg differ. Do we want mpg = 15, mpg = 16, or mpg = 21 in our mean?

There are not many things we can do after a sort that will produce unique results if the sort itself has observations with ties in *varlist*. The ordering is not unique. You must be sure that the ordering really does not matter. If that is the case, then why did you sort in the first place?

So what are we to do? We could rephrase our question as "What is the lowest possible average mpg for five cars with the smallest gear_ratio?" Then we would type

```
. sort gear_ratio mpg

. summarize mpg in 1/5

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
         mpg |          5        15.8    2.949576         14         21
```

Now we will always get the same answer—15.8.

How do you know your sort variables form a unique ordering? Ask

```
. isid gear_ratio mpg
variables gear_ratio and mpg do not uniquely identify the observations
r(459);
```

That is still not a unique ordering. Our analysis does not require a fully unique ordering. Because we are summarizing mpg, tied values of mpg will give the same answer. Even so, there would be no harm in adding another variable to make the ordering truly unique:

```
. isid gear_ratio mpg weight
. sort gear_ratio mpg weight
. summarize mpg in 1/5
```

Variable	Obs	Mean	Std. dev.	Min	Max
mpg	5	15.8	2.949576	14	21

What if we did not want the lowest mpg? What if we preferred a randomized answer where the computer chooses one of the observations with tied gear_ratio? The best approach is to use a good random-number generator to create a new variable with random values that you will also sort on:

```
. set seed 12345
. generate rnd = runiform()
. sort gear_ratio rnd
. summarize mpg in 1/5
```

Variable	Obs	Mean	Std. dev.	Min	Max
mpg	5	17	3.674235	14	21

Why did we set the seed? So that our randomized result is reproducible. That is not a contradiction.

A benefit of this approach is that regardless of any further transformations or manipulations we make on this dataset we can always recover the ordering by typing

```
. sort gear_ratio rnd
```

Well, we cannot change the values of gear_ratio or rnd, and we cannot add or insert observations, but any other manipulations are allowed.

Our example is rather artificial, but there are many cases where you do want a randomized order within tied values of a sorted variable. One such case is creating simulated datasets for panel data or multilevel data.

It turns out that our first results were also randomly ordered. That is true because sort performs a quick randomized jumbling before sorting. We were already getting a randomized order within the ties. Do not use this in practice. The randomization performed by sort is designed solely to make sort faster by preventing any possibility of an initial ordering that defeats the sort algorithm and makes the sorting much slower. If you want a random ordering within ties, then use a random-number generator with good properties like the one implemented in runiform(). For more about the random-number generator, see [R] **set seed** and the references therein.

If you do not want a random ordering within ties and you also do not want to use other variables from the dataset to define a unique ordering, you can add a sequence variable to the dataset and include it in your sort,

```
. generate id = _n
. sort gear_ratio id
```

That sort will still depend on the order of your data when id is created, but you will always be able to recreate the ordering by typing

```
. sort gear_ratio id
```

The ordering produced after this sort will be identical to the ordering had we instead typed

```
. sort gear_ratio, stable
```

The advantage to creating the id variable is that we can recover this ordering at any time in the future by retyping

```
. sort gear_ratio id
```

That cannot be said of

```
. sort gear_ratio, stable
```

The ordering after this sort will depend on the order before the sort command. So if we sort on another variable between our two stable sorts, the ordering after those two stable sorts will be different.

One final note. If you ran the commands in this entry, you may have obtained different results from those printed here for the first several summarize commands and a different ordering from the first list command. That is yet another reminder not to perform order-dependent analyses when your current sort order is not unique. You got different results because the jumbler that sort preapplies started from a different point than it did when we ran the commands for this manual entry. Unless you start Stata immediately before running a sort with tied values or you set the state of the jumbler, you will rarely get the same ordering for tied keys. If you want to get the ordering we got in this entry, you should use Stata/SE and type

```
. set sortrngstate 12345
```

That's what we do so that this entry does not change every time we re-create the manuals. See [P] **set sortrngstate**. This is such an esoteric command that we warn you against using it. Regardless, unless your goal is to write a manual entry that describes how to deal with tied values in sorts, do not use set sortrngstate to create reproducible sorts. Think about your problem and sort on variables that create the unique ordering you need. Or decide you want a stable sort of the ties based on the current ordering. Or use the method described above that creates a good random number to randomly order the tied values.

References

Royston, P. 2001. Sort a list of items. *Stata Journal* 1: 105–106.

Schumm, L. P. 2006. Stata tip 28: Precise control of dataset sort order. *Stata Journal* 6: 144–146.

Also see

[D] **describe** — Describe data in memory or in a file

[D] **gsort** — Ascending and descending sort

[U] **11 Language syntax**

split — Split string variables into parts

Description

`split` splits the contents of a string variable, *strvar*, into one or more parts, using one or more *parse_strings* (by default, blank spaces), so that new string variables are generated. Thus `split` is useful for separating "words" or other parts of a string variable. *strvar* itself is not modified.

Quick start

Create variables `v#` for each word of `v` separated by spaces

```
split v
```

Same as above, but split into words or phrases on commas and generate variables `newv#`

```
split v, parse(,) generate(newv)
```

Same as above, but do not trim leading or trailing spaces

```
split v, parse(,) generate(newv) notrim
```

Create only `newv1`, `newv2`, and `newv3` regardless of the number of possible new variables

```
split v, generate(newv) limit(3)
```

Same as above, and convert to numeric type when possible

```
split v, generate(newv) limit(3) destring
```

Menu

Data > Create or change data > Other variable-transformation commands > Split string variables into parts

Syntax

split *strvar* [*if*] [*in*] [, *options*]

options	Description
Main	
generate(*stub*)	begin new variable names with *stub*; default is *strvar*
parse(*parse_strings*)	parse on specified strings; default is to parse on spaces
limit(#)	create a maximum of # new variables
notrim	do not trim leading or trailing spaces of original variable
Destring	
destring	apply destring to new string variables, replacing initial string variables with numeric variables where possible
ignore("*chars*")	remove specified nonnumeric characters
force	convert nonnumeric strings to missing values
float	generate numeric variables as type float
percent	convert percent variables to fractional form

collect is allowed; see **[U] 11.1.10 Prefix commands**.

Options

Main

generate(*stub*) specifies the beginning characters of the new variable names so that new variables *stub*1, *stub*2, etc., are produced. *stub* defaults to *strvar*.

parse(*parse_strings*) specifies that, instead of using spaces, parsing use one or more *parse_strings*. Most commonly, one string that is one punctuation character will be specified. For example, if parse(,) is specified, then "1,2,3" is split into "1", "2", and "3".

You can also specify 1) two or more strings that are alternative separators of "words" and 2) strings that consist of two or more characters. Alternative strings should be separated by spaces. Strings that include spaces should be bound by " ". Thus if parse(, " ") is specified, "1,2 3" is also split into "1", "2", and "3". Note particularly the difference between, say, parse(a b) and parse(ab): with the first, a and b are both acceptable as separators, whereas with the second, only the string ab is acceptable.

limit(#) specifies an upper limit to the number of new variables to be created. Thus limit(2) specifies that, at most, two new variables be created.

notrim specifies that the original string variable not be trimmed of leading and trailing spaces before being parsed. notrim is not compatible with parsing on spaces, because the latter implies that spaces in a string are to be discarded. You can either specify a parsing character or, by default, allow a trim.

Destring

destring applies destring to the new string variables, replacing the variables initially created as strings by numeric variables where possible. See **[D] destring**.

ignore(), force, float, percent; see **[D] destring**.

Remarks and examples

split is used to split a string variable into two or more component parts, for example, “words”. You might need to correct a mistake, or the string variable might be a genuine composite that you wish to subdivide before doing more analysis.

The basic steps applied by split are, given one or more separators, to find those separators within the string and then to generate one or more new string variables, each containing a part of the original. The separators could be, for example, spaces or other punctuation symbols, but they can in turn be strings containing several characters. The default separator is a space.

The key string functions for subdividing string variables and, indeed, strings in general, are strpos(), which finds the position of separators, and substr(), which extracts parts of the string. (See [FN] **String functions**.) split is based on the use of those functions.

If your problem is not defined by splitting on separators, you will probably want to use substr() directly. Suppose that you have a string variable, date, containing dates in the form "21011952" so that the last four characters define a year. This string contains no separators. To extract the year, you would use substr(date,-4,4). Again suppose that each woman’s obstetric history over the last 12 months was recorded by a str12 variable containing values such as "nppppppppbnn", where p, b, and n denote months of pregnancy, birth, and nonpregnancy. Once more, there are no separators, so you would use substr() to subdivide the string.

split discards the separators, because it presumes that they are irrelevant to further analysis or that you could restore them at will. If this is not what you want, you might use substr() (and possibly strpos()).

Finally, before we turn to examples, compare split with the egen function ends(), which produces the head, the tail, or the last part of a string. This function, like all egen functions, produces just one new variable as a result. In contrast, split typically produces several new variables as the result of one command. For more details and discussion, including comments on the special problem of recognizing personal names, see [D] **egen**.

split can be useful when input to Stata is somehow misread as one string variable. If you copy and paste into the Data Editor, say, under Windows by using the clipboard, but data are space-separated, what you regard as separate variables will be combined because the Data Editor expects comma- or tab-separated data. If some parts of your composite variable are numeric characters that should be put into numeric variables, you could use destring at the same time; see [D] **destring**.

```
. split var1, destring
```

Here no generate() option was specified, so the new variables will have names var11, var12, and so forth. You may now wish to use rename to produce more informative variable names. See [D] **rename**.

You can also use split to subdivide genuine composites. For example, email addresses such as tech-support@stata.com may be split at "@":

```
. split address, p(@)
```

This sequence yields two new variables: address1, containing the part of the email address before the "@", such as "tech-support", and address2, containing the part after the "@", such as "stata.com". The separator itself, "@", is discarded. Because generate() was not specified, the name address was used as a stub in naming the new variables. split displays the names of new variables created, so you will see quickly whether the number created matches your expectations.

If the details of individuals were of no interest and you wanted only machine names, either

```
. egen machinename = ends(address), tail p(@)
```

or

```
. generate machinename = substr(address, strpos(address,"@") + 1,.)
```

would be more direct.

Next suppose that a string variable holds names of legal cases that should be split into variables for plaintiff and defendant. The separators could be `" V "`, `" V. "`, `" VS "`, and `" VS. "`. (We assume that any inconsistency in the use of uppercase and lowercase has been dealt with by the string function `strupper()`; see [FN] **String functions**.) Note particularly the leading and trailing spaces in our detailing of separators: the first separator is `" V "`, for example, not `"V"`, which would incorrectly split `"GOLIATH V DAVID"` into `"GOLIATH "`, `" DA"`, and `"ID"`. The alternative separators are given as the argument to `parse()`:

```
. split case, p(" V " " V. " " VS " " VS. ")
```

Again with default naming of variables and recalling that separators are discarded, we expect new variables `case1` and `case2`, with no creation of `case3` or further new variables. Whenever none of the separators specified were found, `case2` would have empty values, so we can check:

```
. list case if case2 == ""
```

Suppose that a string variable contains fields separated by tabs. For example, `import delimited` leaves tabs unchanged. Knowing that a tab is `char(9)`, we can type

```
. split data, p(`=char(9)') destring
```

`p(char(9))` would not work. The argument to `parse()` is taken literally, but evaluation of functions on the fly can be forced as part of macro substitution.

Finally, suppose that a string variable contains substrings bound in parentheses, such as `(1 2 3) (4 5 6)`. Here we can split on the right parentheses and, if desired, replace those afterward. For example,

```
. split data, p(")")
. foreach v in `r(varlist)' {
        replace `v' = `v' + ")"
. }
```

Stored results

`split` stores the following in `r()`:

Scalars

`r(k_new)`	number of new variables created

Macros

`r(varlist)`	names of the newly created variables

Acknowledgments

`split` was written by Nicholas J. Cox of the Department of Geography at Durham University, UK, who is coeditor of the *Stata Journal* and author of *Speaking Stata Graphics*. He in turn thanks Michael Blasnik of Nest Labs for ideas contributed to an earlier jointly written program.

Also see

[D] **destring** — Convert string variables to numeric variables and vice versa

[D] **egen** — Extensions to generate

[D] **rename** — Rename variable

[D] **separate** — Create separate variables

[FN] **String functions**

Description Quick start Menu Syntax Options
Remarks and examples Stored results Methods and formulas Also see

Description

`splitsample` splits data into random samples based on a specified number of samples and specified proportions for each sample. Splitting can also be done based on clusters. Sample splitting can also be balanced across specified variables. Balanced splitting can be used for matched treatment assignment.

Quick start

Split data into two random samples of equal sizes and generate sample ID variable `svar` with values 1 and 2

```
splitsample, generate(svar)
```

Same as above, but with sample ID variable `svar` having values 0 and 1

```
splitsample, generate(svar) values(0 1)
```

Split data into three random samples of equal sizes and generate sample ID variable `svar` with values 1, 2, and 3

```
splitsample, generate(svar) nsplit(3)
```

Same as above, but with sample ID variable `svar` equal to missing (`.`) whenever any of `y` or `x1-x100` have missing values

```
splitsample y x1-x100, generate(svar) nsplit(3)
```

Split data into three random samples with the first sample having 25% of the observations, the second having 25%, and the third having 50%

```
splitsample, generate(svar) split(0.25 0.25 0.5)
```

Same sample split as above, but specify the split using ratios rather than proportions

```
splitsample, generate(svar) split(1 1 2)
```

Same as above, but maintain the specified sample-size ratios in each group defined by the variables `agegrp` and `gender`

```
splitsample, generate(svar) split(1 1 2) balance(agegrp gender)
```

Same as above, but randomly round sample sizes when samples within an `agegrp` by `gender` group cannot be chosen to satisfy the specified sample-size ratios exactly

```
splitsample, generate(svar) split(1 1 2) balance(agegrp gender) rround
```

Split data into three samples based on clusters defined by `clustvar`

```
splitsample, generate(svar) nsplit(3) cluster(clustvar)
```

Same as above, but maintain the specified sample proportions based on clusters in each group defined by the variables agegrp and gender, randomly round cluster sample sizes, and display a table showing the cluster sample sizes

```
splitsample, generate(svar) nsplit(3) cluster(clustvar) ///
  balance(agegrp gender) rround show
```

Menu

Data > Create or change data > Other variable-creation commands > Split data into random samples

Syntax

`splitsample` [*varlist*] [*if*] [*in*], `generate(`*newvar* [, `replace`]`)` [*options*]

varlist is checked for missing values, and the sample ID variable *newvar* is set to missing for observations where any variable in *varlist* is missing. `_all` or `*` may be specified for *varlist*.

options	Description
Main	
* `generate(`*newvar* [, `replace`]`)`	create new sample ID variable; optionally replace existing variable
`nsplit(#)`	split into # random samples of equal size
`split(`*numlist*`)`	specify *numlist* of proportions or ratios for the split
`rround`	randomly round sample sizes when an exact split cannot be made
`values(`*numlist*`)`	specify *numlist* of values for sample ID variable
`cluster(`*clustvar*`)`	split by clusters defined by *clustvar*, not observations
`balance(`*balvars*`)`	split each group defined by the distinct values of *balvars* independently based on the specified sample proportions
Advanced	
`strok`	evaluate string variables in *varlist* for missing values; by default, string variables are ignored
`rseed(#)`	specify random-number seed
`show`	display a table showing the sample sizes of the split
`percent`	display percentages in the table showing the split

*`generate()` is required.

`collect` is allowed; see **[U] 11.1.10 Prefix commands**.

Options

Main

`generate(`*newvar* [, `replace`]`)` creates a new variable containing ID values for the random samples. The variable *newvar* is valued 1, 2, ...by default. The option `values(`*numlist*`)` can be used to specify different ID values. `generate()` is required.

`replace` allows any existing variable named *newvar* to be replaced.

`nsplit(#)` splits the data into # random samples of equal size, or as close to equal as possible. If neither `nsplit()` nor `split()` is specified, the data are split into two samples.

split(*numlist*) is an alternative to nsplit() for specifying the split. This option splits the data into samples whose sizes are proportional to the values of *numlist*. The values of *numlist* can be any positive number. You can specify proportions that sum to 1, or you can specify integers that define ratios for the sample sizes. Regardless of whether you specify decimals less than 1 or integers, the proportions of the split are given by the values in *numlist* divided by their sum.

rround specifies that sample sizes be randomly rounded when an exact split cannot be made. When an exact split can be made, this option does nothing. When split(*numlist*) is specified with rround, *numlist* must consist of integers, and the integers should contain no common factors. For instance, use split(1 1 2), not split(25 25 50). See Methods and formulas for an explanation.

By default, the sample sizes of the splits are calculated using a deterministic rounding formula. That is, if you repeat the splitting with a different random-number seed, you will get exactly the same sample sizes. Specifying rround creates randomly rounded sample sizes such that the expected values of the sample sizes match the specified split proportions exactly.

The option rround is designed for use with the balance() option when the number of observations in each of the balance groups is small. When group sizes are small (especially when smaller than the number of splits), rround ensures that the overall actual sample split proportions closely match the specified split proportions.

values(*numlist*) specifies that *numlist* be used for the values of the sample ID variable rather than the default of 1, 2, ... The number of values in *numlist* must correspond to the number of samples into which the data are split and must be ascending nonnegative integers.

cluster(*clustvar*) specifies that the data be split by the clusters defined by *clustvar*. That is, all observations in a cluster are kept together in the same split sample. The proportions of the split are based on numbers of clusters, not numbers of observations. *clustvar* can be a numeric or string variable.

balance(*balvars*) specifies that each group defined by the distinct values of *balvars* be split independently based on the specified sample proportions. This ensures a balanced, or roughly balanced, distribution of the *balvars* values across the split samples. When the number of observations (or clusters) in each group is about the same as (or smaller than) the number of split samples, the option rround is recommended. *balvars* can be numeric or string variables.

Advanced

strok (applies only when a *varlist* is specified) specifies to check any string variables in *varlist* for missing values. For observations with missing values, the generated sample ID variable is set to missing. By default, string variables in *varlist* are ignored.

rseed(#) sets the random-number seed. This option can be used to reproduce results. rseed(#) is equivalent to typing set seed # prior to running splitsample. See [R] **set seed**.

show displays a table showing the sample sizes of the split. When cluster() is specified, it shows the numbers of clusters in the samples. When balance(*balvars*) is specified, it displays a table in which each row corresponds to a distinct set of values of *balvars* and shown across the columns are the numbers of observations (or clusters) belonging to each split sample for that balance group.

percent specifies to display percentages rather than the number of observations (or clusters) in the table. percent can only be specified with the option show.

Remarks and examples

splitsample is useful for dividing data into training, validation, and testing samples for machine learning and automated model-building procedures such as those performed by the lasso, stepwise, and nestreg commands.

splitsample with the options balance() and rround can also be used to do random treatment assignment with matching. See example 3.

▷ Example 1: Splitting by observations

Let's create a dataset with 101 observations and run splitsample without any options except the required option giving the name of the sample ID variable to generate. Then we tabulate the newly created variable.

```
. set obs 101
Number of observations (_N) was 0, now 101.
. splitsample, generate(svar)
. tabulate svar
```

svar	Freq.	Percent	Cum.
1	51	50.50	50.50
2	50	49.50	100.00
Total	101	100.00	

By default, splitsample splits the data into two samples, with the samples as equal in size as possible.

The option nsplit(#) can be used to split the data into as many samples as you want—in this case, three samples.

```
. splitsample, generate(svar, replace) nsplit(3)
. tabulate svar
```

svar	Freq.	Percent	Cum.
1	34	33.66	33.66
2	33	32.67	66.34
3	34	33.66	100.00
Total	101	100.00	

The option split(*numlist*) can be specified in place of nsplit() to split the data into any proportions you want. Here we specify that we want 25% of the observations in sample 1, 25% in sample 2, and 50% in sample 3.

```
. splitsample, generate(svar, replace) split(0.25 0.25 0.50) show
```

svar	Freq.	Percent	Cum.
1	25	24.75	24.75
2	26	25.74	50.50
3	50	49.50	100.00
Total	101	100.00	

It split the data as close as it could to 25% : 25% : 50%. The option show displayed the tabulation for us.

◁

▷ Example 2: Splitting by clusters

splitsample can also split the data by clusters. Let's create a cluster variable clustvar and split the data into three samples with proportions 25% : 25% : 50% for the numbers of clusters. We also specify the option show, which gives a convenient tabulation by numbers of clusters rather than numbers of observations.

```
. set seed 12345
. generate clustvar = runiformint(1, 20)
. splitsample, generate(svar, replace) split(0.25 0.25 0.50) cluster(clustvar)
> show
```

svar	Freq.	Percent	Cum.
1	5	25.00	25.00
2	5	25.00	50.00
3	10	50.00	100.00
Total	20	100.00	

```
Total is number of clusters.
```

Because we had 20 clusters, the split into 25% : 25% : 50% yielded cluster sample sizes that met the specified proportions exactly.

The resulting split by number of observations is, of course, different.

```
. tabulate svar
```

svar	Freq.	Percent	Cum.
1	34	33.66	33.66
2	21	20.79	54.46
3	46	45.54	100.00
Total	101	100.00	

When splitting by clusters, the size of each cluster is ignored.

◁

▷ Example 3: Balanced splitting and treatment assignment

splitsample can split the data independently within groups using the option balance(). Let's create two fake categorical variables, one agegrp representing eight age–group categories, and a 0/1 variable gender.

```
. set seed 12345
. generate agegrp = runiformint(1, 8)
. generate gender = runiformint(0, 1)
```

We want to split the data into four samples, where the first three samples are the same size, and the fourth sample is twice the size of each of the others. We specify split(1 1 1 2) using integer ratios. We specify the option balance(agegrp gender) to ensure that the distribution of agegrp × gender is roughly balanced across the four samples. The option show is useful for seeing the actual splits of the numbers of observations within each agegrp × gender group.

```
. splitsample, generate(svar, replace) split(1 1 1 2)
> balance(agegrp gender) show
note: some groups defined by balance() do not contain every sample value.
```

agegrp	gender	svar 1	svar 2	svar 3	svar 4	Total
1	0	2	1	2	3	8
1	1	1	2	1	3	7
2	0	2	2	1	4	9
2	1	1	1	1	2	5
3	0	1	1	1	2	5
3	1	1	1	0	2	4
4	0	2	2	2	4	10
4	1	2	2	1	4	9
5	0	1	0	1	1	3
5	1	1	0	1	1	3
6	0	1	0	1	1	3
6	1	2	2	1	4	9
7	0	0	1	0	1	2
7	1	1	1	1	2	5
8	0	2	1	2	3	8
8	1	2	2	3	4	11

We get a message "some groups defined by `balance()` do not contain every sample value". Indeed, all the groups of size three have no observations in sample 2. Because we are splitting the data into four samples, obviously we need at least four observations in a group for every sample to contain at least one observation.

Second, we notice that all groups of the same size are split into the four samples with exactly the same number of observations in each sample. For example, the two groups of size eight (`agegrp` $= 1$, `gender` $= 0$ and `agegrp` $= 8$, `gender` $= 0$) both have two observations in each of samples 1 and 3, one observation in sample 2, and three observations in sample 4.

Groups of the same size have exactly the same sample-size splits because, by default, the sample sizes for the splits are calculated using a deterministic formula. If the sizes of the groups vary, this typically would not be an issue. Overall, one would expect the actual split proportions to be close to the specified split proportions. But imagine if all, or almost all, the group sizes were the same. What if the size of each group were eight observations in this example? Every group would be split $2:1:2:3$ by observations, yielding actual split proportions of $25\%:12.5\%:25\%:37.5\%$, which are rather different from the specified split proportions of $20\%:20\%:20\%:40\%$.

The option `rround` provides a solution for this problem. It randomly rounds the split sample sizes when the split cannot be made exactly.

```
. splitsample, generate(svar, replace) split(1 1 1 2)
> balance(agegrp gender) rround rseed(54321) show
note: some groups defined by balance() do not contain every sample value.
```

agegrp	gender	svar 1	svar 2	svar 3	svar 4	Total
1	0	2	1	2	3	8
1	1	2	1	1	3	7
2	0	2	2	1	4	9
2	1	1	1	1	2	5
3	0	1	1	1	2	5
3	1	1	1	1	1	4
4	0	2	2	2	4	10
4	1	2	2	2	3	9
5	0	1	1	0	1	3
5	1	1	1	1	0	3
6	0	0	1	1	1	3
6	1	1	2	2	4	9
7	0	0	0	0	2	2
7	1	1	1	1	2	5
8	0	1	2	2	3	8
8	1	2	2	2	5	11

We see that the groups of sizes three, eight, and nine now have different splits by numbers of observations. The groups of size five have exactly the same splits by size because they could be divided exactly based on the specified split ratios of $1 : 1 : 1 : 2$.

The option `rround` with `balance()` thus does a "more random" assignment of observations (or clusters), which is important when the sizes of the balance groups are small. When the sizes of the balance groups are large, and the sizes of the groups vary, splits made with or without `rround` will be similar.

Note that `rround` with `balance()` is suitable for random treatment assignment with matching defined by values of the balance variables.

The computational procedure for option `rround` first randomly assigns as many observations to the split samples as it can to match the specified split proportions exactly. Leftover observations are assigned to samples by dividing them randomly based on the specified split ratios. Splitting ratios must be specified as integers to facilitate this method of splitting the leftovers. See Methods and formulas.

◁

▷ Example 4: Missing values

varlist can be specified with `splitsample` to handle missing values. Let's say we want to divide our data into training and validation samples for a `lasso` or other procedure. Imagine that the variables in the `lasso` have more than a few missing values. Specifying these variables as *varlist* for `splitsample` means that the sample ID variable created will have missing values whenever any of the variables in *varlist* are missing.

Here's an illustration. We create a couple of variables with missing values.

```
. set seed 1234
. generate y = runiform()
. replace  y = . if runiform() < 0.1
(11 real changes made, 11 to missing)
. generate x = runiform()
. replace  x = . if runiform() < 0.1
(15 real changes made, 15 to missing)
```

Then split the data specifying these variables to be checked for missing:

```
. splitsample y x, generate(svar, replace)
. tabulate svar, miss
```

svar	Freq.	Percent	Cum.
1	38	37.62	37.62
2	38	37.62	75.25
.	25	24.75	100.00
Total	101	100.00	

The split was done exactly for the observations without missing values.

◁

Stored results

splitsample stores the following in r():

Scalars

r(N)	total number of observations
r(N_clust)	total number of clusters
r(n_samples)	number of split samples

Macros

r(clustvar)	name of cluster variable
r(balancevars)	names of balance variables
r(rngstate)	random-number state used

Methods and formulas

Let $r_1, r_2, \dots, r_K$ be the arguments to split(*numlist*). If the split is specified using nsplit(#), then we set each $r_k = 1$, and the number of split samples is $K = \#$. The split sample proportions are

$$p_k = \frac{r_k}{R} \quad \text{where } R = \sum_{i=1}^{K} r_i$$

The cumulative proportions are

$$s_k = \sum_{i=1}^{k} p_i$$

For the default deterministic rounding, we calculate cumulative sample sizes:

$$M_k = \text{round}(N s_k)$$

where N is the total number of observations or the number of clusters, and round$(\cdot)$ is Stata's `round()` function. When the option `balance()` is specified, N is the number of observations or clusters in a single balance group. The sample sizes $N_1, N_2, \ldots, N_K$ are given by

$$N_1 = M_1$$
$$N_k = M_k - M_{k-1} \quad \text{for } k = 2, \ldots, K$$

When the option `rround` is specified for random rounding, we first divide N, the number of observations or clusters, as follows:

$$N = cR + d$$

where R is the sum of $r_1, r_2, \ldots, r_K$; c is a nonnegative integer; and $0 \le d < R$. In other words, cR observations can be split into K samples matching the specified split proportions exactly. We randomly pick cR observations and assign them to the samples. The leftover d observations are randomly placed in R bins without replacement, where the first r_1 bins represent sample 1, the next r_2 bins represent sample 2, and so on.

The computational procedure for random rounding thus requires $r_1, r_2, \ldots, r_K$ to be integers and also requires $R \le N$. To reduce the variance of the random rounding, the integers $r_1, r_2, \ldots, r_K$ should have no common factors.

Also see

[D] **sample** — Draw random sample

stack — Stack data

Description | Quick start | Menu | Syntax
Options | Remarks and examples | Reference | Also see

Description

`stack` stacks the variables in *varlist* vertically, resulting in a dataset with variables *newvars* and `_N` $\cdot$ (N_v/N_n) observations, where N_v is the number of variables in *varlist* and N_n is the number in *newvars*. `stack` creates the new variable `_stack` identifying the groups.

Quick start

Replace data in memory with `v`, `v2` appended to `v1` and identify original variable by order in `_stack`

```
stack v1 v2, into(v)
```

Same as above, but with `v1` appended to `v2` and do not display warning that data in memory will be replaced

```
stack v2 v1, into(v) clear
```

Same as above, but save result in `v2`

```
stack v2 v1, group(2) clear
```

Append `v2` to `v1` and `v4` to `v3` and save result in `newv1` and `newv2`

```
stack v1 v3 v2 v4, into(newv1 newv2) clear
```

Same as above, but save results in `v1` and `v3`

```
stack v1 v3 v2 v4, group(2) clear
```

Menu

Data > Create or change data > Other variable-transformation commands > Stack data

Syntax

`stack` *varlist* [*if*] [*in*] , { into(*newvars*) | group(#) } [*options*]

options	Description
Main	
* into(*newvars*)	identify names of new variables to be created
* group(#)	stack # groups of variables in *varlist*
clear	clear dataset from memory
wide	keep variables in *varlist* that are not specified in *newvars*

* Either `into(`*newvars*`)` or `group(#)` is required.

`stack` does not allow alias variables; see [D] **frunalias** for advice on how to get around this restriction.

Options

Main

`into(`*newvars*`)` identifies the names of the new variables to be created. `into()` may be specified using variable ranges (for example, `into(v1-v3)`). Either `into()` or `group()`, but not both, must be specified.

`group(#)` specifies the number of groups of variables in *varlist* to be stacked. The created variables will be named according to the first group in *varlist*. Either `group()` or `into()`, but not both, must be specified.

`clear` indicates that it is okay to clear the dataset in memory. If you do not specify this option, you will be asked to confirm your intentions.

`wide` includes any of the original variables in *varlist* that are not specified in *newvars* in the resulting data.

Remarks and examples

▷ Example 1: Illustrating the concept

This command is best understood by examples. We begin with artificial but informative examples and end with useful examples.

```
. use https://www.stata-press.com/data/r19/stackxmpl
. list

     +---------------+
     | a   b   c   d |
     |---------------|
  1. | 1   2   3   4 |
  2. | 5   6   7   8 |
     +---------------+
```

```
. stack a b  c d, into(e f) clear
. list
```

	_stack	e	f
1.	1	1	2
2.	1	5	6
3.	2	3	4
4.	2	7	8

We formed the new variable e by stacking a and c, and we formed the new variable f by stacking b and d. _stack is automatically created and set equal to 1 for the first (a, b) group and equal to 2 for the second (c, d) group. (When _stack==1, the new data e and f contain the values from a and b. When _stack==2, e and f contain values from c and d.)

There are two groups because we specified four variables in the *varlist* and two variables in the into list, and $4/2 = 2$. If there were six variables in the *varlist*, there would be $6/2 = 3$ groups. If there were also three variables in the into list, there would be $6/3 = 2$ groups. Specifying six variables in the *varlist* and four variables in the into list would result in an error because $6/4$ is not an integer.

◁

▷ Example 2: Stacking a variable multiple times

Variables may be repeated in the *varlist*, and the *varlist* need not contain all the variables:

```
. use https://www.stata-press.com/data/r19/stackxmpl, clear
. list
```

	a	b	c	d
1.	1	2	3	4
2.	5	6	7	8

```
. stack a b  a c, into(a bc) clear
. list
```

	_stack	a	bc
1.	1	1	2
2.	1	5	6
3.	2	1	3
4.	2	5	7

a was stacked on a and called a, whereas b was stacked on c and called bc.

If we had wanted the resulting variables to be called simply a and b, we could have used

```
. stack  a b  a c, group(2) clear
```

which is equivalent to

```
. stack  a b  a c, into(a b) clear
```

◁

▷ Example 3: Keeping the original variables

In this artificial but informative example, the `wide` option includes the variables in the original dataset that were specified in *varlist* in the output dataset:

```
. use https://www.stata-press.com/data/r19/stackxmpl, clear
. list
```

	a	b	c	d
1.	1	2	3	4
2.	5	6	7	8

```
. stack a b  c d, into(e f) clear wide
. list
```

	_stack	e	f	a	b	c	d
1.	1	1	2	1	2	.	.
2.	1	5	6	5	6	.	.
3.	2	3	4	.	.	3	4
4.	2	7	8	.	.	7	8

In addition to the stacked `e` and `f` variables, the original `a`, `b`, `c`, and `d` variables are included. They are set to missing where their values are not appropriate.

◁

▷ Example 4: Using wide with repeated variables

This is the last artificial example. When you specify the `wide` option and repeat the same variable name in both the *varlist* and the `into` list, the variable will contain the stacked values:

```
. use https://www.stata-press.com/data/r19/stackxmpl, clear
. list
```

	a	b	c	d
1.	1	2	3	4
2.	5	6	7	8

```
. stack  a b  a c, into(a bc) clear wide
. list
```

	_stack	a	bc	b	c
1.	1	1	2	2	.
2.	1	5	6	6	.
3.	2	1	3	.	3
4.	2	5	7	.	7

◁

▷ Example 5: Using stack to make graphs

We want one graph of y against x1 and y against x2. We might be tempted to type scatter y x1 x2, but that would graph y against x2 and x1 against x2. One solution is to type

```
. save mydata
. stack  y x1  y x2, into(yy x12) clear
. generate y1 = yy if _stack==1
. generate y2 = yy if _stack==2
. scatter y1 y2 x12
. use mydata, clear
```

The names yy and x12 are supposed to suggest the contents of the variables. yy contains (y,y), and x12 contains (x1,x2). We then make y1 defined at the x1 points but missing at the x2 points—graphing y1 against x12 is the same as graphing y against x1 in the original dataset. Similarly, y2 is defined at the x2 points but missing at x1—graphing y2 against x12 is the same as graphing y against x2 in the original dataset. Therefore, scatter y1 y2 x12 produces the desired graph.

◁

▷ Example 6: Plotting cumulative distributions

We wish to graph y1 against x1 and y2 against x2 on the same graph. The logic is the same as above, but let's go through it. Perhaps we have constructed two cumulative distributions by using cumul (see [R] **cumul**):

```
. use https://www.stata-press.com/data/r19/citytemp
(City temperature data)
. cumul tempjan, gen(cjan)
. cumul tempjuly, gen(cjuly)
```

We want to graph both cumulatives in the same graph; that is, we want to graph cjan against tempjan and cjuly against tempjuly. Remember that we could graph the tempjan cumulative by typing

```
. scatter cjan tempjan, c(l) m(o) sort
  (output omitted)
```

We can graph the tempjuly cumulative similarly. To obtain both on the same graph, we must stack the data:

```
. stack  cjuly tempjuly   cjan tempjan, into(c temp) clear
. generate cjan  = c if _stack==1
(958 missing values generated)
. generate cjuly = c if _stack==2
(958 missing values generated)
. scatter cjan cjuly temp, c(l l) m(o o) sort
  (output omitted)
```

Alternatively, if we specify the `wide` option, we do not have to regenerate `cjan` and `cjuly` because they will be created automatically:

```
. use https://www.stata-press.com/data/r19/citytemp, clear
(City temperature data)
. cumul tempjan, gen(cjan)
. cumul tempjuly, gen(cjuly)
. stack  cjuly tempjuly   cjan tempjan, into(c temp) clear wide
. scatter cjan cjuly temp, c(l l) m(o o) sort
  (output omitted)
```

◁

❑ Technical note

There is a third way, not using the `wide` option, that is exceedingly tricky but is sometimes useful:

```
. use https://www.stata-press.com/data/r19/citytemp, clear
(City temperature data)
. cumul tempjan, gen(cjan)
. cumul tempjuly, gen(cjuly)
. stack cjuly tempjuly  cjan tempjan, into(c temp) clear
. sort _stack temp
. scatter c temp, c(L) m(o)
  (output omitted)
```

Note the use of `connect`'s capital `L` rather than lowercase `l` option. `c(L)` connects points only from left to right; because the data are sorted by `_stack temp`, `temp` increases within the first group (`cjuly` vs. `tempjuly`) and then starts again for the second (`cjan` vs. `tempjan`); see [G-4] ***connectstyle***.

❑

Reference

Baum, C. F. 2016. *An Introduction to Stata Programming*. 2nd ed. College Station, TX: Stata Press.

Also see

[D] **contract** — Make dataset of frequencies and percentages

[D] **frunalias** — Change storage type of alias variables

[D] **reshape** — Convert data from wide to long form and vice versa

[D] **xpose** — Interchange observations and variables

statsby — Collect statistics for a command across a by list

Description

`statsby` collects statistics from *command* across a by list. Typing

. `statsby` *exp_list*, `by(`*varname*`):` *command*

executes *command* for each group identified by *varname*, building a dataset of the associated values from the expressions in *exp_list*. The resulting dataset replaces the current dataset, unless the `saving()` option is supplied. *varname* can refer to a numeric or a string variable.

command defines the statistical command to be executed. Most Stata commands and user-written programs can be used with `statsby`, as long as they follow standard Stata syntax and allow the `if` qualifier; see **[U] 11 Language syntax**. The `by` prefix cannot be part of *command*.

exp_list specifies the statistics to be collected from the execution of *command*. If no expressions are given, *exp_list* assumes a default depending upon whether *command* changes results in `e()` and `r()`. If *command* changes results in `e()`, the default is `_b`. If *command* changes results in `r()` (but not `e()`), the default is all the scalars posted to `r()`. It is an error not to specify an expression in *exp_list* otherwise.

Quick start

Replace data in memory with estimates of the coefficient of `x` and constant for each value of `catvar`

```
statsby, by(catvar): regress y x
```

Same as above, but name new variables `b` and `cons`

```
statsby b=_b[x] cons=_b[_cons], by(catvar): regress y x
```

Add standard errors of the estimates and use default variable names

```
statsby _b _se, by(catvar): regress y x
```

Same as above, but retain data in memory and save estimates to `myest.dta`

```
statsby _b _se, by(catvar) saving(myest): regress y x
```

Same as above, and include estimate for entire dataset

```
statsby _b _se, by(catvar) saving(myest) total: regress y x
```

Note: Any command that accepts the `statsby` prefix may be substituted for `regress` above.

Menu

Statistics > Other > Collect statistics for a command across a by list

Syntax

statsby [*exp_list*] [, *options*] : *command*

options	Description
Main	
* by(*varlist* [, missing])	equivalent to interactive use of by *varlist* :
Options	
clear	replace data in memory with results
saving(*filename*, ...)	save results to *filename*; save statistics in double precision; save results to *filename* every # replications
total	include results for the entire dataset
subsets	include all combinations of subsets of groups
Reporting	
nodots	suppress replication dots
dots(#)	display dots every # replications
noisily	display any output from *command*
trace	trace *command*
nolegend	suppress table legend
verbose	display the full table legend
Advanced	
basepop(*exp*)	restrict initializing sample to *exp*; seldom used
force	do not check for svy commands; seldom used
forcedrop	retain only observations in by-groups when calling *command*; seldom used

* by() is required in the dialog box because statsby is useful to the interactive user only when using by().

All weight types supported by *command* are allowed except pweights; see [U] 11.1.6 weight.

exp_list contains	(*name*: *elist*)
	elist
	eexp
elist contains	*newvarname* = (*exp*)
	(*exp*)
eexp is	*specname*
	[*eqno*]*specname*
specname is	_b
	_b[]
	_se
	_se[]
eqno is	##
	name

exp is a standard Stata expression; see [U] 13 Functions and expressions.

Distinguish between [], which are to be typed, and [], which indicate optional arguments.

Options

Main

by(*varlist* [, missing]) specifies a list of existing variables that would normally appear in the by *varlist*: section of the command if you were to issue the command interactively. By default, statsby ignores groups in which one or more of the by() variables is missing. Alternatively, missing causes missing values to be treated like any other values in the by-groups, and results from the entire dataset are included with use of the subsets option. If by() is not specified, *command* will be run on the entire dataset. *varlist* can contain both numeric and string variables.

Options

clear specifies that it is okay to replace the data in memory, even though the current data have not been saved to disk.

saving(*filename*[, *suboptions*]) creates a Stata data file (.dta file) consisting of (for each statistic in *exp_list*) a variable containing the replicates.

double specifies that the results for each replication be stored as doubles, meaning 8-byte reals. By default, they are stored as floats, meaning 4-byte reals.

every(#) specifies that results be written to disk every #th replication. every() should be specified in conjunction with saving() only when *command* takes a long time for each replication. This will allow recovery of partial results should your computer crash. See [P] **postfile**.

total specifies that *command* be run on the entire dataset, in addition to the groups specified in the by() option.

subsets specifies that *command* be run for each group defined by any combination of the variables in the by() option.

Reporting

nodots and dots(#) specify whether to display replication dots. By default, one dot character is displayed for each by-group. An "x" is displayed if *command* returns an error or if any value in *exp_list* is missing. You can also control whether dots are printed using set dots; see [R] **set**.

nodots suppresses display of the replication dots.

dots(#) displays dots every # replications. dots(0) is a synonym for nodots.

noisily causes the output of *command* to be displayed for each by-group. This option implies the nodots option.

trace causes a trace of the execution of *command* to be displayed. This option implies the noisily option.

nolegend suppresses the display of the table legend, which identifies the rows of the table with the expressions they represent.

verbose requests that the full table legend be displayed. By default, coefficients and standard errors are not displayed.

Advanced

basepop(*exp*) specifies a base population that statsby uses to evaluate the *command* and to set up for collecting statistics. The default base population is the entire dataset, or the dataset specified by any if or in conditions specified on the *command*.

One situation where basepop() is useful is collecting statistics over the panels of a panel dataset by using an estimator that works for time series, but not panel data, for example,

```
. statsby, by(mypanels) basepop(mypanels==2): arima ...
```

force suppresses the restriction that *command* not be a svy command. statsby does not perform subpopulation estimation for survey data, so it should not be used with svy. statsby reports an error when it encounters svy in *command* if the force option is not specified. This option is seldom used, so use it only if you know what you are doing.

forcedrop forces statsby to drop all observations except those in each by-group before calling *command* for the group. This allows statsby to work with user-written programs that completely ignore if and in but do not return an error when either is specified. forcedrop is seldom used.

Remarks and examples

Remarks are presented under the following headings:

Collecting coefficients and standard errors

▷ Example 1

We begin with an example using auto2.dta. In this example, we want to collect the coefficients from a regression in which we model the price of a car on its weight, length, and mpg. We want to run this model for both domestic and foreign cars. We can do this easily by using statsby with the extended expression _b.

```
. use https://www.stata-press.com/data/r19/auto2
(1978 automobile data)

. statsby _b, by(foreign) verbose nodots: regress price weight length mpg
    Command: regress price weight length mpg
  _b_weight: _b[weight]
  _b_length: _b[length]
     _b_mpg: _b[mpg]
    _b_cons: _b[_cons]
         By: foreign

. list
```

	foreign	_b_wei~t	_b_length	_b_mpg	_b_cons
1.	Domestic	6.767233	-109.9518	142.7663	2359.475
2.	Foreign	4.784841	13.39052	-18.4072	-6497.49

If we were interested only in the coefficient of a particular variable, such as mpg, we would specify that particular coefficient; see **[U] 13.5 Accessing coefficients and standard errors**.

```
. use https://www.stata-press.com/data/r19/auto2, clear
(1978 automobile data)

. statsby mpg=_b[mpg], by(foreign) nodots: regress price weight length mpg

      Command: regress price weight length mpg
          mpg: _b[mpg]
           By: foreign

. list

     ┌─────────────────────┐
     │  foreign        mpg │
     ├─────────────────────┤
  1. │ Domestic   142.7663 │
  2. │  Foreign   -18.4072 │
     └─────────────────────┘
```

The extended expression _se indicates that we want standard errors.

```
. use https://www.stata-press.com/data/r19/auto2, clear
(1978 automobile data)

. statsby _se, by(foreign) verbose nodots: regress price weight length mpg

      Command: regress price weight length mpg
   _se_weight: _se[weight]
   _se_length: _se[length]
      _se_mpg: _se[mpg]
     _se_cons: _se[_cons]
           By: foreign

. list

     ┌───────────────────────────────────────────────────────┐
     │  foreign   _se_we~t   _se_le~h    _se_mpg   _se_cons │
     ├───────────────────────────────────────────────────────┤
  1. │ Domestic   1.226326   39.48193   134.7221   7770.131 │
  2. │  Foreign   1.670006   50.70229   59.37442   6337.952 │
     └───────────────────────────────────────────────────────┘
```

◁

▷ Example 2

For multiple-equation estimations, we can use [*eqno*]_b ([*eqno*]_se) to get the coefficients (standard errors) of a specific equation or use _b (_se) to get the coefficients (standard errors) of all the equations. To demonstrate, we use heckman and a slightly different dataset.

```
. use https://www.stata-press.com/data/r19/statsby, clear

. statsby _b, by(group) verbose nodots: heckman price mpg, sel(trunk)

      Command: heckman price mpg, sel(trunk)
  price_b_mpg: [price]_b[mpg]
 price_b_cons: [price]_b[_cons]
select_b_tr~k: [select]_b[trunk]
select_b_cons: [select]_b[_cons]
_eq3_b_athrho: [/]_b[athrho]
_eq3_b_lnsi~a: [/]_b[lnsigma]
           By: group
```

```
. list, compress noobs

  ┌──────────────────────────────────────────────────────────────────────────┐
  │ group   price_b~g   price_~s   select_~k   select~s   _eq3_b_~o   _eq3_b~a │
  ├──────────────────────────────────────────────────────────────────────────┤
  │     1   -253.9293   11836.33   -.0122223   1.248342     -.31078   7.895351 │
  │     2   -242.5759   11906.46   -.0488969   1.943078   -1.399222   8.000272 │
  │     3   -172.6499   9813.357   -.0190373   1.452783   -.3282423   7.876059 │
  │     4   -250.7318   10677.31    .0525965   .3502012    .6133645    7.96349 │
  └──────────────────────────────────────────────────────────────────────────┘
```

To collect the coefficients of the first equation only, we would specify `[price]_b` instead of `_b`.

```
. use https://www.stata-press.com/data/r19/statsby, clear
. statsby [price]_b, by(group) verbose nodots: heckman price mpg, sel(trunk)
     Command: heckman price mpg, sel(trunk)
 price_b_mpg: [price]_b[mpg]
price_b_cons: [price]_b[_cons]
          By: group

. list

     ┌────────────────────────────┐
     │ group   price_b~g   price_~s │
     ├────────────────────────────┤
  1. │     1   -253.9293   11836.33 │
  2. │     2   -242.5759   11906.46 │
  3. │     3   -172.6499   9813.357 │
  4. │     4   -250.7318   10677.31 │
     └────────────────────────────┘
```

◁

❑ Technical note

If *command* fails on one or more groups, `statsby` will capture the error messages and ignore those groups.

❑

Collecting stored results

Many Stata commands store results of calculations; see **[U] 13.6 Accessing results from Stata commands**. `statsby` can collect the stored results and expressions involving these stored results, too. Expressions must be bound in parentheses.

▷ Example 3

Suppose that we want to collect the mean and the median of `price`, as well as their ratios, and we want to collect them for both domestic and foreign cars. We might type

```
. use https://www.stata-press.com/data/r19/auto2, clear
(1978 automobile data)

. statsby mean=r(mean) median=r(p50) ratio=(r(mean)/r(p50)), by(foreign) nodots:
> summarize price, detail

      Command: summarize price, detail
         mean: r(mean)
       median: r(p50)
        ratio: r(mean)/r(p50)
           By: foreign

. list

     +-------------------------------------------+
     |  foreign       mean   median        ratio |
     |-------------------------------------------|
  1. | Domestic   6072.423   4782.5     1.269717 |
  2. |  Foreign   6384.682     5759     1.108644 |
     +-------------------------------------------+
```

◁

❑ Technical note

In *exp_list*, *newvarname* is not required. If no new variable name is specified, `statsby` names the new variables `_stat_1`, `_stat_2`, and so forth.

❑

All subsets

▷ Example 4

When there are two or more variables in `by(`*varlist*`)`, we can execute *command* for any combination, or subset, of the variables in the `by()` option by specifying the `subsets` option.

```
. use https://www.stata-press.com/data/r19/auto2, clear
(1978 automobile data)

. statsby mean=r(mean) median=r(p50) n=r(N), by(foreign rep78) subsets nodots:
> summarize price, detail

      Command: summarize price, detail
         mean: r(mean)
       median: r(p50)
            n: r(N)
           By: foreign rep78
```

```
. list

     ┌──────────────────────────────────────────────┐
     │  foreign       rep78       mean   median    n │
     ├──────────────────────────────────────────────┤
  1. │ Domestic        Poor     4564.5   4564.5    2 │
  2. │ Domestic        Fair   5967.625     4638    8 │
  3. │ Domestic     Average   6607.074     4749   27 │
  4. │ Domestic        Good   5881.556     5705    9 │
  5. │ Domestic   Excellent     4204.5   4204.5    2 │
     ├──────────────────────────────────────────────┤
  6. │ Domestic           .    6179.25     4853   48 │
  7. │  Foreign     Average   4828.667     4296    3 │
  8. │  Foreign        Good   6261.444     6229    9 │
  9. │  Foreign   Excellent   6292.667     5719    9 │
 10. │  Foreign           .   6070.143     5719   21 │
     ├──────────────────────────────────────────────┤
 11. │        .        Poor     4564.5   4564.5    2 │
 12. │        .        Fair   5967.625     4638    8 │
 13. │        .     Average   6429.233     4741   30 │
 14. │        .        Good     6071.5   5751.5   18 │
 15. │        .   Excellent       5913     5397   11 │
     ├──────────────────────────────────────────────┤
 16. │        .           .   6165.257   5006.5   74 │
     └──────────────────────────────────────────────┘
```

In the above dataset, observation 6 is for domestic cars, regardless of the repair record; observation 10 is for foreign cars, regardless of the repair record; observation 11 is for both foreign cars and domestic cars given that the repair record is 1; and the last observation is for the entire dataset.

◁

❑ Technical note

To see the output from *command* for each group identified in the `by()` option, we can use the `noisily` option.

```
. use https://www.stata-press.com/data/r19/auto2, clear
(1978 automobile data)

. statsby mean=r(mean) se=(r(sd)/sqrt(r(N))), by(foreign) noisily nodots:
> summarize price
statsby: First call to summarize with data as is:

. summarize price

    Variable │        Obs        Mean    Std. dev.       Min        Max
─────────────┼─────────────────────────────────────────────────────────
       price │         74    6165.257    2949.496       3291      15906
statsby legend:

      Command: summarize price
         mean: r(mean)
           se: r(sd)/sqrt(r(N))
           By: foreign

Statsby groups:

running (summarize price) on group 1
```

```
. summarize price

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
       price |         52    6072.423    3097.104       3291      15906
running (summarize price) on group 2
. summarize price

    Variable |        Obs        Mean    Std. dev.       Min        Max
-------------+---------------------------------------------------------
       price |         22    6384.682    2621.915       3748      12990
. list

     +-------------------------------+
     |  foreign       mean        se |
     |-------------------------------|
  1. | Domestic   6072.423  429.4911 |
  2. |  Foreign   6384.682  558.9942 |
     +-------------------------------+
```

❑

Acknowledgment

Speed improvements in statsby were based on code written by Michael Blasnik of Nest Labs.

References

Cox, N. J. 2010. Speaking Stata: The statsby strategy. *Stata Journal* 10: 143–151.

Newson, R. B. 2003. Confidence intervals and p-values for delivery to the end user. *Stata Journal* 3: 245–269.

Also see

[D] **by** — Repeat Stata command on subsets of the data

[D] **collapse** — Make dataset of summary statistics

[P] **postfile** — Post results in Stata dataset

[R] **bootstrap** — Bootstrap sampling and estimation

[R] **jackknife** — Jackknife estimation

[R] **permute** — Permutation tests

sysuse — Use shipped dataset

Description

`sysuse` *filename* loads the specified Stata-format dataset that was shipped with Stata or that is stored along the ado-path. If *filename* is specified without a suffix, `.dta` is assumed.

`sysuse dir` lists the names of the datasets shipped with Stata plus any other datasets stored along the ado-path. You can also see `help dta_examples` for a list of datasets shipped with Stata.

Quick start

List example datasets installed with Stata

```
sysuse dir
```

Use `auto.dta` example dataset installed with Stata

```
sysuse auto
```

Same as above, but clear current dataset from memory first

```
sysuse auto, clear
```

Menu

File > Example datasets...

Syntax

Use example dataset installed with Stata

sysuse ["]*filename*["] [, clear]

List example Stata datasets installed with Stata

sysuse dir [, all]

Options

`clear` specifies that it is okay to replace the data in memory, even though the current data have not been saved to disk.

`all` specifies that all datasets be listed, even those that include an underscore (_) in their name. By default, such datasets are not listed.

Remarks and examples

Remarks are presented under the following headings:

Typical use

A few datasets are included with Stata and are stored in the system directories. These datasets are often used in the help files to demonstrate a certain feature.

Typing

```
. sysuse dir
```

lists the names of those datasets. One such dataset is `lifeexp.dta`. If you simply type `use lifeexp`, you will see

```
. use lifeexp
file lifeexp.dta not found
r(601);
```

Type `sysuse`, however, and the dataset is loaded:

```
. sysuse lifeexp
(Life expectancy, 1998)
```

The datasets shipped with Stata are stored in different folders (directories) so that they do not become confused with your datasets.

A note concerning shipped datasets

Not all the datasets used in the manuals are shipped with Stata. To obtain the other datasets, see [D] **webuse**.

The datasets used to demonstrate Stata are often fictional. If you want to know whether a dataset is real or fictional, and its history, load the dataset and type

```
. notes
```

A few datasets have no notes. This means that the datasets are believed to be real, but that they were created so long ago that information about their original source has been lost. Treat such datasets as if they were fictional.

Using user-installed datasets

Any datasets you have installed using `net` or `ssc` (see [R] **net** and [R] **ssc**) can be listed by typing `sysuse dir` and can be loaded using `sysuse` *filename*.

Any datasets you store in your personal ado folder (see [P] **sysdir**) are also listed by `sysuse dir` and can be loaded using `sysuse` *filename*.

How sysuse works

`sysuse` simply looks across the ado-path for `.dta` files; see [P] **sysdir**.

By default, `sysuse dir` does not list a dataset that contains an underscore (_) in its name. By convention, such datasets are used by ado-files to achieve their ends and probably are not of interest to you. If you type `sysuse dir, all`, then all datasets are listed.

Stored results

`sysuse dir` stores in the macro `r(files)` the list of dataset names.

`sysuse` *filename* stores in the macro `r(fn)` the *filename*, including the full path specification.

Also see

[D] **frames use** — Load a set of frames from disk

[D] **use** — Load Stata dataset

[D] **webuse** — Use dataset from Stata website

[P] **findfile** — Find file in path

[P] **sysdir** — Query and set system directories

[R] **net** — Install and manage community-contributed additions from the internet

[R] **ssc** — Install and uninstall packages from SSC

type — Display contents of a file

Description   Quick start   Syntax   Options   Remarks and examples   Also see

Description

`type` lists the contents of a file stored on disk. This command is similar to the Windows `type` command and the Unix `more`(1) or pg(1) commands.

In Stata for Mac and Stata for Unix, `cat` is a synonym for `type`.

On all platforms, Stata understands a leading "~" as an abbreviation for the home directory.

Quick start

Display contents of `myfile.txt` in the Results window

    type myfile.txt

Same as above, but display `myfile.txt` saved in `~\mydir\mysubdir` using Stata for Windows

    type ~\mydir\mysubdir\myfile.txt

Same as above, but using Stata for Mac or Unix

    type ~/mydir/mysubdir/myfile.txt

Display contents of `my file.txt`

    type "my file.txt"

Display the first 20 lines of `myfile.txt`

    type myfile.txt, lines(20)

Syntax

`type` [`"`] *filename* [`"`] [, *options*]

Note: Double quotes must be used to enclose *filename* if the name contains blanks.

options	Description
`asis`	show file as is; default is to display files with suffix `.smcl` or `.sthlp` as SMCL
`smcl`	display file as SMCL; default for files with suffix `.smcl` or `.sthlp`
`showtabs`	display tabs as <T> rather than being expanded
`starbang`	list lines in the file that begin with "`*!`"
`lines(#)`	list first # lines

Options

`asis` specifies that the file be shown exactly as it is. The default is to display files with the suffix `.smcl` or `.sthlp` as SMCL, meaning that the SMCL directives are interpreted and properly rendered. Thus `type` can be used to look at files created by the `log using` command.

`smcl` specifies that the file be displayed as SMCL, meaning that the SMCL directives are interpreted and properly rendered. This is the default for files with the suffix `.smcl` or `.sthlp`.

`showtabs` requests that any tabs be displayed as <T> rather than being expanded.

`starbang` lists only the lines in the specified file that begin with the characters "`*!`". Such comment lines are typically used to indicate the version number of ado-files, class files, etc. `starbang` may not be used with SMCL files.

`lines(#)` lists the first # lines of a file. `lines()` is ignored if the file is displayed as SMCL or if # is less than or equal to 0.

Remarks and examples

▷ Example 1

We have raw data containing the level of Lake Victoria Nyanza and the number of sunspots during the years 1902–1921 stored in a file called `sunspots.raw`. We want to read this dataset into Stata by using `infile`, but we cannot remember the order in which we entered the variables. We can find out by using the `type` command:

```
. type sunspots.raw
1902 -10   5    1903  13 24     1904  18 42
1905  15  63    1906  29 54     1907  21 62
1908  10  49    1909   8 44     1910   1 19
1911  -7   6    1912 -11  4     1913  -3  1
1914  -2  10    1915   4 47     1916  15 57
1917  35 104    1918  27 81     1919   8 64
1920   3  38    1921  -5 25
```

Looking at this output, we now remember that the variables are entered year, level, and number of sunspots. We can read this dataset by typing `infile year level spots using sunspots`.

If we wanted to see the tabs in `sunspots.raw`, we could type

```
. type sunspots.raw, showtabs
1902 -10   5<T>1903  13 24<T>1904  18 42
1905  15  63<T>1906  29 54<T>1907  21 62
1908  10  49<T>1909   8 44<T>1910   1 19
1911  -7   6<T>1912 -11  4<T>1913  -3  1
1914  -2  10<T>1915   4 47<T>1916  15 57
1917  35 104<T>1918  27 81<T>1919   8 64
1920   3  38<T>1921  -5 25
```

◁

▷ Example 2

In a previous Stata session, we typed `log using myres` and created `myres.smcl`, containing our results. We can use `type` to list the log:

```
. type myres.smcl
--------------------------------------------------------------------------------
      name:  <unnamed>
       log:  /work/joe/dof/myres.smcl
  log type:  smcl
 opened on:  20 Jan 2025, 15:37:48

. use lbw
(Hosmer & Lemeshow data)

. logistic low age lwt i.race smoke ptl ht ui

Logistic regression                                     Number of obs     =        189
                                                        LR chi2(8)        =      33.22
                                                        Prob > chi2       =     0.0001
Log likelihood =   -100.724                             Pseudo R2         =     0.1416
  (output omitted)

. estat gof
Logistic model for low, goodness-of-fit test
  (output omitted)

. log close
      name:  <unnamed>
       log:  /work/joe/dof/myres.smcl
  log type:  smcl
 closed on:  20 Jan 2025, 15:38:30
--------------------------------------------------------------------------------
```

We could also use `view` to look at the log; see [R] **view**.

◁

Also see

[D] **cd** — Change directory

[D] **copy** — Copy file from disk or URL

[D] **dir** — Display filenames

[D] **erase** — Erase a disk file

[D] **mkdir** — Create directory

[D] **rmdir** — Remove directory

[D] **shell** — Temporarily invoke operating system

[P] **viewsource** — View source code

[R] **translate** — Print and translate logs

[R] **view** — View files and logs

[U] 11.6 Filenaming conventions

[Suggestion: Read **[U] 12.4.2 Handling Unicode strings** *first.]*

Description

The `unicode` command provides utilities to help you work with Unicode strings in your data. If you have only plain ASCII characters in your data (a–z, A–Z, 0–9, and typical punctuation characters), you can stop reading now. Otherwise, continue with *Remarks and examples* below.

Remarks and examples

We recommend that you start with some overview documentation. First, you should read **[U] 12.4.2 Handling Unicode strings**, which will explain the difference between ASCII and Unicode and provide detailed advice on working with Unicode strings in Stata. In that section, you will learn about locales, encodings, sorting, and Unicode-specific string functions. For a general overview of Unicode-specific advice, see `help unicode advice`.

Second, if you have datasets, do-files, ado-files, or other files that you used with Stata 13 or earlier and those files contain characters other than plain ASCII such as accented characters, Chinese, Japanese, or Korean (CJK) characters, Cyrillic characters, and the like, you should read **[D] unicode translate**.

`unicode` provides the following utilities:

[D] unicode translate	Translate files to Unicode
[D] unicode encoding	Unicode encoding utilities
[D] unicode locale	Unicode locale utilities
[D] unicode collator	Language-specific Unicode collators
[D] unicode convertfile	Low-level file conversion between encodings

You may also find `help encodings` useful if you need to choose an encoding when converting a string from extended ASCII to Unicode.

Also see

[D] unicode collator — Language-specific Unicode collators

[D] unicode convertfile — Low-level file conversion between encodings

[D] unicode encoding — Unicode encoding utilities

[D] unicode locale — Unicode locale utilities

[D] unicode translate — Translate files to Unicode

[U] 12.4.2 Handling Unicode strings

unicode collator — Language-specific Unicode collators

Description Syntax Remarks and examples Also see

Description

`unicode collator list` lists the subset of locales that have language-specific collators for the Unicode string comparison functions: `ustrcompare()`, `ustrcompareex()`, `ustrsortkey()`, and `ustrsortkeyex()`.

Syntax

`unicode collator list` [*pattern*]

pattern is one of `_all`, `*`, `*`*name*`*`, `*`*name*, or *name*`*`. If you specify nothing, `_all`, or `*`, then all results will be listed. `*`*name*`*` lists all results containing *name*; `*`*name* lists all results ending with *name*; and *name*`*` lists all results starting with *name*.

Remarks and examples

Remarks are presented under the following headings:

Overview of collation
The role of locales in collation
Further controlling collation

Overview of collation

Collation is the process of comparing and sorting Unicode character strings as a human might logically order them. We call this ordering strings in a language-sensitive manner. To do this, Stata uses a Unicode tool known as the Unicode collation algorithm, or UCA.

To perform language-sensitive string sorts, you must combine `ustrsortkey()` or `ustrsortkeyex()` with `sort`. It is a complicated process and there are several issues about which you need to be aware. For details, see **[U] 12.4.2.5 Sorting strings containing Unicode characters**. To perform language-sensitive string comparisons, you can use `ustrcompare()` or `ustrcompareex()`.

For details about the UCA, see http://www.unicode.org/reports/tr10/.

The role of locales in collation

During collation, Stata can use the default collator or it can perform language-sensitive string comparisons or sorts that require knowledge of a locale.

A locale identifies a community with a certain set of preferences for how their language should be written; see **[U] 12.4.2.4 Locales in Unicode**. For example, in English, the uppercase letter of the Latin small letter "i" is the Latin capital letter "I". However, in Turkish, the uppercase letter is "I" with a dot above it (Unicode `\u0130`); hence, the case mapping is locale-sensitive.

Collation in Stata involves the locale-sensitive functions ustrcompare(), ustrcompareex(), ustrsortkey(), and ustrsortkeyex(). If you specify a locale with one of these functions or if you have set the locale globally (see [P] **set locale_functions**), then collation may be performed using a language-specific collator.

Because a locale is simply an identifier to locate the resources for specific services, there is no validation of the locale. For example, specifying "klingon" is as valid as specifying "en" when calling ustrcompare() or the other functions discussed here. If the collation data for the "klingon" locale is found, then the locale is populated; otherwise, fallback rules are followed. For more information, see *Default locale and locale fallback* in [D] **unicode locale**.

Stata supports hundreds of locales, but only about 100 have a language-specific collator. unicode collator list lets you determine whether your locale (or language) has its own collator. For example, Stata supports two locales for the Zulu language: zu is a general locale and zu_ZA is Zulu specific to South Africa. Only zu has a language-specific collator.

Further controlling collation

ustrcompare() and ustrsort() use the default collation algorithm for the locale. However, you can exercise finer control over the collation algorithm if you use ustrcompareex() or ustrsortkeyex().

An International Components for Unicode (ICU) locale may contain up to five subtags in the following order: language, script, country, variant, and keywords. Stata usually uses only the language and country tags. However, collation keywords may be used in the ustrcompareex() and ustrsortkeyex() functions.

The collation keyword specifies the string sort order of the locale. For example, "pinyin" and "stroke" for Chinese language produce different string sort orders. In most cases, it is not necessary to specify a collation keyword; the default collator (either for Stata or for the language) provides sufficient control. However, some programmers may wish to specify a specific value. If you do not know the value of the collation keyword, you can obtain a list of valid collation values and their meanings in XML format at http://unicode.org/repos/cldr/trunk/common/bcp47/collation.xml.

If you are comparing or sorting Unicode strings that have come from different data sources, then you may need to normalize the strings before ordering them. See ustrnormalize() for details on normalization, and note the *norm* parameter in ustrcompareex() and ustrsortkeyex().

Also see

[D] **unicode** — Unicode utilities

[D] **unicode locale** — Unicode locale utilities

[U] **12.4.2 Handling Unicode strings**

[U] **12.4.2.5 Sorting strings containing Unicode characters**

unicode convertfile — Low-level file conversion between encodings

Description Syntax Options Remarks and examples Also see

Description

`unicode convertfile` converts text files from one encoding to another encoding. It is a low-level utility that will feel familiar to those of you who have used the Unix command `iconv` or the similar International Components for Unicode (ICU)-based command `uconv`. If you need to convert Stata datasets (`.dta`) or text files commonly used with Stata such as do-files, ado-files, help files, and CSV (`*.csv`) files, you should use the `unicode translate` command; see [D] **unicode translate**. If you wish to convert individual strings or string variables in your dataset, use the `ustrfrom()` and `ustrto()` functions.

Syntax

`unicode convertfile` *srcfilename destfilename* [, *options*]

srcfilename is a text file that is to be converted from a given encoding and *destfilename* is the destination text file that will use a different encoding.

options	Description
`srcencoding(`[*string*]`)`	encoding of the source file; UTF-8 if not specified
`dstencoding(`[*string*]`)`	encoding of the destination file; UTF-8 if not specified
`srccallback(`*method*`)`	what to do if source file contains invalid byte sequence(s)
`dstcallback(`*method*`)`	what to do if destination encoding does not support characters in the source file
`replace`	replace the destination file if it exists

method	Description
`stop`	specify that `unicode convertfile` stop with an error if an invalid character is encountered; the default
`skip`	specify that `unicode convertfile` skip invalid characters
`substitute`	specify that `unicode convertfile` substitute invalid characters with the destination encoding's substitute character during conversion; the substitute character for Unicode encodings is `\ufffd`
`escape`	specify that `unicode convertfile` replace any Unicode characters not supported in the destination encoding with an escaped string of the hex value of the Unicode code point. The string is in 4-hex-digit form `\uhhhh` for a code point less than or equal to `\uffff`. The string is in 8-hex-digit form `\Uhhhhhhhh` for code points greater than `\uffff`. `escape` may only be specified when converting from a Unicode encoding such as UTF-8.

Options

`srcencoding([` *string* `])` specifies the source file encoding. See `help encodings` for a list of common encodings and advice on choosing an encoding.

`dstencoding([` *string* `])` specifies the destination file encoding. See `help encodings` for a list of common encodings and advice on choosing an encoding.

`srccallback(`*method*`)` specifies the method for handling characters in the source file that cannot be converted.

`dstcallback(`*method*`)` specifies the method for handling characters that are not supported in the destination encoding.

`replace` permits `unicode convertfile` to overwrite an existing destination file.

Remarks and examples

Remarks are presented under the following headings:

Conversion between encodings
Invalid and unsupported characters
Examples

Conversion between encodings

`unicode convertfile` is a utility to convert strings from one encoding to another. Encoding is the method by which text is stored in a computer. It maps a character to a nonnegative integer, called a code point, and then maps that integer to a single byte or a sequence of bytes. Common encodings are ASCII, UTF-8, and UTF-16. Stata uses UTF-8 encoding for storing text. Unless otherwise noted, the terms “Unicode string” and “Unicode character” in Stata refer to a UTF-8 encoded Unicode string or character. For more information about encodings, see **[U] 12.4.2.3 Encodings**. See `help encodings` for a list of common encodings, and see [D] **unicode encoding** for a utility to find all available encodings.

If you are using `unicode convertfile` to convert a file to UTF-8 format, the string encoding using by Stata, you only need to specify the encoding of the source file. By default, UTF-8 is selected as the encoding for the destination file. You can also use `unicode convertfile` to convert files from UTF-8 encoding to another encoding. Although conversion to or from UTF-8 is the most common usage, you can use `unicode convertfile` to convert files between any pair of encodings.

Be aware that some characters may not be shared across encodings. The next section explains options for dealing with unsupported characters.

Invalid and unsupported characters

Unsupported characters generally occur in two ways: the bytes used to encode a character in the source encoding are not valid in the destination encoding such as UTF-8 (called an invalid sequence); or the character from the source encoding does not exist in the destination encoding.

It is common to encounter inconvertible characters when converting from a Unicode encoding such as UTF-8 to some other encoding. UTF-8 supports more than 100,000 characters. Depending on the characters in your file and the destination encoding you select, it is possible that not all characters will be supported. For example, ASCII only supports 128 characters, so all Unicode characters with code points greater than 127 are unsupported in ASCII encoding.

Examples

Convert file from Latin1 encoding to UTF-8 encoding

```
. unicode convertfile data.csv data_utf8.csv, srcencoding(ISO-8859-1)
```

Convert file from UTF-32 encoding to UTF-16 encoding, skipping any invalid sequences in the source file

```
. unicode convertfile utf32file.txt utf16file.txt, srcencoding(UTF-32)
> dstencoding(UTF-16) srccallback(skip)
```

Also see

[D] **unicode** — Unicode utilities

[D] **unicode translate** — Translate files to Unicode

[U] 12.4.2 Handling Unicode strings

[U] 12.4.2.6 Advice for users of Stata 13 and earlier

unicode encoding — Unicode encoding utilities

Description   Syntax   Remarks and examples   Also see

Description

`unicode encoding list` and `unicode encoding alias` list encodings that are available in Stata. See `help encodings` for advice on choosing an encoding and a list of the most common encodings. `unicode encoding list` provides a list of all encodings and their aliases or those that meet specified criteria. `unicode encoding alias` provides a list of alternative names that may be used to refer to a specific encoding.

`unicode encoding set` sets an encoding to be used with the `unicode translate` command; see [D] **unicode translate** for documentation for `unicode encoding set`.

Syntax

List encodings

`unicode encoding list` [*pattern*]

List all aliases of an encoding

`unicode encoding alias` *name*

Set an encoding for use with `unicode translate`

`unicode encoding set` *name*

pattern is one of the following: `*`, `_all`, `*`*name*`*`, `*`*name*, or *name*`*`. Specifying nothing, `_all`, or `*` lists all results. Specifying `*`*name*`*` lists all results containing *name*. Specifying `*`*name* lists all results ending with *name*. Specifying *name*`*` lists all results starting with *name*.

Remarks and examples

Encoding is the method by which text is stored in a computer. It maps a character to a nonnegative integer, called a code point, then maps that integer to a single byte or a sequence of bytes. Common encodings are ASCII (for which there are many variants), UTF-8, and UTF-16. Stata uses UTF-8 encoding for storing text and UTF-16 to encode the GUI on Microsoft Windows and macOS. For more information about encodings, see **[U] 12.4.2.3 Encodings**.

The most common reason you will need to specify an encoding is when converting a dataset, do-file, ado-file, or some other file used with Stata 13 or earlier (which was not Unicode aware) for use with modern Stata. See [D] **unicode translate** for help with this, and see `help encodings` for advice on choosing an encoding and a list of common encodings.

Some commands and functions require that you specify one or more encodings. Often you will need to use only common encodings. However, you may not know how to specify these to Stata. For example, suppose that we are using `unicode translate` to convert a do-file from Stata 13 that contains extended ASCII characters for use in modern Stata. If we are working on a Windows machine, the most likely encoding is Windows-1252. If we want to check that this is how it should be specified as we use `unicode translate`, we can type

```
. unicode encoding list Windows-1252
```

Stata returns all encodings for which the encoding name or an alias exactly matches `Windows-1252`. Capitalization does not matter.

If we wanted to search for all encodings and aliases that have `windows` anywhere in their name, we could type

```
. unicode encoding list *windows*
```

and see a long list of matches.

If we are told that a text file is encoded with `ibm-913_P100-2000` and we want to see by what other names that encoding is known (perhaps because we just do not want to type out such a long string when using Stata's functions that need an encoding), we can use

```
. unicode encoding alias ibm-913_P100-2000
```

and we find that there are many synonyms, including some that are much easier to type.

You may not know the exact encoding that you need and wish to browse the full list of available encodings. To do this, you can just type `unicode encoding list` without specifying a pattern.

Also see

`help encodings`

[D] **unicode** — Unicode utilities

[D] **unicode translate** — Translate files to Unicode

[U] 12.4.2 Handling Unicode strings

[U] 12.4.2.3 Encodings

Description Syntax Remarks and examples Also see

Description

`unicode locale list` lists all available locales or those locales that meet the specified criteria. Any of these locale codes may be specified in Stata or Mata functions that accept a locale as an argument, such as `ustrcompare()` and `ustrupper()`, or in the `set locale_functions` setting.

`unicode uipackage list` lists all localization packages that are available for the graphics user interface (GUI). Any of the listed locales may be specified in the `set locale_ui` setting to change the language of the text that is displayed in GUI elements such as the menus and dialog boxes.

Syntax

List locales

`unicode` <u>`loc`</u>`ale list` [*pattern*]

List user interface (UI) localization packages

`unicode` <u>`ui`</u>`package list`

pattern is one of `_all`, `*`, `*`*name*`*`, `*`*name*, or *name*`*`. If you specify nothing, `_all`, or `*`, then all results will be listed. `*`*name*`*` lists all results containing *name*; `*`*name* lists all results ending with *name*; and *name*`*` lists all results starting with *name*.

Remarks and examples

Remarks are presented under the following headings:

Overview
Default locale and locale fallback

Overview

A locale identifies a user community with a certain preference for how their language should be written; see **[U] 12.4.2.4 Locales in Unicode**. A locale can be as general as a certain language (for example, "en" for English) or can be more specific to a country or region (for example, "en_US" for US English or "en_HK" for Hong Kong English. Stata uses International Components for Unicode's (ICU's) locale format. See http://userguide.icu-project.org/locale for full information about ICU. Note that ICU differs from the POSIX locale identifiers used by Linux systems.

Locales use tags to define how specific they are to language variants. An ICU locale may contain up to five subtags in the following order: language, script, country, variant, and keywords. Typically, the language is required and the other tags are optional. In most cases, Stata uses only the language and country tags. For example, "en_US" specifies the language as English and the country as the USA.

Many language-specific operations require the locale to perform their task. This kind of operation is called locale-sensitive. For example, in English, the uppercase letter of the Latin small letter "i" is the Latin capital letter "I". However, in Turkish, the uppercase letter is "İ" with a dot above it (Unicode \u0130); hence, the case mapping is locale-sensitive.

The following functions are locale-sensitive: ustrupper(), ustrlower(), ustrtitle(), ustrword(), ustrwordcount(), ustrcompare(), ustrcompareex(), ustrsortkey(), and ustrsortkeyex().

Although Stata usually uses only the language and country tags, collation keywords may also be used in functions ustrcompare() and ustrsortkey() to affect ordering of Unicode strings. The collation keyword affects the string sort order of the locale. For example, "pinyin" and "stroke" for Chinese language produce different string sort orders. In most cases, it is not necessary to specify a collation keyword; the default collator (either for Stata or for the language) provides sufficient control. However, some programmers may wish to specify a specific value. If you do not know the value of the collation keyword, you can obtain a list of valid collation values and their meanings in XML format at http://unicode.org/repos/cldr/trunk/common/bcp47/collation.xml.

Default locale and locale fallback

Because a locale is simply an identifier to locate the resources for specific services, there is no validation of the locale. For example, specifying "klingon" is as valid as specifying "en" when calling ustrcompare() or the other functions discussed here. If the collation data for the "klingon" locale is found, then the locale is populated; otherwise, a fallback search process starts.

The fallback process proceeds as follows:

1 . The variant is removed if there is one.

2 . The country is removed if there is one.

3 . The script is removed if there is one.

4 . Steps 1–3 are repeated on the default locale.

5 . If a locale cannot be found after following the previous steps, the ICU "Root", or built-in fallback, locale is used.

The process stops at any point if the desired information is found. The ICU default locale is usually the system locale on the machine, which you can change. Note that on macOS, the ICU default locale is usually "en_US_posix", which does not change even if you change the system locale from the operating system's "Language" setting. To see the ICU default locale, you can type

```
. display c(locale_icudflt)
```

You can also find it under the Unicode settings in the output of creturn list along with two other locale-related settings: locale_ui and locale_functions. See [P] **set locale_ui** and [P] **set locale_functions** for details.

set locale_functions affects the functions ustrupper(), ustrlower(), ustrtitle(), ustrword(), ustrwordcount(), ustrcompare(), ustrcompareex(), ustrsortkey(), and ustrsortkeyex() when no locale is specified. If locale_functions is not set, the default ICU locale c(locale_icudflt) is used.

For example, if your operating system is Microsoft Windows English version, the system locale is most likely "en". It is "en_US" if you chose the country to be USA during installation of the operating system. If locale_functions is not set or is set to default, then ustrupper("istanbul") is equivalent to ustrupper("istanbul", "en_US"), which returns ISTANBUL.

However, if locale_functions is set to tr for Turkish, then ustrupper("istanbul") is equivalent to ustrupper("istanbul", "tr"), which returns ISTANBUL with a dot over the capital I. Although ICU does not validate locales, Stata validates that the language subtag of the locale_functions setting is a valid ISO-639-2 language code. (See the ISO-639-2 list at http://www.loc.gov/standards/iso639-2/.) Hence, set locale_functions klingon will produce an error.

With the fallback rules, the effective locale can be very different from the locale you specified, depending on the operation being performed. Currently, ustrword() and ustrwordcount(), which use ICU's word break iterator service, and ustrcompare(), ustrcompareex(), ustrsortkey(), and ustrsortkeyex(), which use ICU's collation service, are affected by this. You may use the functions wordbreaklocale() and collatorlocale() to find the effective locale from the requested locale.

Also see

[D] **unicode** — Unicode utilities

[P] **set locale_functions** — Specify default locale for functions

[P] **set locale_ui** — Specify a localization package for the user interface

[U] 12.4.2 Handling Unicode strings

[U] 12.4.2.4 Locales in Unicode

unicode translate — Translate files to Unicode

Description   Syntax   Options   Remarks and examples   Also see

Description

`unicode translate` translates files containing extended ASCII to Unicode (UTF-8).

Extended ASCII is how people got accented Latin characters such as "á" and "à" and got characters from other languages such as "Я", "Θ", and "わたし" before the advent of Unicode or, in this context, before Stata became Unicode aware.

> If you have do-files, ado-files, `.dta` files, etc., from Stata 13 or earlier—and those files contain extended ASCII—you need to use the `unicode translate` command to translate the files from extended ASCII to Unicode.

The `unicode translate` command is also useful if you have text files containing extended ASCII that you wish to read into Stata.

Syntax

Analyze files to be translated

`unicode analyze` *filespec* [`,` `redo` `nodata`]

Set encoding to be used during translation

`unicode encoding set` [`"`]*encoding*[`"`]

Translate or retranslate files

`unicode translate` *filespec* [`,` `invalid`[`(escape` | `mark` | `ignore)`]
`transutf8` `nodata`]

`unicode retranslate` *filespec* [`,` `invalid`[`(escape` | `mark` | `ignore)`]
`transutf8` `replace` `nodata`]

Restore backups of translated files

`unicode restore` *filespec* [`,` `replace`]

Delete backups of translated files

`unicode erasebackups, badidea`

filespec is a single filename or a file specification containing `*` and `?` specifying one or more files, such as

```
*.dta
*.do
*.*
*
myfile.*
year??data.dta
```

`unicode` analyzes and translates `.dta` files and text files. It assumes that filenames with suffix `.dta` contain Stata datasets and that all other suffixes contain text. Those other suffixes are `.ado`, `.do`, `.mata`, `.txt`, `.csv`, `.sthlp`, `.class`, `.dlg`, `.idlg`, `.ihlp`, `.smcl`, and `.stbcal`.

Files with suffixes other than those listed are ignored. Thus "`*.*`" would ignore any `.docx` files or files with other suffixes. If such files contain text, they can be analyzed and translated by specifying the suffix explicitly, such as `info.README` and `*.README`.

Options

`redo` is allowed with `unicode analyze`. `unicode analyze` remembers results from one run to the next so that it does not repeat results for files that have been previously analyzed and determined not to need translation. Thus `unicode analyze`'s output focuses on the files that remain to be translated. `redo` specifies that `unicode analyze` show the analysis for all files specified.

`nodata` is used with `unicode analyze`, `translate`, and `retranslate`. It specifies that the contents of the `str`*#* and `strL` variables in `.dta` files are not to be translated. The contents of the variables are to be left as is. The default behavior is to translate if necessary.

If option `nodata` is specified, only the metadata—variable names, dataset label, variable labels, value labels, and characteristics—are analyzed and perhaps translated.

This option is provided for two reasons.

`nodata` is included for those who do not trust automated software to modify the most vital part of their datasets, the data themselves. We emphasize to those users that `unicode` backs up files, and so translated files are easily restored to their original status.

The other reason `nodata` is included is for those datasets that include string variables in which some variables (observations) use one encoding and other variables (observations) use another. Such datasets are rare and called mixed-encoding datasets. One could arise if dataset `result.dta` was the result of merging `input1.dta` and `input2.dta`, and `input1.dta` encoded its string variables using ISO-8859-1, whereas `input2.dta` used JIS-X-0208. Such datasets are rare because if this had occurred, you would have noticed when you produced `result.dta`. The two extended ASCII encodings are simply not compatible, and one group or another of characters would have displayed incorrectly.

`invalid` and `invalid()` are allowed with `unicode translate` and `retranslate`. They specify how invalid characters are to be handled. Invalid characters are not supposed to arise, and when they do, it is a sign that you have set the wrong extended ASCII encoding. So let's assume that you have indeed set the right encoding and that still one or a few invalid characters do arise. The stories on how this might happen are long and technical, and all of them involve you playing sophisticated font games, or they involve you using a proprietary extended ASCII encoding that is no longer available, and so you are using an encoding that is close to the actual encoding used.

By default, `unicode` will not translate files containing invalid characters. `unicode` instead warns you so that you can specify the correct extended ASCII encoding.

`invalid` specifies the invalid characters are to be shown with an escape sequence. If a string contained "A@B", where @ indicates an invalid character, after translation, the string might contain "A%XCDB", which is say, %XCD was substituted for @. In general, invalid characters are replaced with `%X`##, where ## is the invalid character's hex value. The substitution is admittedly ugly, but it ensures that distinct strings remain distinct, which is important if the string is used as an identifier when you use the data.

`invalid(escape)` is a synonym for `invalid`.

`invalid(mark)` specifies that the official Unicode replacement character be substituted for invalid characters. That official character is `\ufffd` in Unicode speak and how it looks varies across operating systems. On Windows, the Unicode replacement character looks like a square; on Mac and Unix, it looks like a question mark in a hexagon.

`invalid(ignore)` indicates that the invalid character simply be removed. "A@B" becomes "AB".

`transutf8` is allowed with `unicode translate` and `retranslate`. `transutf8` specifies that characters that look as if they are UTF-8 already should nonetheless be translated according to the extended ASCII encoding. Do not specify this option unless `unicode` suggests it when you translate the file without the option, and even then, specify the option only after you have examined the translated file and determined that you agree.

For most of us, this issue arises when two extended ASCII characters appear next to each other, such as a German word containing "üß", or a French word containing "àö". Even when extended ASCII characters are adjacent, that is not necessarily sufficient to mimic valid UTF-8 characters, but some combinations do mimic UTF-8.

Adjacent UTF-8 characters that mimic UTF-8 characters are actually likely when you are using a CJK extended ASCII encoding. CJK stands for Chinese, Japanese, and Korean.

In any case, if `unicode analyze` reports when valid UTF-8 strings appear and if the file needs translating because it is not all ASCII plus UTF-8, you may need to specify `transutf8` when you translate the file. If you are unsure, proceed by translating the file without specifying `transutf8`, inspect the result, and retranslate if necessary.

`replace` has nothing to do with translation and is allowed with `unicode retranslate` and `restore`. It has to do with the restoration of original, untranslated files from the backups that `unicode translate` and `retranslate` make. Option `replace` should not be specified unless `unicode` suggests it.

`unicode` keeps backups of your originals. When you restore the originals or retranslate files (which involves restoring the originals), `unicode` checks that the previously translated file is unchanged from when `unicode` last translated it. It does this because if you modified the translated file since translation, those changes might be important to you and because if `unicode` restored the original from the backup, you would lose those changes. `replace` specifies that it is okay to change the previously translated file even though it has changed.

`badidea` is used with `unicode erasebackups` and is not optional. Erasing the backups of original files is usually a bad idea. We recommend you keep them for six months or so. Eventually, however, you will want to delete the backups. You are required to specify option `badidea` to show that you realize that erasing the backups is a bad idea if done too soon.

Remarks and examples

Remarks are presented under the following headings:

What is this about?

Stata 14 and later use UTF-8, a form of Unicode, to encode strings. Stata 13 and earlier used ASCII. Datasets, do-files, ado-files, help files, and the like may need translation to display properly in Stata 14 and later.

Files containing strings using only plain ASCII do not need translation. Plain ASCII provides the following characters:

Latin letters:	A–Z, a–z
Digits:	0–9
Symbols:	! " # $ % & ' ( ) * + , − . /
	: ; < = > ? @ [\ ] ^ _ `
	{ | } ~

If the variable names, variable labels, value labels, and string variables in your `.dta` files and the lines in your do-files, ado-files, and other Stata text files contain only the characters above, there is nothing you need to do.

On the other hand, if your `.dta` files, do-files, ado-files, etc., contain accented characters such as

á è ô ü ý ...

or symbols such as

£ ¥ ...

or characters from other alphabets,

знать

こんにちは

then the files do need translating so that the characters display correctly.

`unicode analyze` will tell you whether you have such files, and `unicode translate` will translate them.

You first use unicode analyze. It may turn out that no files need translating, and in that case, you are done.

If you do have files that need translating, you will use unicode translate. unicode translate makes a backup of your file before translating it.

If you do have files that need translating, unicode translate will translate them. Before you can use unicode translate, you must set the extended ASCII encoding that your files used. You do this with unicode encoding set. Encodings go by names such as ISO-8859-1, Windows-1252, Big5, ISO-2022-KR, and about a thousand other names. However, there are only 231 encodings. Most of the names are aliases (synonyms). ISO-8859-1, for instance, is also known as ISO-Latin1, Latin1, and other names.

See help encodings for more information on encodings. Some of you will find the appropriate encoding name immediately. Others will be able only to narrow down the alternatives. Even so, all is not lost. unicode translate makes it easy to translate and retranslate a file over and over again until you find the encoding that works best. Once you find that encoding, it is likely that all of your files are using the same encoding.

Do I need to translate my files?

Can I ignore the issue?

If you are asking whether you can close your eyes and ignore the issue, the answer is maybe and maybe not.

If you have files using extended ASCII, they will not display correctly in modern Stata. We view that as a significant problem, but let's assume that does not concern you. If you used extended ASCII for variable names, you may find it difficult or impossible to type the untranslated name. That would be a problem. Other than that, you are probably okay, or more accurately, we cannot think of a problem even though we have tried. We have tried because if we could think of a problem, we would have fixed it. Stata's data management routines have been modified and certified to work with UTF-8. If they receive extended ASCII, they can mightily mess up what is displayed, but beyond that, they should produce results equivalent to what previous Statas produced.

Our advice is, for safety's sake, do not ignore the problem.

However, you do not need to analyze and translate all of your files today. One day, you will use a dataset and results will look odd when you describe or list the data. You will see unprintable characters and probably mutter a few unprintable words yourself, but having discovered the problem, you can then turn to solving it using unicode analyze and unicode translate.

However, we recommend that you learn to use unicode translate today. Take some files you are working with, determine whether you have a problem, and fix them if you do.

Do my files need translation?

If you are asking whether you have files that contain extended ASCII in hopes that you do not, here is our answer:

If you live and work in an English-speaking country, you probably do not have files containing extended ASCII.

If you live and work outside an English-speaking country but you have limited yourself to the unadorned Latin alphabet, you probably do not have files containing extended ASCII.

Otherwise, you probably do have files containing extended ASCII.

How will I know what to do?

unicode analyze will tell you whether you have files containing extended ASCII. unicode analyze can look at single files, or it can look at all the files in a directory. And if you do have files containing extended ASCII, unicode translate will fix the files.

Overview of the process

You will analyze your files and, if necessary, translate them. You can do this one file at a time by typing

```
. unicode analyze myfile.dta
. unicode encoding set encoding
. unicode translate myfile.dta
```

or you can do this with all of your files at once by typing

```
. unicode analyze *
. unicode encoding set encoding
. unicode translate *
```

Shockingly, we are going to advise you that analyzing and even translating all of your files at once is perfectly safe! That is because

1. unicode analyze by default ignores files that are not Stata related.
2. unicode analyze reads your files and reports on them; it does not change them.
3. unicode analyze might report that no files need translating. In that case, you are done.
4. if you do have files that need translating, before you can use unicode translate, you must set the extended ASCII encoding. How you determine the encoding is the topic of the next section.
5. unicode translate, just like unicode analyze, ignores by default files that are not Stata related. Typing unicode translate * is safe.
6. unicode translate does not modify files that do not need translation. This does not hinge on your having run unicode analyze. Typing unicode translate * is safe.
7. unicode translate does not modify files in which the translation goes poorly; it discards the translation. Typing unicode translate * is safe.
8. unicode translate makes backups of the original of any file it does translate successfully. At any time, you can type

   ```
   . unicode restore *
   ```

   and the files in your directory are back to being just as they were when you started. Typing unicode translate * is safe.

In the rest of this manual entry, we could discuss what might happen when you run unicode analyze and unicode translate and offer advice on what you might do about it.

unicode analyze and unicode translate, however, produce a ream of output, especially if you run them on a group of files. That output is tailored to your files and your situation. That output states what did happen and offers advice. Read it.

How to determine the extended ASCII encoding

We are getting ahead of ourselves because we have not yet determined that any of your files do need translating. Whether translation is necessary can be determined without knowing the extended ASCII encoding.

Determining the encoding can be more difficult than you would wish. Back in the day when the experts were still trying to make the extended ASCII solution work, the cleverest among them went to a lot of effort to hide the encoding from you, and they did a good job.

When the time comes to type

```
. unicode encoding set encoding
```

see `help encodings`. We have advice. In the meantime, allow us to predict how this process will transpire:

Some of you will not be able to determine the encoding your files are using, but you will be able to make guesses and narrow the choices down to a few of them. Then you will experiment to see which works best. We say "see" because that is literally how you are going to do it. You will guess, you will translate, and you will look at the result. And then you will repeat the process with a different encoding. The `unicode` command will make the translation and retranslation part easy.

Many of you will discover the single encoding that works for all of your files. Some of you will discover that one encoding works for most of your files but that there are one or two other encodings that you have to use with other files.

And then there is the issue of mixed UTF-8 and extended ASCII. This will affect only a few of you.

1. `unicode translate` will warn you when a file is a mix of UTF-8 and extended ASCII. It warns you because 1) the file could be exactly what it appears to be, a mix of encodings, or 2) the file is all extended ASCII and a few extended ASCII strings are merely masquerading as UTF-8.

2. By default, `unicode translate` assumes that the file really is a mix. It does not translate the UTF-8 strings; it translates just the strings that are extended ASCII.

   Technical note: Here is how this works. A variable label appearing to be UTF-8 already is not translated, whereas another variable label containing extended ASCII is translated even if a part of it appears to be UTF-8. `unicode translate` assumes that each variable label follows a single encoding. This same logic applies to `str#` and `strL` variables in the data. The variable is assumed to use the same encoding in all observations.

3. The default assumption may be incorrect; the file could be entirely extended ASCII. The default assumption is more likely to be incorrect in the CJK case. You can determine whether the default assumption is correct by looking at the file after translation. If some parts of it look like memory junk, then use `unicode retranslate, transutf8` to retranslate the file, and if you do not like that result, use `unicode retranslate` without `transutf8` to return to the previous result. Or you could use `unicode restore` to return to the original file and start all over again, perhaps with a different encoding.

   Technical note: There is no difference between using `unicode restore` followed by `unicode translate` and using `unicode retranslate`. So if you want to try a different encoding, you can restore, set the new encoding, and translate, or you can set the new encoding and retranslate.

Use of unicode analyze

If the files you want to examine are not in the current directory, change to the appropriate directory:

```
. cd wherever
```

`unicode analyze` and all the rest of the `unicode` commands described in this entry look at files in the current directory and only files in the current directory. `unicode` does not even look in subdirectories of the current directory.

Analyze the file.

```
. unicode analyze myfile.dta
```

`unicode analyze` will report whether the file needs translation and provide other information, too. The output looks something like this:

```
. unicode analyze myfile.dta
File summary (before starting):
      1   file(s) specified
      1   file(s) to be examined ...
File myfile.dta (Stata dataset)
             ________________________________________
             File does not need translation
File summary:
    all files okay
```

Or it might look like this:

```
. unicode analyze myfile.dta
File summary (before starting):
      1   file(s) specified
      1   file(s) to be examined ...
File myfile.dta (Stata dataset)
      3 variable names need translation
      2 variable labels need translation
      1 str# variable needs translation
             ________________________________________
             File needs translation.
             Use unicode translate on this file
File summary:
    1 file needs translation
```

If you were to now rerun the analysis in the case where the file does not need translation, you would see something like this:

```
. unicode analyze myfile.dta
File summary (before starting):
      1   file(s) specified
      1   file(s) already known to be ASCII in previous runs
      0   file(s) to be examined ...
(nothing to do)
```

If you want to see the detailed output, type `unicode analyze myfile.dta, redo`.

The primary purpose of `unicode analyze` is to get the files that do not need translating out of the way. `unicode analyze` does not change your files; it just dismisses the ones that need no further work.

You can run `unicode analyze` on multiple files, and we recommend that you do that.

```
. unicode analyze *
     30   file(s) specified
      6   file(s) not Stata
      1   file(s) already known to be ASCII in previous runs
      1   file(s) already known to be UTF-8 in previous runs
     22   files(s) to be examined
```

There is more to the output, but before we look at that, note that `unicode analyze` reported that 6 files were not Stata. `unicode analyze` and `unicode translate` ignore non-Stata files unless you explicitly specify them, say, by typing `unicode analyze README` or `unicode analyze *.README`.

Let's now return to the remaining output from `unicode analyze *`:

File *filename* (*filetype*)
        notes about elements that need translating
        ————————————————————————

        recommendations

File *filename* (*filetype*)
        notes about elements that need translating
        ————————————————————————

        recommendations

.
.

File *filename* (*filetype*)
        notes about elements that need translating
        ————————————————————————

        recommendations

Files matching * that need translation:
        list of files

```
File summary:
        2   file(s) skipped (known okay from previous runs)
        8   file(s) need translation
```

`unicode analyze` produced a lot of output. If you are like us, you will want a log of the output and perhaps want to look at it in the Viewer. It is not too late, just remember to specify the `redo` option:

```
. log using output
. unicode analyze *, redo
```
(*output omitted*)
```
. log close
. view output.smcl
```

If you are really like us, you will instead want a file you can edit in Stata's Do-file Editor:

```
. log using output.log
. unicode analyze *, redo
```
(*output omitted*)
```
. log close
. doedit output.log
```

Now, you can edit the output to make a to-do list for yourself. We go through the output and delete the parts with which we agree, such as the following:

```
File myfile.do (text file)
        40 line(s) in file
  ------------------------------------------------------------
  File does not need translation.
```

Buried in the output, however, may be something like this:

```
File german.dta (Stata dataset)
  ─────────────────────────────────────────────────
  File does not need translation, except ...
  The file appears to be UTF-8 already.  Sometimes, files that need
  translating can look like UTF-8.  Look at these examples:
      variable name "länge"
      variable label "Kofferraumvolumen (Kubikfuß)"
      value-label contents "Ausländisch"
      contents of str# variable marke
  Do they look okay to you?
  If not, the file needs translating or retranslating with the
  transutf8 option.  Type
      . unicode   translate "bill_utf8.dta", transutf8
      . unicode retranslate "bill_utf8.dta", transutf8
```

This file, too, is marked as not needing translation, and we agree based on the evidence presented, but we might not have agreed. Assume that the file was named `japan.dta` and that the examples did not look like Japanese but looked like memory junk. We would want to add this file to our list to translate and remind ourselves to specify option `transutf8` when translating.

It is unlikely that any file that `unicode analyze` reports as purely UTF-8 needs translating unless the file is short, and then you must look at it to determine whether the file really is UTF-8.

Here is a different example. The file, according to `unicode analyze`, needs translation, but it also includes UTF-8:

```
File filter.do (text file)
        40 line(s) in file
        33 line(s) ASCII
         1 line(s) UTF-8
         6 line(s) need translation
   ────────────────────────────────────────────────────────────
   File needs translation.  Use unicode translate on this file.
     There are three possibilities.
     1) The file is exactly what it appears to be, a mix of extended
     ASCII and UTF-8.  Use unicode translate.
     2) The UTF-8 lines are extended ASCII masquerading as UTF-8.
     Use unicode translate, transutf8.
     3) The file is UTF-8 with some invalid characters.  Set the
     encoding to utf8 and then use unicode translate, invalid().
```

`unicode analyze` thinks this file needs translation and speculates about how it should be translated. Read the output. Possibility 3) did not even occur to us. Even so, and even without looking at the file, we would favor possibility 2) because there is only one UTF-8 line and there are 6 lines known to need translation.

You will learn that running `unicode analyze` is optional. The advantage of running `unicode analyze` is that it offers advice.

You can analyze files repeatedly. If you type `unicode analyze` without the `redo` option, the output reappears, but files are skipped that `unicode analyze` previously determined as not needing translation. Specify `redo` and you will see all the files.

`unicode analyze` remembers results from previous runs. Five years from now, `unicode analyze` will remember the files it has examined and determined do not need translation, and it will even know whether the file has changed in the intervening five years and so needs reexamination.

unicode analyze remembers from one run to the next by creating a directory named bak.stunicode, where it can put its notes. Ignore the directory and its subdirectories. When we tell you about unicode translate, you will learn that bak.stunicode is also where backups of unmodified original files are stored. Now that you know that, you might be tempted to restore originals from the backups by copying the files. Do not do that because you will confuse unicode. Use unicode restore to restore originals. We will get to that.

The purpose of unicode analyze is to dismiss all the files that do not have problems so you can focus on those that do. When you later use unicode translate, it will also skip over files that do not need translating. Using unicode analyze is optional, and even if you do not use it, unicode translate will never translate a file that does not need it; unicode translate runs unicode analyze in secret if it needs to.

Use of unicode translate: Overview

Let's assume that we have used unicode analyze and learned that the following files need translating:

```
myfile.dta
anotherfile.do
```

Before we can translate the files, we must set the extended ASCII encoding. See help encodings when you are translating your files.

Let's just assume right now that we know the encoding for the files is ISO-8859-1, and then we will assume that we were wrong and show you how we get out of that situation.

Step 1. Inform unicode of the encoding by typing

```
. unicode encoding set ISO-8859-1
```

Step 2. Translate the files, one at a time by typing

```
. unicode translate myfile.dta
. unicode translate anotherfile.do
```

or both in one command by typing

```
. unicode translate *
```

Specifying * or *.* or *.dta or m*.* or any other file specification is perfectly safe. unicode translate ignores irrelevant files just as unicode analyze does. unicode translate also ignores files that do not need translating, and it ignores files that have already been translated. unicode translate does not depend on your having run unicode analyze previously.

unicode translate has another great feature: it makes backups of the files it modifies. If, after translation, you decide you do not like the translation, you can restore the original by typing

```
. unicode restore myfile.dta
```

You can even type

```
. unicode restore *
```

if you want all of your files restored.

You do not have to restore the original just to retranslate it. Use `unicode retranslate` instead:

```
. unicode retranslate myfile.dta
. unicode retranslate *
```

The only reason to run `unicode retranslate`, however, is if you want to specify different options or try a different encoding:

```
. unicode encoding set some_other_encoding
. unicode retranslate *
```

And if you do not like that result, you can still `unicode restore`.

Use of unicode translate: A word on backups

`unicode translate` and `retranslate` automatically make backups when they modify a file and a backup does not already exist. `unicode` calculates and keeps track of checksums calculated on the original and translated files, so it knows whether the files are subsequently changed. `unicode` is thoroughly tested. What could possibly go wrong?

If you are like us, you trust nobody with regard to your files. We do not even trust ourselves. Trust us on this. Make your own back up in whatever way you know before using `unicode translate`. Backup the entire directory. We would make a zip file of it, but if nothing else, just copy all the files to a new, out-of-the-way directory. We predict you will not need the copies, but one never knows for sure.

Even if `unicode` is perfect, the subsequent validity of the backups depends on the bak.stunicode subdirectory not being corrupted by another process or even by you. More than once, we have ourselves damaged files in haste.

After you have translated your files, keep the backups for a while. Eventually, however, there will come a day when the backups are no longer needed. The command to delete the backups of your originals is

```
. unicode erasebackups, badidea
```

You must specify option `badidea`. Think of `badidea` as an abbreviation for `badideaifdonetoosoon`: what you are doing in specifying the option is stating that it is not too soon.

Use of unicode translate: Output

`unicode translate`'s output looks just like `unicode analyze`'s output except that the content varies:

```
. unicode translate *
       30   file(s) specified
        6   file(s) not Stata
        6   file(s) already known to be ASCII in previous runs
        4   file(s) already known to be UTF-8 in previous runs
       14   files(s) to be examined

  File filename  (filetype)
         notes about the translation
         ________________________________________
         result message
```

```
File badfile.ado (textfile)
      40 lines in file
      16 lines ASCII
       2 lines translated
      22 lines w/ invalid chars not translated
      ----------------------------------------
      File not translated because it contains untranslatable
      characters;
             you need to specify a different encoding or, if you
             are sure that you have the correct encoding, use
             unicode translate with the invalid() option
.
.
File filename (filetype)
      notes about the translation
      notes about elements that need translating
      ----------------------------------------
      result message
Files matching * that still need translation:
      badfile.ado
File summary:
     10   file(s) skipped (known okay from previous runs)
     13   file(s) successfully translated
      1   files(s) not translated because they contain
          untranslatable characters
             you need to specify a different encoding or, if you
             are sure that you have the correct encoding, use
             unicode translate with the invalid() option
```

One file still needs translation according to the output. How can files still need translation? The output explains. We had untranslatable characters. The output even says what to do about it. We should specify a different encoding—the fact that we had untranslatable characters is evidence that we are using the wrong encoding—or we should accept that there are invalid characters in our file and tell `unicode translate` how to handle them. It will help us make the decision if we scan up from the file-summary message to find the detailed output for badfile.ado:

```
File badfile.ado (textfile)
      40 lines in file
      16 lines ASCII
       2 lines translated
      22 lines w/ invalid chars not translated
      ----------------------------------------
      File not translated because it contains untranslatable
      characters;
          you need to specify a different encoding or, if you
          are sure that you have the correct encoding, use
          unicode translate with the invalid() option
```

You can read about the `invalid()` option under *Options*, but this looks like a case where the file needs a different encoding; 2 lines translated with the current encoding, and 22 did not. If we had instead seen that 22 lines translated and that 2 lines had invalid characters, we would be less sure about needing a different encoding. Assume the output had been

```
File badfile.ado (textfile)
      40 lines in file
      38 lines ASCII
       2 lines w/ invalid chars not translated
      ----------------------------------------
```

```
        File not translated because it contains untranslatable
        characters;
            you need to specify a different encoding or, if you
            are sure that you have the correct encoding, use
            unicode translate with the invalid() option
```

That an ado-file is mostly ASCII does not surprise us. The fact that no lines could be translated (given the encoding) speaks volumes. We need a different encoding.

Most of our files were translated. For successful translations, the detailed output for .dta files will be something like the following:

```
File trees.dta (Stata dataset)
          9 variable names okay, ASCII
          3 variable names translated
        all data labels okay, ASCII
          8 variable labels okay, ASCII
          4 variable labels translated
        all value-label names okay, ASCII
        all value-label contents translated
        all characteristic names okay, ASCII
        all characteristic contents okay, ASCII
        all str# variables okay, ASCII
        --------------------------------------------------
        File successfully translated
```

The detailed output for text files might look like the following:

```
File runjob.do (textfile)
    120 lines in file
    101 lines ASCII
     19 lines translated
     --------------------------------------------------
     File successfully translated
```

Here is an example of a file that translated successfully but produced a lot of output:

```
File northwest.dta (Stata dataset)
    all variable names okay, ASCII
    all data labels okay, ASCII
    all variable labels okay, ASCII
    all value-label names okay, ASCII
    all value-label contents okay, ASCII
    all characteristic names okay, ASCII
    all characteristic contents okay, ASCII
      1 strL variable okay, ASCII
      1 strL variable(s) have binary values
           This concerns strL variable diagnotes.
           StrL variables that contain binary values in even one
           observation are not translated by unicode.  Translating
           binary values is inappropriate.  Rarely, however,
           "binary" values are just text or the variable contains
           binary values in some observations and nonbinary values
           in others.  You translate such variables using generate
           or replace; see translating binary strLs.
      1 strL variable translated
      2 str# variables okay, ASCII
      1 str# variable translated
     --------------------------------------------------
     File successfully translated
```

The extra output concerns a strL variable that was not translated. The output states that the variable is binary and that translating binary strLs is inappropriate, but maybe not. This is the topic of the next section.

Translating binary strLs

`unicode translate` does not translate binary strLs. That is probably the right decision. StrLs are sometimes used in Stata to record documents, images, and other binary files, and modifying binary files is never a good idea.

Stata marks strL variables as binary on an observation-by-observation basis. As far as `unicode translate` is concerned, however, if there is just one observation in which the strL is marked as binary, it treats all observations as binary and does not translate them. The thinking is that variables hold different realizations of the same underlying type of thing, and if the strL is binary in one observation, it is probably truly binary in all observations.

Perhaps you know differently in your specific application and wish to translate the variable's nonbinary observations or all of its observations. Here is how you do that.

You use string function `ustrfrom()` to obtain a translated string. Assuming the existing strL variable is named `myvar`, you type

```
. generate strL newvar = ustrfrom(myvar, "encoding", #)
```

Specify encoding just as you would with `unicode encoding set` *encoding*. *encoding* might be ISO-8859-1, Windows-1252, Big5, ISO-2022-KR, or any other extended ASCII encoding. Whatever string you specify for *encoding*, make sure it is valid and spelled correctly. Testing the string with `unicode encoding set` is one way to do that.

is specified as 1, 2, 3, or 4 and determines how invalid characters are to be handled. Three of the four values correspond to `unicode`'s `invalid()` option:

1	is equivalent to	`invalid(mark)`
2	is equivalent to	`invalid(ignore)`
4	is equivalent to	`invalid(escape)`

The remaining code, 3, specifies that the function return “ ” if invalid characters are encountered.

So one way of translating all the values of `myvar` would be

```
. generate strL try = ustrfrom(myvar, "ISO-8859-1", 1)
. browse newvar          // review result
. replace newvar = try
. drop try
```

If you want to translate only the nonbinary values of `myvar`, you could type

```
. gen strL try = ustrfrom(myvar, "ISO-8859-1", 1) if !_strisbinary(myvar)
. replace try = myvar if _strisbinary(myvar)
```

That would use Stata's definition of binary, which is difficult to explain. Another good definition of binary is that the string not contain binary 0:

```
. gen strL try = ustrfrom(myvar, "ISO-8859-1", 1) if !strpos(myvar, char(0))
. replace try = myvar if strpos(myvar, char(0))
```

Also see

[D] **unicode** — Unicode utilities

[U] 12.4.2 Handling Unicode strings

[U] 12.4.2.6 Advice for users of Stata 13 and earlier

use — Load Stata dataset

Description Quick start Menu Syntax Options Remarks and examples
Also see

Description

`use` loads into memory a Stata-format dataset previously saved by `save`. If *filename* is specified without an extension, `.dta` is assumed. If your *filename* contains embedded spaces, remember to enclose it in double quotes.

In the second syntax for `use`, a subset of the data may be read.

Quick start

Load Stata-format dataset `mydata.dta` into memory from current directory

    use mydata

Same as above, but load data from the `mysubdir` subdirectory in current directory and clear current data from memory first

    use mysubdir/mydata, clear

Load only variables `v1`, `v2`, and `v3` from `mydata.dta`

    use v1 v2 v3 using mydata

Same as above, and further restrict to the first 100 observations

    use v1 v2 v3 in 1/100 using mydata

Load observations from `mydata.dta` where `catvar` = 2

    use if catvar==2 using mydata

Menu

File > Open...

Syntax

Load Stata-format dataset

use *filename* [, clear nolabel]

Load subset of Stata-format dataset

use [*varlist*] [*if*] [*in*] using *filename* [, clear nolabel]

Options

`clear` specifies that it is okay to replace the data in memory, even though the current data have not been saved to disk.

`nolabel` prevents value labels in the saved data from being loaded. It is unlikely that you will ever want to specify this option.

Remarks and examples

▷ Example 1

We have no data in memory. In a previous session, we issued the command `save hiway` to save the Minnesota Highway Data that we had been analyzing. We retrieve it now:

```
. use hiway
(Minnesota Highway Data, 1973)
```

Stata loads the data into memory and shows us that the dataset is labeled "Minnesota Highway Data, 1973".

◁

▷ Example 2

We continue to work with our `hiway` data and find an error in our data that needs correcting:

```
. replace spdlimit=70 in 1
(1 real change made)
```

We remember that we need to forward some information from another dataset to a colleague. We `use` that other dataset:

```
. use accident
no; dataset in memory has changed since last saved
r(4);
```

Stata refuses to load the data because we have not saved the `hiway` data since we changed it.

```
. save hiway, replace
file hiway.dta saved

. use accident
(Minnesota accident data)
```

After we save our hiway data, Stata lets us load our accident dataset. If we had not cared whether our changed hiway dataset were saved, we could have typed use accident, clear to tell Stata to load the accident data without saving the changed dataset in memory.

◁

❏ Technical note

In example 2, you saved a revised hiway.dta dataset, which you forward to your colleague. Your colleague issues the command

```
. use hiway
```

and gets the message

```
file hiway.dta not Stata format
r(610);
```

Your colleague is using a version of Stata older than Stata 14. If your colleague is using Stata 11, 12, or 13, you can save the dataset in Stata 11, 12, or 13 format by using the saveold command; see [D] **save**.

Newer versions of Stata can always read datasets created by older versions of Stata. Stata/MP and Stata/SE can read datasets created by Stata/BE. Stata/BE can read datasets created by Stata/MP and Stata/SE if those datasets conform to Stata/BE's limits; see [R] **Limits**.

❏

▷ Example 3

If you are using a dataset that is too large for the amount of memory on your computer, you could load only some of the variables:

```
. use ln_wage grade age tenure race using
> https://www.stata-press.com/data/r19/nlswork
(National Longitudinal Survey of Young Women, 14-24 years old in 1968)

. describe

Contains data from https://www.stata-press.com/data/r19/nlswork.dta
 Observations:        28,534                  National Longitudinal Survey of
                                                Young Women, 14-24 years old in
                                                1968
    Variables:             5                  27 Nov 2024 08:14
                                              (_dta has notes)
-------------------------------------------------------------------------------
Variable      Storage   Display    Value
    name         type    format    label      Variable label
-------------------------------------------------------------------------------
age             byte    %8.0g                 Age in current year
race            byte    %8.0g      racelbl    Race
grade           byte    %8.0g                 Current grade completed
tenure          float   %9.0g                 Job tenure, in years
ln_wage         float   %9.0g                 ln(wage/GNP deflator)
-------------------------------------------------------------------------------
Sorted by:
```

Stata successfully loaded the five variables.

◁

▷ Example 4

You are new to Stata and want to try working with a Stata dataset that was used in example 1 of [XT] **xtlogit**. You load the dataset:

```
. use https://www.stata-press.com/data/r19/union
(NLS Women 14-24 in 1968)
```

The dataset is successfully loaded, but it would have been shorter to type

```
. webuse union
(NLS Women 14-24 in 1968)
```

`webuse` is a synonym for `use https://www.stata-press.com/data/r19/`; see [D] **webuse**.

◁

Also see

[D] **compress** — Compress data in memory

[D] **datasignature** — Determine whether data have changed

[D] **frames use** — Load a set of frames from disk

[D] **import** — Overview of importing data into Stata

[D] **save** — Save Stata dataset

[D] **sysuse** — Use shipped dataset

[D] **webuse** — Use dataset from Stata website

[U] 11.6 Filenaming conventions

[U] 22 Entering and importing data

varmanage — Manage variable labels, formats, and other properties

Description

varmanage opens the Variables Manager. The Variables Manager allows for the sorting and filtering of variables for the purpose of setting properties on one or more variables at a time. Variable properties include the name, label, storage type, format, value label, and notes. The Variables Manager also can be used to create *varlist*s for the Command window.

Menu

Data > Variables Manager

Syntax

varmanage

Remarks and examples

A tutorial discussion of varmanage can be found in [GS] **7 Using the Variables Manager** (GSM, GSU, or GSW).

Also see

[D] **drop** — Drop variables or observations

[D] **edit** — Browse or edit data with Data Editor

[D] **format** — Set variables' output format

[D] **label** — Manipulate labels

[D] **notes** — Place notes in data

[D] **rename** — Rename variable

Description Remarks and examples Also see

Description

`vl` stands for variable list. It is a suite of commands for creating and managing named variable lists. Lists are intended especially to be used as arguments to estimation commands.

In particular, the suite is designed to help divide variables into two groups: one group that will be treated as factor variables and another group that will be treated as continuous or interval variables.

`vl` creates two types of named variable lists: system-defined variable lists, created automatically by `vl set`, and user-defined variable lists, created by `vl create`. You will usually use `vl set` to create system-defined variable lists first, and then create your own variable lists from them with `vl create`.

After creating a variable list called *vlusername*, the expression `$`*vlusername* can be used in Stata anywhere a *varlist* is allowed. Variable lists are actually global macros, and the `vl` commands are a convenient way to create and manipulate them.

Variable lists are saved with the dataset.

Remarks and examples

Remarks are presented under the following headings:

Introduction

The `vl` commands are the following:

System only

`vl set`	initializes the system-defined variable lists based on the number of levels and other characteristics of a variable
`vl move`	moves variables from one system-defined variable list to another

User only

`vl create`	creates user-defined variable lists
`vl modify`	adds or removes variables from user-defined variable lists
`vl label`	adds a label to a user-defined variable list
`vl substitute`	creates a user-defined variable list using factor-variable operators

System or user

`vl list`	lists the contents of variable lists, either system or user
`vl dir`	displays the defined variable lists, either system or user
`vl drop`	deletes variable lists or removes variables from multiple variable lists
`vl clear`	deletes all variable lists
`vl rebuild`	restores variable lists

The first thing to note is that some `vl` commands only work with system-defined variable lists, some only work with user-defined variable lists, and others work with both.

`vl set` is typically used first. It initializes the system-defined variable lists. By default, it classifies all the numeric variables in your dataset. Or you can specify *varlist* and have it classify only those variables.

When we are discussing the `vl` commands and say "variable list", we mean a named variable list created by `vl set` or `vl create`. A traditional Stata list of variables, that is, *varlist*, we will call *varlist*. Variable lists contain *varlist*s.

`vl create` allows you to create your own variable lists, either starting with system-defined variable lists or with *varlist*s you specify. There is no need to run `vl set` and create system-defined variable lists. You can create your own from scratch. If you are familiar with the variables in your dataset and know which ones you want treated as factor variables and which as continuous variables, you may want to create only user-defined variable lists.

`vl rebuild` restores all the `vl`-generated variable lists after loading a dataset that previously had variable lists. Stata saves variable lists when you `save` your data, but when you `use` the saved data file, they are not automatically restored.

We will explain how to use `vl` with a series of examples.

vl set and system-defined variable lists

We will first show examples using Stata's automobile dataset because it only has a small number of variables and the output will not be too lengthy. We will do that even though you are unlikely to want to use `vl` with this small dataset. `vl` is intended for use with dozens or even thousands of variables.

```
. sysuse auto
(1978 automobile data)
```

Typing `vl set` without *varlist* classifies all the numeric variables in the data.

```
. vl set

-------------------------------------------------------------------------------
                  |                      Macro's contents
                  |------------------------------------------------------------
Macro             |  # Vars   Description
------------------+------------------------------------------------------------
System            |
  $vlcategorical  |       2   categorical variables
  $vlcontinuous   |       2   continuous variables
  $vluncertain    |       7   perhaps continuous, perhaps categorical variables
  $vlother        |       0   all missing or constant variables
-------------------------------------------------------------------------------
Notes

      1. Review contents of vlcategorical and vlcontinuous to ensure they are
         correct.  Type vl list vlcategorical and type vl list vlcontinuous.

      2. If there are any variables in vluncertain, you can reallocate them
         to vlcategorical, vlcontinuous, or vlother.  Type
         vl list vluncertain.

      3. Use vl move to move variables among classifications.  For example,
         type vl move (x50 x80) vlcontinuous to move variables x50 and x80 to
         the continuous classification.

      4. vlnames are global macros.  Type the vlname without the leading
         dollar sign ($) when using vl commands.  Example: vlcategorical not
         $vlcategorical.  Type the dollar sign with other Stata commands to
         get a varlist.
```

By default, all numeric variables are put into one of four system-defined variable lists: `vlcategorical`, `vlcontinuous`, `vluncertain`, or `vlother`.

`vlcategorical` is intended for variables that are to be used as factor variables. `vlcontinuous` is intended for variables that are to be treated as continuous. `vluncertain` is intended for variables that may be categorical or may be continuous. `vlother` is a garbage classification intended for variables you want to ignore. `vl set` only puts constants and variables that are always missing into `vlother`, but you can move other variables there—more on that later.

Classification criteria for system-defined variable lists

Division into `vlcategorical`, `vlcontinuous`, or `vluncertain` is determined by several criteria.

First, if the variable contains any noninteger values, it goes in `vlcontinuous`.

Second, if the variable has negative values, it goes in `vlcontinuous` because factor variables in Stata must be nonnegative. If you have a variable that has values -1 and 1, you must recode it as 0 and 1 (or 1 and 2 or any other two distinct nonnegative integers) before you can use it as a factor variable.

Third, values of factor variables must be smaller than $2^{31} = 2{,}147{,}483{,}648$, so a variable with any values $\geq 2^{31}$ goes in `vlcontinuous`.

Fourth, constants, even when nonnegative integers, go in `vlother`.

For the remaining variables containing nonnegative integers, where they are placed is determined by two cutoffs, which can be specified by the options `categorical(#)` and `uncertain(#)`.

When the number of levels (distinct values), L, is

$$2 \le L \le \texttt{categorical(\#)}$$

the variable goes in `vlcategorical`. When

$$\texttt{categorical(\#)} < L \le \texttt{uncertain(\#)}$$

the variable goes in `vluncertain`. When

$$L > \texttt{uncertain(\#)}$$

the variable goes in `vlcontinuous`.

The defaults are `categorical(10)` and `uncertain(100)`, which are admittedly arbitrary. They were chosen because they are easy-to-remember round numbers. In many cases, you will want to use different cutoffs. See the next section, where we reset `categorical(#)` and `uncertain(#)`.

Moving variables into another classification

`vl list` will show how each variable was classified and why.

```
. vl list, minimum maximum observations
```

Variable	Macro	Values	Levels	Min	Max	Obs
rep78	$vlcategorical	integers >=0	5	1	5	69
foreign	$vlcategorical	0 and 1	2	0	1	74
headroom	$vlcontinuous	noninteger		1.5	5	74
gear_ratio	$vlcontinuous	noninteger		2.19	3.89	74
price	$vluncertain	integers >=0	74	3291	15906	74
mpg	$vluncertain	integers >=0	21	12	41	74
trunk	$vluncertain	integers >=0	18	5	23	74
weight	$vluncertain	integers >=0	64	1760	4840	74
length	$vluncertain	integers >=0	47	142	233	74
turn	$vluncertain	integers >=0	18	31	51	74
displacement	$vluncertain	integers >=0	31	79	425	74

We specified options `minimum`, `maximum`, and `observations` to display the minimum and maximum values of each variable and the number of nonmissing observations.

`vl set` does not use the minimum and maximum to determine whether the variable goes in `vlcategorical`, `vlcontinuous`, or `vluncertain`. If the variable is a nonnegative integer, only the number of levels matters to `vl set`. A variable with levels 1,000,000 and 2,000,000 is classified the same as a variable with levels 0 and 1. The minimum and maximum can be displayed because you might want to use them to reclassify the variables.

In our example, we look at the number of levels and the minimum and maximum of the variables in `vluncertain`, and we decide we want to treat them all as continuous. We use `vl move` to move them into `vlcontinuous`.

```
. vl move vluncertain vlcontinuous
note: 7 variables specified and 7 variables moved.

------------------------------
Macro            # Added/Removed
------------------------------
$vlcategorical               0
$vlcontinuous                7
$vluncertain                -7
$vlother                     0
------------------------------
```

When variables are moved into a different system-defined variable list, they are moved out of their current list.

Moving on, variable `rep78`, which gives the vehicle repair record, is worth some thought.

```
. tabulate rep78

     Repair
record 1978 |      Freq.     Percent        Cum.
------------+-----------------------------------
          1 |          2        2.90        2.90
          2 |          8       11.59       14.49
          3 |         30       43.48       57.97
          4 |         18       26.09       84.06
          5 |         11       15.94      100.00
------------+-----------------------------------
      Total |         69      100.00
```

`rep78` could be considered categorical and used as a factor variable or could be considered as an interval variable and treated as a continuous variable.

Let's say we want to move it into `vlcontinuous`. To specify variable names directly, you specify them in parentheses. We move `rep78`.

```
. vl move (rep78) vlcontinuous
note: 1 variable specified and 1 variable moved.

------------------------------
Macro            # Added/Removed
------------------------------
$vlcategorical              -1
$vlcontinuous                1
$vluncertain                 0
$vlother                     0
------------------------------
```

vl create and user-defined variable lists

`vl set` and `vl move` are a first-pass classification of your variables. Next you will likely want to create specialized variable lists for use as independent variables for an estimation command.

You can create variable lists based on a specific set of variables. Use `vl create` and specify a *varlist* enclosed in parentheses, `()`.

```
. vl create power = (gear_ratio displacement weight)
note: $power initialized with 3 variables.

. vl create nonpower = (turn length rep78)
note: $nonpower initialized with 3 variables.
```

We want to model mpg. We created the variable list power, containing variables we think are related to power, and another variable list nonpower, containing variables that are not related to power but might be predictive of mpg.

After creating these variable lists, we decide the variable length belongs in power instead of nonpower. So we add it to power by using the vl modify command.

```
. vl modify power = power + (length)
note: 1 variable added to $power.
```

vl create and vl modify are like generate and replace in Stata. vl create creates new variable lists. vl modify modifies existing variable lists.

vl list

We can use vl list to see the variable lists to which the variable length belongs.

```
. vl list (length), user
```

Variable	Macro	Values	Levels
length	$nonpower	integers >=0	47
length	$power	integers >=0	47

We used vl list with *varlist* enclosed in parentheses. We specified option user to list only the user-defined variable lists.

If we do not want length in nonpower, we must explicitly move it out.

```
. vl modify nonpower = nonpower - (length)
note: 1 variable removed from $nonpower.
```

In this way, vl modify differs from vl move. vl move moves a variable out of its current system-defined variable list when the variable is moved into a new one. vl modify only modifies the specified variable list.

We can create new user-defined variable lists from existing variable lists, whether user or system defined.

```
. vl create xvars = power + nonpower
note: $xvars initialized with 6 variables.
```

Using `(*)` to specify the *varlist* for `vl list` gives a listing ordered by variable name first and then variable-list name.

```
. vl list (*)
```

Variable	Macro	Values	Levels
price	$vlcontinuous	integers >=0	74
price	not in vluser		74
mpg	$vlcontinuous	integers >=0	21
mpg	not in vluser		21
rep78	$vlcontinuous	integers >=0	5
rep78	$nonpower	integers >=0	5
rep78	$xvars	integers >=0	5
headroom	$vlcontinuous	noninteger	
headroom	not in vluser		
trunk	$vlcontinuous	integers >=0	18
trunk	not in vluser		18
weight	$vlcontinuous	integers >=0	64
weight	$power	integers >=0	64
weight	$xvars	integers >=0	64
length	$vlcontinuous	integers >=0	47
length	$power	integers >=0	47
length	$xvars	integers >=0	47
turn	$vlcontinuous	integers >=0	18
turn	$nonpower	integers >=0	18
turn	$xvars	integers >=0	18
displacement	$vlcontinuous	integers >=0	31
displacement	$power	integers >=0	31
displacement	$xvars	integers >=0	31
gear_ratio	$vlcontinuous	noninteger	
gear_ratio	$power	noninteger	
gear_ratio	$xvars	noninteger	
foreign	$vlcategorical	0 and 1	2
foreign	not in vluser		2

See [D] **vl list** for all the different ways it can list variable lists and variables.

vl substitute and factor-variable operators

Factor-variable operators can be used with variable lists using `vl substitute`. Here is an example:

```
. vl substitute indepvars = i.vlcategorical##c.xvars
```

See **[U] 11.4.3 Factor variables**.

To see what is in `indepvars`, we use the global macro syntax with a `$` in front of its name and use `display` to view its contents.

```
. display "$indepvars"
i.foreign gear_ratio displacement weight length turn rep78 i.foreign#c.gear_ratio i
> .foreign#c.displacement i.foreign#c.weight i.foreign#c.length i.foreign#c.turn i.
> foreign#c.rep78
```

To use variable lists with other Stata commands, we do the same thing. We treat the list name like the global macro it is and put a $ in front of it.

```
. regress mpg $indepvars
      Source |       SS           df       MS      Number of obs   =        69
-------------+----------------------------------   F(13, 55)       =     20.86
       Model |  1945.54632        13  149.657409   Prob > F        =    0.0000
    Residual |  394.656577        55  7.17557413   R-squared       =    0.8314
-------------+----------------------------------   Adj R-squared   =    0.7915
       Total |   2340.2029        68  34.4147485   Root MSE        =    2.6787

------------------------------------------------------------------------------
         mpg | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
     foreign |
    Foreign  |  -32.65519   24.36955    -1.34   0.186    -81.49286    16.18248
  gear_ratio |  -.0847818   1.959716    -0.04   0.966    -4.012141    3.842577
 (output omitted)
foreign#c.rep78 |
    Foreign  |   4.480624    1.10794     4.04   0.000     2.260263    6.700985
             |
       _cons |   50.52293   8.553643     5.91   0.000     33.38104    67.66481
------------------------------------------------------------------------------
```

Just like all the other user-defined variable lists, variable lists created by `vl substitute` are saved with the data. See [D] **vl rebuild**.

Exploring data with vl set

Consider a bigger dataset. It is fictitious data, designed to mimic real questionnaire data.

```
. use https://www.stata-press.com/data/r19/questionnaire, clear
(Fictitious Questionnaire Data)
```

`vl` can be used to explore your data. It is a bit like `codebook` except that `codebook` provides more information. `vl set`, however, is much faster. `vl set` is even speedy with datasets containing millions of observations and thousands of variables.

We run `vl set` with the `list()` option, which is equivalent to using the `vl list` command. We also specify the option `nonotes` to suppress the notes at the end of the table.

```
. vl set, list(min max obs) nonotes
```

Variable	Macro	Values	Levels	Min	Max	Obs
gender	$vlcategorical	0 and 1	2	0	1	1,058
age	$vluncertain	integers >=0	47	2	64	1,058
q1	$vluncertain	integers >=0	40	1	47	1,048
q2	$vlcategorical	integers >=0	3	1	3	1,046
q3	$vlcategorical	0 and 1	2	0	1	1,049
q4	$vlcategorical	0 and 1	2	0	1	1,042
q5	$vlcategorical	0 and 1	2	0	1	1,048
q6	$vlcategorical	integers >=0	3	1	3	1,046
q7	$vlcategorical	0 and 1	2	0	1	1,047
q8	$vlcategorical	0 and 1	2	0	1	1,046
q9	$vlcategorical	0 and 1	2	0	1	1,051
q10	$vlcategorical	0 and 1	2	0	1	1,047
q11	$vlcategorical	0 and 1	2	0	1	1,042
q12	$vlcategorical	integers >=0	5	1	5	1,052
q13	$vlcategorical	0 and 1	2	0	1	1,045
q14	$vlcategorical	0 and 1	2	0	1	1,047
q15	$vluncertain	integers >=0	36	0	37	1,040
q16	$vlcategorical	integers >=0	3	1	3	1,046
q17	$vlcategorical	0 and 1	2	0	1	1,054
q18	$vlcategorical	integers >=0	7	1	7	1,048
q19	$vlcategorical	0 and 1	2	0	1	1,043
q20	$vluncertain	integers >=0	30	1	30	1,048
check1	$vlother	constant	1	1	1	1,058
q21	$vluncertain	integers >=0	39	2	40	1,048
q22	$vluncertain	integers >=0	32	3	36	1,050
q23	$vlcategorical	integers >=0	10	1	10	1,050
q24	$vlcontinuous	negative		-1	1	1,050
(output omitted)						
q45	$vlcontinuous	noninteger		8.7	69.9	1,045
(output omitted)						
q60	$vlother	all missing		.	.	0
(output omitted)						
q76	$vlcontinuous	integers >=0	>100	84	287	1,051
(output omitted)						
q161	$vlcategorical	0 and 1	2	0	1	1,047
check8	$vlother	constant	1	1	1	1,058

Summary

Macro	Macro's contents	
	# Vars	Description
System		
$vlcategorical	138	categorical variables
$vlcontinuous	3	continuous variables
$vluncertain	21	perhaps continuous, perhaps categorical variables
$vlother	9	all missing or constant variables

From the summary table, we see that most of the variables were put in `vlcategorical`. The default cutoff for the number of levels for `vlcategorical` is 10, so these 138 variables all have 10 levels or less.

Three variables were put in `vlcontinuous`. One, `q24`, has negative values. Its values are actually only -1 and 1. So it is integer with only two levels, yet it is classified as continuous. Factor variables must be nonnegative, so any variable with negative values is put into `vlcontinuous`. We need to recode `q24` as 0/1 (or 1/2, etc.) to use it as a factor variable.

The variable `q45` was put in `vlcontinuous` because it contains noninteger values.

The variable `q76` was put in `vlcontinuous` because, although it is a nonnegative integer, it has over 100 levels. The default cutoff is 100 for determining whether variables are put in `vlcontinuous` or `vluncertain`. Note that the output does not say exactly how many levels, just that the number is greater than 100.

The variable list `vluncertain` contains 21 variables. These are nonnegative integers with the number of levels > 10 and ≤ 100.

The variable list `vlother` contains nine variables. These variables are either constants or all missing—variables not suitable for any statistical analyses.

Changing the cutoffs for classification

The default classification produced by `vl set` was not very useful in this case. `vl set` put too many variables in `vlcategorical`, and it put too many in `vluncertain`. Most of the variables in `vluncertain` are integer-valued scales, and we want those in `vlcontinuous`.

We will fix this. We run `vl set` again to re-create the classifications, and this time, we specify `categorical(4)` and `uncertain(19)`, meaning that variables in `vlcategorical` can have up to 4 levels and variables with 5 to 19 levels are placed in `vluncertain`. We also specify the option `dummy` to tell `vl set` to smarten up and put all the 0/1 variables in their own classification. Finally, we specify option `clear` to clear the old classifications. See [D] **vl set**.

```
. vl set, categorical(4) uncertain(19) dummy clear nonotes
```

	Macro's contents	
Macro	# Vars	Description
System		
$vldummy	99	0/1 variables
$vlcategorical	16	categorical variables
$vlcontinuous	21	continuous variables
$vluncertain	26	perhaps continuous, perhaps categorical variables
$vlother	9	all missing or constant variables

We did not really need to create the `vldummy` variable list. Had we wanted to treat the dummy variables as factor variables, we could have let `vl set` put them in `vlcategorical`, as it would by default. Note that `vldummy` contains only 0/1 variables. A 1/2 variable is still put in `vlcategorical`.

Moving variables from one classification to another

At this point, we are happy with the variables that are in `vlcategorical` and `vlcontinuous`. We are unhappy with having variables in `vluncertain`, and we have 26 of them! Those variables have between 5 and 19 levels. Let's list the variables and categorize them by hand.

```
. vl list vluncertain
```

Variable	Macro	Values	Levels
q12	$vluncertain	integers >=0	5
q18	$vluncertain	integers >=0	7
q23	$vluncertain	integers >=0	10
q27	$vluncertain	integers >=0	8
q28	$vluncertain	integers >=0	15
q35	$vluncertain	integers >=0	7
q39	$vluncertain	integers >=0	5
q54	$vluncertain	integers >=0	10
q63	$vluncertain	integers >=0	7
q66	$vluncertain	integers >=0	5
q80	$vluncertain	integers >=0	5
q81	$vluncertain	integers >=0	5
q92	$vluncertain	integers >=0	5
q93	$vluncertain	integers >=0	7
q99	$vluncertain	integers >=0	5
q103	$vluncertain	integers >=0	7
q111	$vluncertain	integers >=0	7
q112	$vluncertain	integers >=0	7
q119	$vluncertain	integers >=0	8
q120	$vluncertain	integers >=0	7
q124	$vluncertain	integers >=0	14
q127	$vluncertain	integers >=0	5
q132	$vluncertain	integers >=0	7
q135	$vluncertain	integers >=0	10
q141	$vluncertain	integers >=0	12
q157	$vluncertain	integers >=0	7

Many of the variables have seven levels. Let's tabulate one of them.

```
. tabulate q18
```

Question 18	Freq.	Percent	Cum.
very strongly disagree	136	12.98	12.98
strongly disagree	148	14.12	27.10
disagree	144	13.74	40.84
neither agree nor disagree	146	13.93	54.77
agree	173	16.51	71.28
strongly agree	146	13.93	85.21
very strongly agree	155	14.79	100.00
Total	1,048	100.00	

This variable contains a Likert scale and, because of that, we want to treat the variable as continuous. In fact, all the variables with seven levels are Likert scales. We move them all into `vlcontinuous`.

```
. vl move (q18 q35 q63 q93 q103 q111 q112 q120 q132 q157) vlcontinuous
note: 10 variables specified and 10 variables moved.
```

Macro	# Added/Removed
$vldummy	0
$vlcategorical	0
$vlcontinuous	10
$vluncertain	-10
$vlother	0

Now we can list the remaining `vluncertain` variables.

```
. vl list vluncertain
```

Variable	Macro	Values	Levels
q12	$vluncertain	integers >=0	5
q23	$vluncertain	integers >=0	10
q27	$vluncertain	integers >=0	8
q28	$vluncertain	integers >=0	15
q39	$vluncertain	integers >=0	5
q54	$vluncertain	integers >=0	10
q66	$vluncertain	integers >=0	5
q80	$vluncertain	integers >=0	5
q81	$vluncertain	integers >=0	5
q92	$vluncertain	integers >=0	5
q99	$vluncertain	integers >=0	5
q119	$vluncertain	integers >=0	8
q124	$vluncertain	integers >=0	14
q127	$vluncertain	integers >=0	5
q135	$vluncertain	integers >=0	10
q141	$vluncertain	integers >=0	12

You can decide for yourself where they go and use `vl move` to place them.

Dropping variables and rebuilding variable lists

We have variables in `vlother`.

```
. vl list vlother
```

Variable	Macro	Values	Levels
check1	$vlother	constant	1
check2	$vlother	constant	1
q60	$vlother	all missing	
check3	$vlother	constant	1
check4	$vlother	constant	1
check5	$vlother	constant	1
check6	$vlother	constant	1
check7	$vlother	constant	1
check8	$vlother	constant	1

We could use `vl drop` to remove them from the `vl` system classification. But we do not want them in our dataset, so we `drop` them.

```
. drop $vlother
```

Now if we run

```
. vl list
variable check1 not found
    Run vl rebuild to rebuild vl macros.
r(111);
```

we get an error! `vl` keeps track of all the variables put into variable lists, and whenever a `vl` command is run, it first checks that everything is okay. It discovered missing variables and needs confirmation that this is intentional. If it is, we `vl rebuild` the system.

```
. vl rebuild
Rebuilding vl macros ...
```

Macro	Macro's contents	
	# Vars	Description
System		
$vldummy	99	0/1 variables
$vlcategorical	16	categorical variables
$vlcontinuous	31	continuous variables
$vluncertain	16	perhaps continuous, perhaps categorical variables
$vlother	0	all missing or constant variables

Changing variables and updating variable lists

If you change the values of a variable, you need to `vl set` the variable again to update its statistics. You can update its statistics leaving its classification unchanged or tell `vl set` to redo the classification as well.

We noticed that age had a suspiciously low minimum.

```
. vl list (age), min max obs
```

Variable	Macro	Values	Levels	Min	Max	Obs
age	$vlcontinuous	integers >=0	>19	2	64	1,058

We do not believe a two-year-old took our questionnaire. Let's find the ID of this subject.

```
. list id age if age == 2
```

	id	age
543.	05034558	2

We check our original data source and discover that the subject was 20 years old. We correct the value of age.

```
. replace age = 20 if id == "05034558" & age == 2
(1 real change made)
```

Now the minimum of age stored by `vl` is wrong. We could ignore it, or we could fix it by using the `update` option of `vl set`. The option `update` does not change the classification of a variable; it only updates the stored statistics.

```
. vl set age, update list(min max obs) nonotes
```

Variable	Macro	Values	Levels	Min	Max	Obs
age	$vlcontinuous	integers >=0	47	18	64	1,058

Summary

Macro	Macro's contents # Vars	Description
System		
$vldummy	99	0/1 variables
$vlcategorical	16	categorical variables
$vlcontinuous	31	continuous variables
$vluncertain	16	perhaps continuous, perhaps categorical variables
$vlother	0	all missing or constant variables

If we wanted to redo the classification of age and update its statistics, we would type

```
. vl set age, redo
```

(*output omitted*)

Saving and using datasets with variable lists

When we `save` our data, the `vl` system is saved.

```
. save quest_with_vl
file quest_with_vl.dta saved
```

However, when we `use` our data, the `vl` system is not automatically restored.

```
. use quest_with_vl
(Fictitious Questionnaire Data)
```

Type `vl rebuild` to bring the system back to life.

```
. vl rebuild
Rebuilding vl macros ...
```

Macro	Macro's contents # Vars	Description
System		
$vldummy	99	0/1 variables
$vlcategorical	16	categorical variables
$vlcontinuous	31	continuous variables
$vluncertain	16	perhaps continuous, perhaps categorical variables
$vlother	0	all missing or constant variables

See [D] **vl rebuild** for other instances when you need to run `vl rebuild`.

User-defined variable lists and factor-variable operators

We continue with our previous example using fictitious questionnaire data.

The system-defined variable lists are good for organizing variables. We would not use them, however, to specify *varlists* for estimation commands if for no other reason than we do not want to use all the variables in the dataset. For this purpose, we need to create user-defined variable lists.

Here is a variable list containing demographic variables we want to use for model fitting.

```
. vl create demographics = (gender q3 q4 q5)
note: $demographics initialized with 4 variables.
```

We are going to create two more variable lists: `factors`, containing variables we want to treat as factor variables, and `control_scales`, containing variables we want to treat as continuous.

```
. vl create factors = vldummy + vlcategorical
note: $factors initialized with 115 variables.

. vl create control_scales = (q15 q20 q21 q22)
note: $control_scales initialized with 4 variables.
```

This is the real power of `vl`. We created `factors` from `vldummy` plus `vlcategorical`. But `factors` contains variables in `demographics`, and we want to handle the `demographics` variables differently. So we remove them from `factors`. We also remove some other variables we do not want in our model.

```
. vl modify factors = factors - demographics
note: 4 variables removed from $factors.

. vl modify factors = factors - (q155 q156 q158)
note: 3 variables removed from $factors.
```

We are going to fit a `poregress` model, and our variables of interest (ones for which we want to do inference) are the categorical variables `q7`, `q13`, and `q16`, and the continuous variable `q35`.

We create a variable list with the categorical ones, and remove them from `factors`.

```
. vl create fvofinterest = (q7 q13 q16)
note: $fvofinterest initialized with 3 variables.

. vl modify factors = factors - fvofinterest
note: 3 variables removed from $factors.
```

Now we use `vl substitute` to create a variable list that contains factor variables.

```
. vl substitute interest = i.fvofinterest q35
```

Notice that we tucked the continuous variable `q35` in at the end. `vl substitute` lets you specify variable lists and variables by using factor-variable operators—or not—in a natural way.

If you want to see the contents of a variable list created using `vl substitute`, you can `display` it:

```
. display "$interest"
i.q7 i.q13 i.q16 q35
```

The one thing to remember about `vl substitute` is that it is a one-shot deal. Once the variable list is created, you cannot modify it. If you want to change it, you must delete it using `vl drop` and then re-create it using `vl substitute`.

We are going to go nuts and create a variable list consisting of bushels of interactions.

```
. vl substitute controlvars = i.demographics i.factors##c.control_scales
```

The `interest` variable list contains our variables of interest for `poregress`. The `controlvars` variable list contains control variables for the model.

```
. poregress q1 $interest, controls($controlvars)
Estimating lasso for q1 using plugin
Estimating lasso for 1bn.q7 using plugin
Estimating lasso for 1bn.q13 using plugin
Estimating lasso for 2bn.q16 using plugin
Estimating lasso for 3bn.q16 using plugin
Estimating lasso for q35 using plugin
Partialing-out linear model          Number of obs              =        339
                                     Number of controls         =      1,137
                                     Number of selected controls =        12
                                     Wald chi2(5)               =      12.89
                                     Prob > chi2                =     0.0244

------------------------------------------------------------------------------
             |               Robust
          q1 | Coefficient  std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
          q7 |
         yes |  -1.333003   .7441531    -1.79   0.073    -2.791516    .1255107
             |
         q13 |
         yes |   .4321797    .684376     0.63   0.528    -.9091725    1.773532
             |
         q16 |
           2 |   .6905278   .8355682     0.83   0.409    -.9471559    2.328211
           3 |   2.497944   .8572828     2.91   0.004     .8177008    4.178188
             |
         q35 |  -.1238627   .1833827    -0.68   0.499    -.4832861    .2355608
------------------------------------------------------------------------------
Note: Chi-squared test is a Wald test of the coefficients of the variables
      of interest jointly equal to zero. Lassos select controls for model
      estimation. Type lassoinfo to see number of selected variables in each
      lasso.
```

Using `vl`, we can specify huge *varlists* in a succinct notation. If we were to list the expanded estimation command, it would take half a page!

Updating variable lists created by vl substitute

What is especially convenient about variable lists is how easy they are to modify. Suppose we decide we do not want `q13` in our model. We cannot explicitly change `interest` because it was created by `vl substitute`, but we can change `fvofinterest`.

```
. vl modify fvofinterest = fvofinterest - (q13)
note: 1 variable removed from $fvofinterest.
```

We now update `interest` using `vl rebuild`.

```
. vl rebuild
Rebuilding vl macros ...
```

Macro	# Vars	Description
	Macro's contents	
System		
$vldummy	99	0/1 variables
$vlcategorical	16	categorical variables
$vlcontinuous	31	continuous variables
$vluncertain	16	perhaps continuous, perhaps categorical variables
$vlother	0	all missing or constant variables
User		
$demographics	4	variables
$factors	105	variables
$control_scales	4	variables
$fvofinterest	2	variables
$interest		factor-variable list
$controlvars		factor-variable list

And we see that q13 is gone from our variable list.

```
. display "$interest"
i.q7 i.q16 q35
```

Also see

[D] **vl create** — Create and modify user-defined variable lists

[D] **vl drop** — Drop variable lists or variables from variable lists

[D] **vl list** — List contents of variable lists

[D] **vl rebuild** — Rebuild variable lists

[D] **vl set** — Set system-defined variable lists

Description Quick start Syntax Remarks and examples Also see

Description

`vl create` creates user-defined variable lists.

`vl modify` modifies existing user-defined variable lists.

`vl substitute` creates a variable list using factor-variable operators operating on variable lists.

After creating a variable list called *vlusername*, the expression $*vlusername* can be used in Stata anywhere a *varlist* is allowed. Variable lists are actually global macros, and the `vl` commands are a convenient way to create and manipulate them. They are saved with the dataset. See [D] **vl rebuild**.

For an introduction to the `vl` commands, see [D] **vl**.

Quick start

Create a variable list

```
vl create demographics = (age_cat gender)
```

Add variables to a variable list

```
vl modify demographics = demographics + (educ_cat income_cat)
```

Add the variables in the variable list named `othervars` to the existing variable list called `myxvars`

```
vl modify myxvars = myxvars + othervars
```

Remove the variable `x8` from the variable list

```
vl modify myxvars = myxvars - (x8)
```

Apply factor-variable operator `i.` to all the variables in a variable list

```
vl substitute idemographics = i.demographics
```

Create interactions between the levels of the variables in the variable list `demographics` and the continuous variables in the variable list `vlcontinuous`

```
vl substitute myinteractions = i.demographics#c.vlcontinuous
```

Run a regression specifying the independent variables using variable lists

```
regress y $idemographics $myxvars $myinteractions
```

Syntax

Create user-defined variable lists

`vl create` *vlusername* = (*varlist*)

`vl create` *vlusername* = *vlname* + | - (*varlist*)

`vl create` *vlusername* = *vlname1* [+ | - *vlname2*]

Modify user-defined variable lists

`vl modify` *vlusername* = (*varlist*)

`vl modify` *vlusername* = *vlname* + | - (*varlist*)

`vl modify` *vlusername* = *vlname1* [+ | - *vlname2*]

Apply factor-variable operators to variable-list names

`vl substitute` *vlusername* = `i.`*vlname*

`vl substitute` *vlusername* = `i.`*vlname1*`#i.`*vlname2*

`vl substitute` *vlusername* = `i.`*vlname1*`##c.`*vlname2*

Label a user-defined variable-list name

`vl label` *vlusername* ["*label*"]

vlname is an existing user-defined variable-list name or a system-defined variable-list name. When specifying *varlist*, it is always enclosed in parentheses: (*varlist*). See [D] **vl**.

Remarks and examples

Remarks are presented under the following headings:

vl create

`vl create` creates a new variable list. It can be created from a list of variables:

```
. vl create myxvars = (x1-x100)
```

In the above, note that the *varlist* is enclosed in parentheses. *varlists* must always be enclosed in parentheses.

When we are discussing the `vl` commands and say "variable list," we mean a named variable list created by `vl create` or `vl set`. In this case, we created the variable list `myxvars`. A traditional Stata list of variables, that is, a *varlist*, we will call a *varlist*.

A new variable list also can be created from an existing variable list:

```
. vl create indepvars = myxvars
```

vl modify

`vl modify` is the same as `vl create`, except that `vl modify` cannot create new variables lists, and `vl create` cannot modify existing lists.

The operator + can be used to take the union of two variable lists with duplicates removed.

```
. vl modify indepvars = myxvars + othervars
```

The operator − can be used to obtain the difference of two variable lists.

```
. vl modify indepvars = myxvars - othervars
```

Now `indepvars` contains the variables that are in `myxvars` excluding any that are in `othervars`. If there are variables in `othervars` that are not in `myxvars`, it is not an error. These variables are simply ignored.

The + and − operators can be used with *varlist*s as well.

```
. vl modify indepvars = myxvars + (w1 w2 w3)
```

(*varlist*) must be specified after + or −, never before.

To list the variables in a variable list, use `vl list`. To see a directory of variable lists that have been created, type `vl dir`. See [D] **vl list** for details on these two commands.

`vl label` attaches a label to the variable list that is displayed by `vl dir`.

```
. vl label indepvars "My brilliant choice of variables"
```

To delete `indepvars`, type

```
. vl drop indepvars
```

`vl drop` has other uses too; see [D] **vl drop**.

Using variable lists with other Stata commands

To use variable lists with other Stata commands, type $ in front of the variable-list name. Remember: With the `vl` commands, do not use $. With other Stata commands, use $.

```
. display "$indepvars"
. summarize $indepvars
. regress y $indepvars
```

If you know Stata, you will have already figured out that variable lists are global macros. But the `vl` system is more than another way to create global macros. For instance, variable lists are saved with the dataset. Global macros are not. Both variable lists and other `vl` system information are saved. To make the `vl` system come back to life in the state we last had it, after we `use` a dataset, we type

```
. vl rebuild
```

See [D] **vl rebuild**.

vl substitute

Factor-variable operators can be used with variable lists. There are two ways to do this.

The first is to use factor-variable operators on the global macro form of the variable list like so:

```
. regress y i.($myfactors)##c.($mycontinuous)
```

Here `myfactors` is a user-defined variable list containing variables you want treated as factors. `mycontinuous` are variables you want treated as continuous. Specifying `i.(...)##c.(...)` means you want main effects of the factors plus interactions of all their levels with the continuous variables. Note that the parentheses, `()`, are required.

A second way to use factor-variable operators with variable lists is with the command `vl substitute`. For example,

```
. vl substitute myinteractions = i.myfactors##c.mycontinuous
. regress y $myinteractions
```

would produce the same result as the previous command. However, using `vl substitute` has the advantage that the variable lists it creates will be saved with your dataset, just like any other variable list.

See [U] **11.4.3 Factor variables**.

You can mix variable names with names of variable lists:

```
. vl substitute myinteractions = i.gender##c.(mycontinuous x100)
```

Here `gender` and `x100` are variable names and `mycontinuous` is a variable list.

Be careful when mixing variable names and names of variable lists. `vl substitute` first assumes names are names of variable lists. Then it looks for variable names. For example, if you have both a variable named `x` and a variable list named `x`, and you specify

```
. vl substitute myinteractions = i.gender##c.(mycontinuous x)
```

then `vl substitute` will assume `x` is the variable list.

Using `vl substitute` to create a user-defined variable list is a one-shot deal. These variable lists cannot be modified after they are created. If you want to change them, first drop them,

```
. vl drop myinteractions
```

and then define them again:

```
. vl substitute myinteractions = i.myfactors##c.mycontinuous
```

For examples using `vl create`, `vl modify`, and `vl substitute`, see [D] **vl**.

Also see

[D] **vl** — Manage variable lists

[D] **vl drop** — Drop variable lists or variables from variable lists

[D] **vl list** — List contents of variable lists

[D] **vl rebuild** — Rebuild variable lists

[D] **vl set** — Set system-defined variable lists

vl drop — Drop variable lists or variables from variable lists

Description Quick start Syntax Options Remarks and examples Also see

Description

`vl drop` *vlusername* deletes user-defined variable lists.

`vl drop` *vlsysname* zeros system-defined variable lists. They still exist but are empty.

`vl drop (`*varlist*`)` removes variables from all variable lists.

`vl clear` deletes all variable lists and removes all traces of the `vl` system.

For an introduction to the `vl` commands, see [D] **vl**.

Quick start

Delete the user-defined variable list `myfav`

```
vl drop myfav
```

Zero the system-defined variable list `vluncertain`

```
vl drop vluncertain
```

Drop the variables `x1` and `x2` from all variable lists

```
vl drop (x1 x2)
```

Same as above, but only drop them from user-defined variable lists

```
vl drop (x1 x2), user
```

Delete all variable lists and all traces of the `vl` system

```
vl clear
```

Delete all user-defined variable lists

```
vl clear, user
```

Delete all system-defined variable lists and the stored variable statistics

```
vl clear, system
```

Syntax

Drop variable lists

`vl drop` *vlnamelist* [, `system user`]

Drop variables from variable lists

`vl drop (`*varlist*`)` [, `system user`]

Clear all variable lists

`vl clear` [, `system user`]

vlnamelist is a list of variable-list names.

`(_all)` or `(*)` can be used to specify all numeric variables in the dataset.

Options

`system` when specified with `vl drop (`*varlist*`)`, drops the variables in *varlist* only from system-defined variable lists. By default, variables are dropped from all variable lists, both system-defined and user-defined.

When specified with `vl clear`, only the system-defined variable lists are deleted. By default, both the system-defined and user-defined variable lists are deleted, and all traces of the `vl` system are gone.

`user` when specified with `vl drop (`*varlist*`)`, drops the variables in *varlist* only from user-defined variable lists.

When specified with `vl clear`, only the user-defined variable lists are deleted.

Remarks and examples

When given one or more names of user-defined variable lists, `vl drop` deletes them. That is, typing

```
. vl drop myname
```

deletes the user-defined variable list `myname`. It is as if `myname` was never created. A new variable list called `myname` can now be created using `vl create`.

When given one or more names of system-defined variable lists, `vl drop` zeros them. That is, typing

```
. vl drop vluncertain
```

zeros the system-defined variable list `vluncertain`. It still exists but is empty. A single system-defined variable list cannot be deleted.

All system-defined variable lists can be deleted using

```
. vl clear, system
```

All system-defined variable lists are now gone. Also deleted are the stored variable statistics, namely, the number of levels, minimum and maximum values, and the number of nonmissing observations. It is as if `vl set` was never run.

Typing

```
. vl clear
```

deletes all variable lists and all traces of the `vl` system.

Typing

```
. vl drop (varlist)
```

removes the variables in *varlist* from all variable lists.

Say we only want to remove variable `x8` from the user-defined variable list `mylist`. To do this, we type

```
. vl modify mylist = mylist - (x8)
```

Note the parentheses around `x8`; see [D] **vl create**.

Say you want to remove variable `x8` from the system-defined variable list `vlcategorical`. System-defined variable lists are disjoint, so a variable is only in one of them. Thus, we can remove it by typing

```
. vl drop (x8), system
```

Rather than drop it, we could have moved it to the system-defined variable list `vlother`.

```
. vl move (x8) vlother
```

See [D] **vl set**.

Also see

[D] **vl** — Manage variable lists

[D] **vl create** — Create and modify user-defined variable lists

[D] **vl list** — List contents of variable lists

[D] **vl rebuild** — Rebuild variable lists

[D] **vl set** — Set system-defined variable lists

vl list — List contents of variable lists

Description Quick start Syntax Options Remarks and examples
Stored results Also see

Description

vl list shows the contents of variable lists when given names of variable lists. When given names of variables, it shows the variable lists to which each variable belongs.

vl dir shows the names of all variable lists.

For an introduction to the vl commands, see [D] **vl**.

Quick start

Show the contents of all variable lists

```
vl list
```

Show the contents of the system-defined variable list vlcategorical

```
vl list vlcategorical
```

Show the contents of the user-defined variable list myfav

```
vl list myfav
```

Show the variable lists to which x1-x100 belong

```
vl list (x1-x100)
```

Show the variable lists to which every numeric variable belongs

```
vl list (*)
```

Show the contents of all system-defined variable lists

```
vl list, system
```

Show the contents of all user-defined variable lists

```
vl list, user
```

Show the contents of all variable lists, and show the minimum value, maximum value, and number of nonmissing values for each variable

```
vl list, minimum maximum observations
```

Show the contents of all variable lists, ordered by variable list and then alphabetically by variable name

```
vl list, sort
```

Show the variable lists to which every numeric variable belongs, ordered alphabetically by variable name and then by variable list

```
vl list (*), sort
```

Syntax

Show the contents of variable lists

`vl list` [*vlnamelist*] [, *options*]

Show the variable lists to which variables belong

`vl list (`*varlist*`)` [, *options*]

Show names of all variable lists

`vl dir` [, `system` `user`]

vlnamelist is a list of variable-list names.

`(_all)` or `(*)` can be used to specify all numeric variables in the dataset.

options	Description
`system`	show only system-defined variable lists
`user`	show only user-defined variable lists
`minimum`	show minimum value of each variable
`maximum`	show maximum value of each variable
`observations`	show number of nonmissing observations of each variable
`sort`	order by variable list and then alphabetically by variable name when *vlnamelist* is specified; order alphabetically by variable name and then by variable list when (*varlist*) is specified
`strok`	allow string variables when (*varlist*) is specified
`nolstretch`	do not stretch the width of the table to accommodate long names

`collect` is allowed with `vl list` and `vl dir`; see **[U] 11.1.10 Prefix commands**.

Options

`system` specifies that only system-defined variable lists be shown. By default, both system-defined and user-defined variable lists are shown.

`user` specifies that only user-defined variable lists be shown.

`minimum` specifies that the minimum value of each variable be displayed.

`maximum` specifies that the minimum value of each variable be displayed.

`observations` specifies that number of nonmissing observations of each variable be displayed.

`sort` specifies that the listing be sorted. When *vlnamelist* is specified, the listing is ordered by variable list and then alphabetically by variable name. By default in this case, variables are listed in the order in which they were added to the variable list.

When (*varlist*) is specified, the listing is ordered alphabetically by variable name and then by variable list. By default in this case, variables are listed in the order in which they appear in *varlist*.

`strok` specifies that string variables be included in the listing when (*varlist*) is specified. By default, specifying string variables in *varlist* gives an error message. Specifying `strok` prevents this error message and lists any string variables.

`nolstretch` specifies that the width of the table not be automatically widened to accommodate long variable and variable-list names. When `nolstretch` is specified, names are abbreviated to make the table width no more than 79 characters. The default, `lstretch`, is to automatically widen the table up to the width of the Results window. To change the default, use `set lstretch off`.

Remarks and examples

`vl list` produces two types of listings. The first lists by variable-list name and then by variable name. The second is the reverse; it lists by variable name and then by variable-list name.

Typing

```
. vl list
```

produces the first type of listing. This listing is useful when you want to see the contents of each variable list.

Typing

```
. vl list (*)
```

or

```
. vl list (x1-x100)
```

produces the second type of listing. This listing is useful when you want to see all variable lists to which a variable belongs.

System-defined variable lists are disjoint, so a variable can only belong to one of them. There is no such restriction on user-defined variable lists. Variables can belong to more than one user-defined variable list.

Typing

```
. vl dir
```

shows all the variable lists, both system-defined and user-defined. The options `system` and `user` work with both `vl list` and `vl dir` to restrict the output accordingly.

▷ Example 1: Showing the contents of variable lists

We show examples using Stata's automobile dataset because it has only a small number of variables and the output will not be too lengthy.

```
. sysuse auto
(1978 automobile data)
```

We run `vl set` with the option `nonotes` to suppress the notes at the end of the output.

```
. vl set, nonotes

-------------------------------------------------------------------------------
                  |                      Macro's contents
                  |------------------------------------------------------------
Macro             |  # Vars   Description
------------------+------------------------------------------------------------
System            |
  $vlcategorical  |       2   categorical variables
  $vlcontinuous   |       2   continuous variables
  $vluncertain    |       7   perhaps continuous, perhaps categorical variables
  $vlother        |       0   all missing or constant variables
-------------------------------------------------------------------------------
```

Let's list the contents of the variable lists.

```
. vl list

----------------------------------------------------------
    Variable | Macro           Values         Levels
-------------+--------------------------------------------
       rep78 | $vlcategorical  integers >=0        5
     foreign | $vlcategorical  0 and 1             2
    headroom | $vlcontinuous   noninteger
  gear_ratio | $vlcontinuous   noninteger
       price | $vluncertain    integers >=0       74
         mpg | $vluncertain    integers >=0       21
       trunk | $vluncertain    integers >=0       18
      weight | $vluncertain    integers >=0       64
      length | $vluncertain    integers >=0       47
        turn | $vluncertain    integers >=0       18
displacement | $vluncertain    integers >=0       31
----------------------------------------------------------
```

We decide to treat all the variables in `vluncertain` as continuous, so we move them to `vlcontinuous`. Then we run `vl dir` to confirm that `vluncertain` is empty.

```
. vl move vluncertain vlcontinuous
note: 7 variables specified and 7 variables moved.

------------------------------
Macro          # Added/Removed
------------------------------
$vlcategorical               0
$vlcontinuous                7
$vluncertain                -7
$vlother                     0
------------------------------

. vl dir

-------------------------------------------------------------------------------
                  |                      Macro's contents
                  |------------------------------------------------------------
Macro             |  # Vars   Description
------------------+------------------------------------------------------------
System            |
  $vlcategorical  |       2   categorical variables
  $vlcontinuous   |       9   continuous variables
  $vluncertain    |       0   perhaps continuous, perhaps categorical variables
  $vlother        |       0   all missing or constant variables
-------------------------------------------------------------------------------
```

Let's create two user-defined variable lists.

```
. vl create power = (gear_ratio weight displacement)
note: $power initialized with 3 variables.
. vl create other = (price turn length)
note: $other initialized with 3 variables.
```

Let's do a listing ordered by variable list. We specify options to see the minimum and maximum values and the number of nonmissing observations for each variable.

```
. vl list, minimum maximum observations
```

Variable	Macro	Values	Levels	Min	Max	Obs
rep78	$vlcategorical	integers >=0	5	1	5	69
foreign	$vlcategorical	0 and 1	2	0	1	74
headroom	$vlcontinuous	noninteger		1.5	5	74
gear_ratio	$vlcontinuous	noninteger		2.19	3.89	74
price	$vlcontinuous	integers >=0	74	3291	15906	74
mpg	$vlcontinuous	integers >=0	21	12	41	74
trunk	$vlcontinuous	integers >=0	18	5	23	74
weight	$vlcontinuous	integers >=0	64	1760	4840	74
length	$vlcontinuous	integers >=0	47	142	233	74
turn	$vlcontinuous	integers >=0	18	31	51	74
displacement	$vlcontinuous	integers >=0	31	79	425	74
gear_ratio	$power	noninteger		2.19	3.89	74
weight	$power	integers >=0	64	1760	4840	74
displacement	$power	integers >=0	31	79	425	74
price	$other	integers >=0	74	3291	15906	74
turn	$other	integers >=0	18	31	51	74
length	$other	integers >=0	47	142	233	74

Specifying (*) means that we want a listing ordered by variable name.

```
. vl list (*)
```

Variable	Macro	Values	Levels
price	$vlcontinuous	integers >=0	74
price	$other	integers >=0	74
mpg	$vlcontinuous	integers >=0	21
mpg	not in vluser		21
rep78	$vlcategorical	integers >=0	5
rep78	not in vluser		5
headroom	$vlcontinuous	noninteger	
headroom	not in vluser		
trunk	$vlcontinuous	integers >=0	18
trunk	not in vluser		18
weight	$vlcontinuous	integers >=0	64
weight	$power	integers >=0	64
length	$vlcontinuous	integers >=0	47
length	$other	integers >=0	47
turn	$vlcontinuous	integers >=0	18
turn	$other	integers >=0	18
displacement	$vlcontinuous	integers >=0	31
displacement	$power	integers >=0	31
gear_ratio	$vlcontinuous	noninteger	
gear_ratio	$power	noninteger	
foreign	$vlcategorical	0 and 1	2
foreign	not in vluser		2

Variables are listed multiple times showing all the variable lists to which each belongs. We can restrict the listing to user-defined variable lists.

```
. vl list (*), user
```

Variable	Macro	Values	Levels
price	$other	integers >=0	74
mpg	not in vluser		21
rep78	not in vluser		5
headroom	not in vluser		
trunk	not in vluser		18
weight	$power	integers >=0	64
length	$other	integers >=0	47
turn	$other	integers >=0	18
displacement	$power	integers >=0	31
gear_ratio	$power	noninteger	
foreign	not in vluser		2

See the lines "`not in vluser`"? They are omitted if you run `vl list, user`.

Let's use `vl substitute` with factor-variable operators to create interactions between the variables in the system-defined variable list, `vlcategorical`, and the variables in our user-defined variable list, `mycontinuous`.

```
. vl substitute indepvars = i.vlcategorical##c.(power other)
```

The factor-variable list `indepvars` shows up when we run `vl dir`.

```
. vl dir
```

	Macro's contents	
Macro	# Vars	Description
System		
$vlcategorical	2	categorical variables
$vlcontinuous	9	continuous variables
$vluncertain	0	perhaps continuous, perhaps categorical variables
$vlother	0	all missing or constant variables
User		
$power	3	variables
$other	3	variables
$indepvars		factor-variable list

Factor-variable lists do not work with `vl list`. But you can display their contents because variable lists are global macros. You can list the contents of a variable list by typing

```
. display "$indepvars"
i.rep78 i.foreign gear_ratio weight displacement price turn length i.rep78#c.gear_r
> atio i.rep78#c.weight i.rep78#c.displacement i.rep78#c.price i.rep78#c.turn i.rep
> 78#c.length i.foreign#c.gear_ratio i.foreign#c.weight i.foreign#c.displacement i.
> foreign#c.price i.foreign#c.turn i.foreign#c.length
```

◁

Stored results

vl list stores the following in r():

Scalars	
r(k)	number of variables listed
r(k_system)	number of variables listed in system-defined variable lists
r(k_not_system)	number of variables listed not in system-defined variable lists
r(k_vlcategorical)	number of variables listed in vlcategorical
r(k_vlcontinuous)	number of variables listed in vlcontinuous
r(k_vluncertain)	number of variables listed in vluncertain
r(k_vlother)	number of variables listed in vlother
r(k_vldummy)	number of variables listed in vldummy when defined
r(k_user)	number of variables listed in user-defined variable lists
r(k_not_user)	number of variables listed not in user-defined variable lists
r(k_*vlusername*)	number of variables listed in *vlusername*
r(k_string)	number of string variables listed when strok specified
Macros	
r(vlsysnames)	names of all system-defined variable lists
r(vlusernames)	names of all user-defined variable lists

vl dir stores the following in r():

Scalars	
r(k_system)	number of variables in system-defined variable lists
r(k_vlcategorical)	number of variables in vlcategorical
r(k_vlcontinuous)	number of variables in vlcontinuous
r(k_vluncertain)	number of variables in vluncertain
r(k_vlother)	number of variables in vlother
r(k_vldummy)	number of variables in vldummy when defined
r(k_user)	number of variables in user-defined variable lists
r(k_*vlusername*)	number of variables in *vlusername*
Macros	
r(vlsysnames)	names of system-defined variable lists
r(vlusernames)	names of user-defined variable lists

Also see

[D] **vl** — Manage variable lists

[D] **vl create** — Create and modify user-defined variable lists

[D] **vl drop** — Drop variable lists or variables from variable lists

[D] **vl rebuild** — Rebuild variable lists

[D] **vl set** — Set system-defined variable lists

vl rebuild — Rebuild variable lists

Description   Quick start   Syntax   Remarks and examples   Stored results   Also see

Description

`vl rebuild` restores system-defined and user-defined variable lists. After loading a dataset with `use`, run `vl rebuild`.

After using `merge` or `append`, run `vl rebuild` to merge variable lists. You only need to run `vl rebuild` when the using dataset has variable lists.

After dropping variables with `drop`, run `vl rebuild` to remove the dropped variables from all variable lists.

After modifying variable lists with `vl modify` or `vl move`, run `vl rebuild` to update variable lists created by `vl substitute`.

And if you are confused, know that it never hurts to run `vl rebuild`.

For an introduction to the `vl` commands, see [D] **vl**.

Quick start

Restore variable lists after loading a dataset with `use`

    vl rebuild

After running `merge` when the using dataset has variable lists, merge its variable lists into those in the master dataset

    vl rebuild

After dropping variables with `drop`, remove the dropped variables from all variable lists

    vl rebuild

Update a variable list created by `vl substitute` after modifying any of its component variable lists

    vl rebuild

Syntax

`vl rebuild`

`collect` is allowed; see [U] **11.1.10 Prefix commands**.

Remarks and examples

Remarks are presented under the following headings:

Reloading datasets

System-defined and user-defined variable lists are saved with the dataset. However, they are not automatically restored when you reload the data. Just type `vl rebuild` to restore them.

```
. use ...
. vl rebuild
```

Merging datasets

Another time when `vl rebuild` is needed is when a `merge` is done and the `using` dataset has variable lists.

```
. merge ... using filename
. vl rebuild
```

Only when *filename* has variable lists is it necessary to run `vl rebuild`. When both the master dataset in memory and *filename* have variable lists, `vl rebuild` merges them. When the master dataset has variable lists but *filename* does not, there is no need to run `vl rebuild`. However, running `vl rebuild` is always harmless.

Dropping variables

When you drop variables from the data in memory using `drop`, the dropped variables are not automatically removed from variable lists. They can be explicitly removed by using `vl drop`.

```
. drop varlist
. vl drop (varlist)
```

Instead of running `vl drop` with the list of variables that were dropped, you can simply type

```
. vl rebuild
```

It will do the same thing, and you do not have to remember the names of the variables that were dropped.

If you drop or add observations or change any of the values of variables in variable lists, `vl rebuild` does not update the stored variable statistics, namely, the number of levels, the minimum and maximum values, and the number of nonmissing observations. If you want to update these statistics without changing the system-defined classifications, type

```
. vl set, update
```

If you want to update the statistics and redo the system-defined classifications for all variables, type

```
. vl set, clear
```

See [D] **vl set**.

vl substitute and vl rebuild

`vl rebuild` has another important use. It will update variable lists created by `vl substitute`.

For example, we created two user-defined variable lists:

```
. vl create myfactors = (x1 x2 x3)
. vl create mycontinuous = (c1 c2 c3 c4 c5)
```

Then we created a variable list using factor-variable operators:

```
. vl substitute myinteraction = i.myfactors##c.mycontinuous
```

If we modify `mycontinuous`,

```
. vl modify mycontinuous = mycontinuous - (c3)
```

then the global macro `$myinteraction` for the variable list `myinteraction` remains unchanged.

Running

```
. vl rebuild
```

updates the global macro `$myinteraction`.

Again, if you make any changes to your data or to your variable lists, and you want to make sure everything is set properly and up to date, just type

```
. vl rebuild
```

Characteristics

Advanced Stata users will likely guess how variable lists and variable statistics are stored with the dataset. They are stored as characteristics. If you want to see them, type

```
. char list
```

See [P] **char**.

Stored results

`vl rebuild` stores the following in `r()`:

Scalars

`r(k_system)`	number of variables in system-defined variable lists
`r(k_vlcategorical)`	number of variables in `vlcategorical`
`r(k_vlcontinuous)`	number of variables in `vlcontinuous`
`r(k_vluncertain)`	number of variables in `vluncertain`
`r(k_vlother)`	number of variables in `vlother`
`r(k_vldummy)`	number of variables in `vldummy` when defined
`r(k_user)`	number of variables in user-defined variable lists
`r(k_`*vlusername*`)`	number of variables in *vlusername*

Macros

`r(vlsysnames)`	names of system-defined variable lists
`r(vlusernames)`	names of user-defined variable lists

Also see

[D] **vl** — Manage variable lists

[D] **vl create** — Create and modify user-defined variable lists

[D] **vl drop** — Drop variable lists or variables from variable lists

[D] **vl list** — List contents of variable lists

[D] **vl set** — Set system-defined variable lists

vl set — Set system-defined variable lists

Description Quick start Syntax Options Remarks and examples
Stored results Also see

Description

`vl set` is designed to identify variables that are to be treated as factor variables in Stata's estimation commands.

`vl set` creates the system-defined variable lists `vlcategorical`, `vlcontinuous`, `vluncertain`, and `vlother`. Variables are placed in them based on their values (integer or noninteger, all nonnegative, etc.) and default or user-specified cutoffs for the number of levels in a variable.

`vl move` moves variables from one classification to another.

Variable lists are actually global macros, and they are saved with the dataset. See [D] **vl rebuild**.

For an introduction to the `vl` commands, see [D] **vl**.

Quick start

Classify all numeric variables in the dataset

```
vl set
```

Same as above, and include a `vldummy` classification for 0/1 variables

```
vl set, dummy
```

Classify all numeric variables in the dataset, and list each variable as it is classified

```
vl set, list
```

Put nonnegative integer variables with 6 or fewer categories into `vlcategorical`; put nonnegative integer variables with 7–20 categories into `vluncertain`; put nonnegative integer variables with more than 20 categories into `vlcontinuous`

```
vl set, categorical(6) uncertain(20)
```

Classify only the variables `x1-x100`

```
vl set x1-x100
```

Discard the existing classifications, and classify all numeric variables again

```
vl set, clear
```

Redo the classification of the variable `age`

```
vl set age, redo
```

Update the stored statistics for the variable `age`, but do not change its classification

```
vl set age, update
```

Move the variables `x8` and `x20` out of their current classification and into `vlcategorical`

```
vl move (x8 x20) vlcategorical
```

Move all the variables in `vluncertain` into `vlcontinuous`

```
vl move vluncertain vlcontinuous
```

Syntax

Create system-defined variable lists

`vl set` [*varlist*] [, *options*]

Move variables from their current system-defined variable list to another

`vl move (`*varlist*`)` *vlsysname*

Move all variables in one system-defined variable list to another

`vl move` *vlsysname1 vlsysname2*

varlist contains only numeric variables. If not specified, then all numeric variables in the dataset are classified.

options	Description
`categorical(#)`	upper limit for the number of categories in `vlcategorical`
`uncertain(#)`	upper limit for the number of categories in `vluncertain`
`dummy`	create variable list `vldummy` containing 0/1 variables
`list`[`(`*list_options*`)`]	list variables as they are classified
`clear`	discard all existing classifications and make new classifications
`redo`	redo classifications for variables in *varlist*
`update`	update stored statistics for variables in *varlist*, but do not change their classification
`nonotes`	suppress the notes below the summary table

`collect` is allowed with `vl set`; see **[U] 11.1.10 Prefix commands**.

Options

`categorical(#)` specifies that variables containing nonnegative integers be put into the `vlcategorical` variable list when the number of levels is between 2 and # inclusive. Variables with only one level (that is, constants) are put into the `vlother` variable list. The default is `categorical(10)`.

`categorical(.)` can be specified to set the upper limit effectively to infinity. That is, all variables containing nonnegative integers (whose values are less than $2^{31} = 2{,}147{,}483{,}648$) are put into `vlcategorical`. Setting # to `.` or a large value can slow computation time considerably when the number of observations is extremely large.

`uncertain(#)` specifies that variables containing nonnegative integers be put into the `vluncertain` variable list when the number of levels are between `categorical(#)` + 1 and # inclusive. The default is `uncertain(100)`.

must be ≥ `categorical(#)`. To omit the `vluncertain` classification, set
= `categorical(#)` or specify `uncertain(0)`.

`uncertain(.)` can be specified to set the upper limit effectively to infinity. That is, all variables containing nonnegative integers (whose values are less than $2^{31} = 2{,}147{,}483{,}648$) with more than `categorical(#)` levels are put into `vluncertain`. Setting # to `.` or a large value can slow computation time considerably when the number of observations is extremely large.

dummy specifies that a vldummy variable list be created containing 0/1 variables. By default, 0/1 variables are put into vlcategorical.

list[(*list_options*)] lists variables as they are classified. The classification is shown as well as the number of levels for variables in vlcategorical and vluncertain. *list_options* are as follows:

minimum shows the minimum value of each variable;

maximum shows the maximum value of each variable; and

observations shows the number of nonmissing values of each variable.

The same listing can be obtained using vl list after running vl set.

clear specifies that all the system-defined variable lists (if any) be dropped and the classifications redone. It is equivalent to running vl clear, system and then running vl set.

redo specifies that the classifications be redone for the variables in *varlist*. It is equivalent to running vl drop (*varlist*), system and then running vl set *varlist*.

update specifies that all statistics (number of levels, minimum value, maximum value, and number of nonmissing observations) that are saved for the variables in *varlist* be updated but the classifications of the variables not be changed. update is intended for use when observations are added to or dropped from the data and you want the classifications to remain unchanged.

nonotes specifies that the notes at the bottom of the summary table not be displayed. By default, the notes are shown.

Remarks and examples

vl set creates the system-defined variable lists vlcategorical, vlcontinuous, vluncertain, and vlother.

The vlcategorical variable list is intended for variables that will be used as factor variables in estimation commands.

The vlcontinuous variable list is intended for variables that will be used as continuous variables in estimation commands.

The vluncertain variable list is intended for variables that we may want to treat as factors or as continuous, and we will decide which on a case-by-case basis. As we decide, we use vl move to move them out of vluncertain and into vlcategorical or vlcontinuous. For example, we decide we want variable q31, currently in vluncertain, to be a factor variable. We type

```
. vl move (q31) vlcategorical
```

In the above, note that q31 is enclosed in parentheses. *varlist*s must always be enclosed in parentheses in vl move.

When q31 is moved into vlcategorical, it is automatically moved out of vluncertain. The system-defined variable lists are always kept as disjoint sets. That is, a variable can only appear in one system-defined variable list. User-defined variable lists can be made to be overlapping. See [D] **vl create** and [D] **vl**.

Suppose we look at the remaining variables in `vluncertain`, and we decide that they all should be treated as continuous. We type

```
. vl move vluncertain vlcategorical
```

Suppose we look at the remaining variables in `vluncertain`, and we decide we do not want any of them in any of the estimation commands we wish to run. We could move them to `vlother`.

```
. vl move vluncertain vlother
```

`vlother` is intended to be a garbage classification for variables you do not want to use in estimation commands. `vl set` puts variables that are constant and variables that are missing for all observations into `vlother`.

Suppose, however, we simply want some variables gone from the system-defined variable lists. We do not want them shown when we do a `vl list`. To make them gone, gone, gone, use `vl drop`.

```
. vl drop (varlist), system
```

This removes the variables in *varlist* from the system-defined variable lists.

We can also

```
. vl drop vluncertain
```

This removes all the variables in `vluncertain`. `vluncertain` still exists, but it is empty. We can still move other variables into it if we want. System-defined variable lists always exist although they may be empty. They cannot be renamed. If you do not like this behavior, you can create your own variable lists using `vl create`. For example,

```
. vl create mycat = vlcategorical
. vl create mycont = vlcontinuous
```

If you are done using the system-defined variable lists and do not want them around, you can remove them by typing

```
. vl clear, system
```

The system-defined variable lists will be gone, but user-defined variable lists will remain. When you clear the system-defined variable lists, you also erase the statistics that are stored with each variable in the system.

When `vl set` runs, it calculates the minimum, maximum, and number of nonmissing observations for each variable. It also computes the number of levels for the variables in `vlcategorical` and `vluncertain`. It does not compute the number of levels for other variables. That is why `vl set` is so fast even when there are millions of observations.

Computing the exact number of levels when there are thousands of levels can be time consuming. You can have `vl set` compute the number of levels for more variables by specifying the option `uncertain(#)` and setting # to a large number or missing (`.`). But expect it to be much slower when there are lots of observations.

To use variable lists with other Stata commands, type $ in front of the variable-list name. Remember: With the `vl` commands, do not use $. With other Stata commands, use $.

```
. display "$vlcategorical"
. summarize $vlcontinuous
. regress y i.($vlcategorical) $vlcontinuous
```

If you know Stata, you will have already sensed that variable lists are global macros.

In this example, we used `i.($vlcategorical)` to turn the variables in `vlcategorical` into factor variables. More likely, however, you will want to create your own variable lists based on the system-defined variable lists, and then apply factor-variable operators. The `vl create`, `vl modify`, and `vl substitute` commands were designed for this purpose. See [D] **vl create**.

Variable lists are saved with the dataset. Not only are variable lists saved but also all the `vl` system information and variable statistics are saved. To make the `vl` system come back to life in the state we last had it, after we `use` a dataset, we type

```
. vl rebuild
```

See [D] **vl rebuild**.

For examples of using `vl set` and its options, see [D] **vl**.

Stored results

`vl set` stores the following in `r()`:

Scalars

`r(k_system)`	number of variables in system-defined variable lists
`r(k_vlcategorical)`	number of variables in `vlcategorical`
`r(k_vlcontinuous)`	number of variables in `vlcontinuous`
`r(k_vluncertain)`	number of variables in `vluncertain`
`r(k_vlother)`	number of variables in `vlother`
`r(k_vldummy)`	number of variables in `vldummy` when defined

Macros

`r(vlsysnames)`	names of system-defined variable lists

Also see

[D] **vl** — Manage variable lists

[D] **vl create** — Create and modify user-defined variable lists

[D] **vl drop** — Drop variable lists or variables from variable lists

[D] **vl list** — List contents of variable lists

[D] **vl rebuild** — Rebuild variable lists

webuse — Use dataset from Stata website

Description

`webuse` *filename* loads the specified dataset, obtaining it over the web. By default, datasets are obtained from https://www.stata-press.com/data/r19/. If *filename* is specified without a suffix, `.dta` is assumed.

`webuse query` reports the URL from which datasets will be obtained.

`webuse set` allows you to specify the URL to be used as the source for datasets. `webuse set` without arguments resets the source to https://www.stata-press.com/data/r19/.

You can see lists of available dataset names for each manual in your browser at https://www.stata-press.com/data/r19/ or from within Stata at `help dta_manuals`.

Quick start

Load example `nlswork.dta` dataset from default Stata Press website

```
webuse nlswork
```

Same as above, but clear current dataset from memory first

```
webuse nlswork, clear
```

Change URL for data downloads to http://www.myuniversity.edu/mycourse

```
webuse set www.myuniversity.edu/mycourse
```

Reset source for datasets to Stata Press

```
webuse set
```

Report current URL from which datasets will be obtained

```
webuse query
```

Menu

File > Example datasets...

Syntax

Load dataset over the web

webuse ["]*filename*["] [, clear]

Report URL from which datasets will be obtained

webuse query

Specify URL from which dataset will be obtained

webuse set [https://]*url*[/]

webuse set [http://]*url*[/]

Reset URL to default

webuse set

Option

clear specifies that it is okay to replace the data in memory, even though the current data have not been saved to disk.

Remarks and examples

Remarks are presented under the following headings:

Typical use

In the examples in the Stata manuals, we see things such as

```
. use https://www.stata-press.com/data/r19/lifeexp
```

The above is used to load—in this instance—the dataset lifeexp.dta. You can type that, and it will work:

```
. use https://www.stata-press.com/data/r19/lifeexp
(Life expectancy, 1998)
```

Or you may simply type

```
. webuse lifeexp
(Life expectancy, 1998)
```

webuse is a synonym for use https://www.stata-press.com/data/r19/.

A note concerning example datasets

The datasets used to demonstrate Stata are often fictional. If you want to know whether a dataset is real or fictional, and its history, load the dataset and type

```
. notes
```

A few datasets have no notes. This means that the datasets are believed to be real but that they were created so long ago that information about their original source has been lost. Treat such datasets as if they were fictional.

Redirecting the source

By default, `webuse` obtains datasets from https://www.stata-press.com/data/r19/, but you can change that. Say that the site http://www.zzz.edu/users/~sue/ has several datasets that you wish to explore. You can type

```
. webuse set http://www.zzz.edu/users/~sue
```

`webuse` will become a synonym for `use http://www.zzz.edu/users/~sue/` for the rest of the session or until you give another `webuse` command.

When you set the URL, you may omit the trailing slash (as we did above), or you may include it:

```
. webuse set http://www.zzz.edu/users/~sue/
```

You may also omit `https://` or `http://`:

```
. webuse set www.zzz.edu/users/~sue
```

If you type `webuse set` without arguments, the URL will be reset to the default, https://www.stata-press.com/data/r19/:

```
. webuse set
```

Also see

[D] **frames use** — Load a set of frames from disk

[D] **sysuse** — Use shipped dataset

[D] **use** — Load Stata dataset

[U] **1.2.2 Example datasets**

xpose — Interchange observations and variables

Description Quick start Menu Syntax
Options Remarks and examples Reference Also see

Description

xpose transposes the data, changing variables into observations and observations into variables. All new variables—that is, those created by the transposition—are made the default storage type. Thus any original variables that were strings will result in observations containing missing values. (If you transpose the data twice, you will lose the contents of string variables.)

Quick start

Replace dataset in memory with transposed variables and observations

```
xpose, clear
```

Add _varname containing the original variable names

```
xpose, clear varname
```

Use the most compact data type that preserves accuracy in the transposed data

```
xpose, clear promote
```

Menu

Data > Create or change data > Other variable-transformation commands > Interchange observations and variables

Syntax

`xpose , clear [options]`

options	Description
* clear	reminder that untransposed data will be lost if not previously saved
format	use largest numeric display format from untransposed data
format(%*fmt*)	apply specified format to all variables in transposed data
varname	add variable _varname containing original variable names
promote	use the most compact data type that preserves numeric accuracy

* clear is required.

xpose does not allow alias variables; see [D] **frunalias** for advice on how to get around this restriction.

Options

clear is required and is supposed to remind you that the untransposed data will be lost (unless you have saved the data previously).

format specifies that the largest numeric display format from your untransposed data be applied to the transposed data.

format(%*fmt*) specifies that the specified numeric display format be applied to all variables in the transposed data.

varname adds the new variable _varname to the transposed data containing the original variable names. Also, with or without the varname option, if the variable _varname exists in the dataset before transposition, those names will be used to name the variables after transposition. Thus transposing the data twice will (almost) yield the original dataset.

promote specifies that the transposed data use the most compact numeric data type that preserves the original data accuracy.

If your data contain any variables of type double, all variables in the transposed data will be of type double.

If variables of type float are present, but there are no variables of type double or long, the transposed variables will be of type float. If variables of type long are present, but there are no variables of type double or float, the transposed variables will be of type long.

Remarks and examples

▷ Example 1

We have a dataset on something by county and year that contains

```
. use https://www.stata-press.com/data/r19/xposexmpl
. list
```

	county	year1	year2	year3
1.	1	57.2	11.3	19.5
2.	2	12.5	8.2	28.9
3.	3	18	14.2	33.2

Each observation reflects a county. To change this dataset so that each observation reflects a year, type

```
. xpose, clear varname
. list
```

	v1	v2	v3	_varname
1.	1	2	3	county
2.	57.2	12.5	18	year1
3.	11.3	8.2	14.2	year2
4.	19.5	28.9	33.2	year3

We would now have to drop the first observation (corresponding to the previous county variable) to make each observation correspond to one year. Had we not specified the `varname` option, the variable `_varname` would not have been created. The `_varname` variable is useful, however, if we want to transpose the dataset back to its original form.

```
. xpose, clear
. list
```

	county	year1	year2	year3
1.	1	57.2	11.3	19.5
2.	2	12.5	8.2	28.9
3.	3	18	14.2	33.2

◁

Reference

Baum, C. F. 2016. *An Introduction to Stata Programming*. 2nd ed. College Station, TX: Stata Press.

Also see

[D] **frunalias** — Change storage type of alias variables

[D] **reshape** — Convert data from wide to long form and vice versa

[D] **stack** — Stack data

zipfile — Compress and uncompress files and directories in zip archive format

Description

`zipfile` compresses files and directories into a zip file that is compatible with Zip64, WinZip, PKZIP 2.04g, and other applications that use the zip archive format.

`unzipfile` extracts files and directories from a file in zip archive format into the current directory. `unzipfile` can open zip files created by Zip64, WinZip, PKZIP 2.04g, and other applications that use the zip archive format.

Quick start

Compress `mydata.dta` and save as `myproject.zip`

```
zipfile mydata.dta, saving(myproject)
```

Same as above, but also compress `mydofile.do` and `mylog.smcl`

```
zipfile mydata.dta mydofile.do mylog.smcl, saving(myproject)
```

Replace `myproject.zip` if it already exists

```
zipfile mydata.dta mydofile.do mylog.smcl, ///
  saving(myproject, replace)
```

Compress all files in the `myproject` subdirectory of the current directory

```
zipfile myproject/*, saving(myproject)
```

Extract files and directories from `myzip.zip` to the current directory

```
unzipfile myzip
```

Same as above, but replace any file or directory in the current directory that has the same name as a file or directory in the zip file

```
unzipfile myzip, replace
```

Syntax

Add files or directories to a zip file

zipfile *file* | *directory* [*file* | *directory*] ..., saving(*zipfilename*[, replace])
[complevel(#)]

Extract files or directories from a zip file

unzipfile *zipfilename* [, replace
ifilter(includefilter) efilter(excludefilter)]

Note: Double quotes must be used to enclose *file* and *directory* if the name or path contains blanks. *file* and *directory* may also contain the ? and * wildcard characters.

Options for zipfile

saving(*zipfilename*[, replace]) specifies the filename to be created or replaced. If *zipfilename* is specified without an extension, .zip will be assumed. saving() is required.

complevel(#) sets the compression level for the zipfile. # is an integer from 0, meaning no compression, to 9, meaning full compression. The default is complevel(6).

Options for unzipfile

replace overwrites any file or directory in the current directory with the files or directories in the zip file that have the same name.

ifilter(*includefilter*) limits the extracted files by including only those files that match the specified pattern. Pattern matching is based on java.util.regex.Pattern.

efilter(*excludefilter*) limits the extracted files by excluding all files that match the specified pattern. Pattern matching is based on java.util.regex.Pattern.

Remarks and examples

▷ Example 1: Creating a zip file

Suppose that we would like to zip all the .dta files in the current directory into the file myfiles.zip. We would type

```
. zipfile *.dta, saving(myfiles)
```

But we notice that we did not want the files in the current directory; instead, we wanted the files in the dta, abc, and eps subdirectories. We can easily zip all the .dta files from all three-character subdirectories of the current directory and overwrite the file myfiles.zip if it exists by typing

```
. zipfile ???/*.dta, saving(myfiles, replace)
```

◁

▷ Example 2: Unzipping a zip file

Say, for example, we send `myfiles.zip` to a colleague, who now wants to unzip the file in the current directory, overwriting any files or directories that have the same name as the files or directories in the zip file. The colleague should type

```
. unzipfile myfiles, replace
```

◁

Stored results

`zipfile` stores the following in `r()`:

Scalars

`r(archived)`	number of files compressed
`r(skipped)`	number of files skipped
`r(total)`	number of files processed
`r(compressed_size)`	size of compressed file
`r(processed_size)`	combined size of all processed files
`r(compression_ratio)`	ratio of compressed size to uncompressed size

`unzipfile` stores the following in `r()`:

Scalars

`r(extracted)`	number of files extracted
`r(skipped)`	number of files skipped
`r(total)`	number of files contained in zip file

Glossary

ASCII. ASCII stands for American Standard Code for Information Interchange. It is a way of representing text and the characters that form text in computers. It can be divided into two sections: plain, or lower, ASCII, which includes numbers, punctuation, plain letters without diacritical marks, whitespace characters such as space and tab, and some control characters such as carriage return; and extended ASCII, which includes letters with diacritical marks as well as other special characters.

Before Stata 14, datasets, do-files, ado-files, and other Stata files were encoded using ASCII.

binary 0. Binary 0, also known as the null character, is traditionally used to indicate the end of a string, such as an ASCII or UTF-8 string.

Binary 0 is obtained by using `char(0)` and is sometimes displayed as `\0`. See **[U] 12.4.10 strL variables and binary strings** for more information.

binary string. A binary string is, technically speaking, any string that does not contain text. In Stata, however, a string is only marked as binary if it contains binary 0, or if it contains the contents of a file read in using the `fileread()` function, or if it is the result of a string expression containing a string that has already been marked as binary.

In Stata, `strL` variables, string scalars, and Mata strings can store binary strings.

See **[U] 12.4.10 strL variables and binary strings** for more information.

byte. Formally, a byte is eight binary digits (bits), the units used to record computer data. Each byte can also be considered as representing a value from 0 through 255. Do not confuse this with Stata's `byte` variable storage type, which allows values from -127 to 100 to be stored. With regard to strings, all strings are composed of individual characters that are encoded using either one byte or several bytes to represent each character.

For example, in UTF-8, the encoding system used by Stata, byte value 97 encodes "a". Byte values 195 and 161 in sequence encode "á".

characteristics. Characteristics are one form of metadata about a Stata dataset and each of the variables within the dataset. They are typically used in programming situations. For example, the xt commands need to know the name of the panel variable and possibly the time variable. These variable names are stored in characteristics within the dataset. See **[U] 12.8 Characteristics** for an overview and [P] **char** for a technical description.

code pages. A code page maps extended ASCII values to a set of characters, typically for a specific language or set of languages. For example, the most commonly used code page is Windows-1252, which maps extended ASCII values to characters used in Western European languages. Code pages are essentially encodings for extended ASCII characters.

code point. A code point is the numerical value or position that represents a single character in a text system such as ASCII or Unicode. The original ASCII encoding system contains only 128 code points and thus can represent only 128 characters. Historically, the 128 additional bytes of extended ASCII have been encoded in many different and inconsistent ways to provide additional sets of 128 code points. The formal Unicode specification has 1,114,112 possible code points, of which roughly 250,000 have been assigned to actual characters. Stata uses UTF-8 encoding for Unicode. Note that the UTF-8–encoded version of a code point does not have the same numeric value as the code point itself.

display column. A display column is the space required to display one typical character in the fixed-width display used by Stata's Results window and Viewer. Some characters are too wide for one display column. Each character is displayed in one or two display columns.

All plain ASCII characters (for example, "M" and "9") and many UTF-8 characters that are not plain ASCII (for example, "é") require the same space when using a fixed-width font. That is to say, they all require a single display column.

Characters from non-Latin alphabets, such as Chinese, Cyrillic, Japanese, and Korean, may require two display columns.

See **[U] 12.4.2.2 Displaying Unicode characters** for more information.

display format. The display format for a variable specifies how the variable will be displayed by Stata. For numeric variables, the display format would indicate to Stata how many digits to display, how many decimal places to display, whether to include commas, and whether to display in exponential format. Numeric variables can also be formatted as dates. For strings, the display format indicates whether the variable should be left-aligned or right-aligned in displays and how many characters to display. Display formats may be specified by the `format` command. Display formats may also be used with individual numeric or string values to control how they are displayed. Distinguish display formats from storage types.

encodings. An encoding is a way of representing a character as a byte or series of bytes. Examples of encoding systems are ASCII and UTF-8. Stata uses UTF-8 encoding.

For more information, see **[U] 12.4.2.3 Encodings**.

extended ASCII. Extended ASCII, also known as higher ASCII, is the byte values 128 to 255, which were not defined as part of the original ASCII specification. Various code pages have been defined over the years to map the extended ASCII byte values to many characters not supported in the original ASCII specification, such as Latin letters with diacritical marks, such as "á" and "Á"; non-Latin alphabets, such as Chinese, Cyrillic, Japanese, and Korean; punctuation marks used in non-English languages, such as "<", complex mathematical symbols such as "±", and more.

Although extended ASCII characters are stored in a single byte in ASCII encoding, UTF-8 stores the same characters in two to four bytes. Because each code page maps the extended ASCII values differently, another distinguishing feature of extended ASCII characters is that their meaning can change across fonts and operating systems.

frames. Frames, also known as data frames, are in-memory areas where datasets are analyzed. Stata can hold multiple datasets in memory, and each dataset is held in a memory area called a frame. A variety of commands exist to manage frames and manipulate the data in them. See [D] **frames**.

hexadecimal. The hexadecimal number system, or simply hex, is a base-16 number system represented by digits 0 through 9 and letters A through F.

higher ASCII. See *extended ASCII*.

locale. A locale is a code that identifies a community with a certain set of rules for how their language should be written. A locale can refer to something as general as an entire language (for example, "en" for English) or something as specific as a language in a particular country (for example, "en_HK" for English in Hong Kong).

A locale specifies a set of rules that govern how the language should be written. Stata uses locales to determine how certain language-specific operations are carried out. For more information, see **[U] 12.4.2.4 Locales in Unicode**.

long format and wide format. Think of a dataset as having an ID variable, i, and a variable, j, whose values denote a subobservation. For instance, a person might be the i variable, and a year might be the j variable, so you have information about a set of people across several years. If this information is organized such that the j variable is explicitly specified, then the data are in long format; otherwise, they are in wide format. For instance,

```
id    year   income
 1    1980    10000
 1    1981    12000
 1    1982    11000
 2    1980    15000
 2    1981    14000
 2    1982    17000
```

are in long format because the j variable, `year`, is explicitly specified. In the following, the data are in wide format:

```
id  income1980   income1981   income1982
 1       10000        12000        11000
 2       15000        14000        17000
```

See [D] **reshape** for how to go between long and wide format.

lower ASCII. See *plain ASCII*.

null-terminator. See *binary 0*.

numlist. A numlist is a list of numbers. That list can be one or more arbitrary numbers or can use certain shorthands to indicate ranges, such as `5/9` to indicate integers 5, 6, 7, 8, and 9. Ranges can be ascending or descending and can include an optional increment or decrement amount, such as `10.5(-2)4.5` to indicate 10.5, 8.5, 6.5, and 4.5. See [U] **11.1.8 numlist** for a list of shorthands to indicate ranges.

plain ASCII. We use plain ASCII as a nontechnical term to refer to what computer programmers call lower ASCII. These are the plain Latin letters "a" to "z" and "A" to "Z"; numbers "0" through "9"; many punctuation marks, such as "!"; simple mathematical symbols, such as "+"; and whitespace and control characters such as space (" "), tab, and carriage return.

Each plain ASCII character is stored as a single byte with a value between 0 and 127. Another distinguishing feature is that the byte values used to encode plain ASCII characters are the same across different operating systems and are common between ASCII and UTF-8.

Also see *ASCII* and *encodings*.

prefix command. A prefix command is a command in Stata that prefixes other Stata commands. For example, `by` *varlist*`:`. The command `by region: summarize marriage_rate divorce_rate` would summarize `marriage_rate` and `divorce_rate` for each region separately. See [U] **11.1.10 Prefix commands**.

storage types. A storage type is how Stata stores a variable. The numeric storage types in Stata are `byte`, `int`, `long`, `float`, and `double`. There is also a `string` storage type. The storage type is specified before the variable name when a variable is created. See [U] **12.2.2 Numeric storage types**, [U] **12.4 Strings**, and [D] **Data types**. Distinguish storage types from display formats.

str1, **str2**, ..., **str2045**. See *strL*.

strL. `strL` is a storage type for string variables. The full list of string storage types is `str1`, `str2`, ..., `str2045`, and `strL`.

str1, str2, ..., str2045 are fixed-length storage types. If variable mystr is str8, then 8 bytes are allocated in each observation to store mystr's value. If you have 2,000 observations, then 16,000 bytes in total are allocated.

Distinguish between storage length and string length. If myvar is str8, that does not mean the strings are 8 characters long in every observation. The maximum length of strings is 8 characters. Individual observations may have strings of length 0, 1, ..., 8. Even so, every string requires 8 bytes of storage.

You need not concern yourself with the storage length because string variables are automatically promoted. If myvar is str8, and you changed the contents of myvar in the third observation to "Longer than 8", then myvar would automatically become str13.

If you changed the contents of myvar in the third observation to a string longer than 2,045 characters, myvar would become strL.

strL variables are not necessarily longer than 2,045 characters; they can be longer or shorter than 2,045 characters. The real difference is that strL variables are stored as varying length. Pretend that myothervar is a strL and its third observation contains "this". The total memory consumed by the observation would be $64 + 4 + 1 = 69$ bytes. There would be 64 bytes of tracking information, 4 bytes for the contents (there are 4 characters), and 1 more byte to terminate the string. If the fifth observation contained a 2,000,000-character string, then $64 + 2{,}000{,}000 + 1 = 2{,}000{,}069$ bytes would be used to store it.

Another difference between str1, str2, ..., str2045, and strLs is that the str# storage types can store only ASCII strings. strL can store ASCII or binary strings. Thus a strL variable could contain, for instance, the contents of a Word document or a JPEG image or anything else.

strL is pronounce *sturl*.

titlecase, **title-cased string**, and **Unicode title-cased string**. In grammar, titlecase refers to the capitalization of the key words in a phrase. In Stata, titlecase refers to (a) the capitalization of the first letter of each word in a string and (b) the capitalization of each letter after a nonletter character. There is no judgment of the word's importance in the string or whether the letter after a nonletter character is part of the same word. For example, "it's" in titlecase is "It'S".

A title-cased string is any string to which the above rules have been applied. For example, if we used the strproper() function with the book title *Zen and the Art of Motorcycle Maintenance*, Stata would return the title-cased string Zen And The Art Of Motorcycle Maintenance.

A Unicode title-cased string is a string that has had Unicode title-casing rules applied to Unicode words. This is almost, but not exactly, like capitalizing the first letter of each Unicode word. Like capitalization, title-casing letters is locale-dependent, which means that the same letter might have different titlecase forms in different locales. For example, in some locales, capital letters at the beginning of words are not supposed to have accents on them, even if that capital letter by itself would have an accent.

If you do not have characters beyond plain ASCII and your locale is English, there is no distinction in results. For example, ustrtitle() with an English locale locale also would return the title-cased string Zen And The Art Of Motorcycle Maintenance.

Use the ustrtitle() function to apply the appropriate capitalization rules for your language (locale).

Unicode. Unicode is a standard for encoding and dealing with text written in almost any conceivable living or dead language. Unicode specifies a set of encoding systems that are designed to hold (and, unlike extended ASCII, to keep separate) characters used in different languages. The Unicode standard defines not only the characters and encodings for them, but also rules on how to perform various operations on words in a given language (locale), such as capitalization and ordering. The most common Unicode encodings are mUTF-8, UTF-16, and UTF-32. Stata uses UTF-8.

Unicode character. Technically, a Unicode character is any character with a Unicode encoding. Colloquially, we use the term to refer to any character other than the plain ASCII characters.

Unicode normalization. Unicode normalization allows us to use a common representation and therefore compare Unicode strings that appear the same when displayed but could have more than one way of being encoded. This rarely arises in practice, but because it is possible in theory, Stata provides the `ustrnormalize()` function for converting between different normalized forms of the same string.

For example, suppose we wish to search for "ñ" (the lowercase n with a tilde over it from the Spanish alphabet). This letter may have been encoded with the single code point U+00F1. However, the sequence U+006E (the Latin lowercase "n") followed by U+0303 (the tilde) is defined by Unicode to be equivalent to U+00F1. This type of visual identicalness is called canonical equivalence. The one-code-point form is known as the canonical composited form, and the multiple-code-point form is known as the canonical decomposed form. Normalization modifies one or the other string to the opposite canonical equivalent form so that the underlying byte sequences match. If we had strings in a mixture of forms, we would want to use this normalization when sorting or when searching for strings or substrings.

Another form of Unicode normalization allows characters that appear somewhat different to be given the same meaning or interpretation. For example, when sorting or indexing, we may want the code point U+FB00 (the typographic ligature "ﬀ") to match the sequence of two Latin "f" letters encoded as U+0066 U+0066. This is called compatible equivalence.

Unicode title-cased string. See *titlecase, title-cased string, and Unicode title-cased string*.

UTF-8. UTF-8 stands for Universal character set + Transformation Format—8-bit. It is a type of Unicode encoding system that was designed for backward compatibility with ASCII and is used by Stata 14.

value label. A value label defines a mapping between numeric data and the words used to describe what those numeric values represent. So, the variable disease might have a value label status associated with it that maps 1 to positive and 0 to negative. See **[U] 12.6.3 Value labels**.

varlist. A varlist is a list of variables that observe certain conventions: variable names may be abbreviated; the asterisk notation can be used as a shortcut to refer to groups of variables, such as `income*` or `*1995` to refer to all variable names beginning with `income` or all variable names ending in `1995`, respectively; and a dash may be used to indicate all variables stored between the two listed variables, for example, `mpg-weight`. See **[U] 11.4 varname and varlists**.

wide format. See *long and wide format*.

Subject and author index

See the combined subject index and the combined author index in the *Stata Index*.