Title

cumul — Cumulative distribution

Description

cumul creates *newvar*, defined as the empirical cumulative distribution function of *varname*.

Quick start

Create new variable ecd containing the empirical cumulative distribution of v

```
cumul v, gen(ecd)
```

Use frequency as the unit for v to generate ecdf

```
cumul v, gen(ecdf) freq
```

Give equal values of v the same value in generated ecde

```
cumul v, gen(ecde) equal
```

Graph the empirical cumulative distribution of v

```
line ecd v, sort
```

Graph the distributions of variables v1 and v2

```
cumul v1, gen(ecd1) equal
cumul v2, gen(ecd2) equal
stack ecd1 v1 ecd2 v2, into(ecd v) wide clear
line ecd1 ecd2 v, sort
```

Menu

Statistics > Summaries, tables, and tests > Distributional plots and tests > Generate cumulative distribution

1

Syntax

> cumul *varname* [*if*] [*in*] [*weight*] , <u>g</u>enerate(*newvar*) [*options*]

options	Description
Main	
* <u>g</u>enerate(*newvar*)	create variable *newvar*
<u>f</u>req	use frequency units for cumulative
equal	generate equal cumulatives for tied values

* generate(*newvar*) is required.

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

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

Options

> ┌─── Main ───

generate(*newvar*) is required. It specifies the name of the new variable to be created.

freq specifies that the cumulative be in frequency units; otherwise, it is normalized so that *newvar* is 1 for the largest value of *varname*.

equal requests that observations with equal values in *varname* get the same cumulative value in *newvar*.

Remarks and examples

▷ Example 1

cumul is most often used with graph to graph the empirical cumulative distribution. For instance, we have data on the median family income of 957 U.S. cities:

```
. use https://www.stata-press.com/data/r18/hsng
(1980 Census housing data)
. cumul faminc, gen(cum)
. sort cum
. line cum faminc, ytitle("") xlabel(, format(%6.0f))
> title("Cumulative of median family income")
> subtitle("1980 Census, 957 U.S. cities")
```

Cumulative of median family income

1980 Census, 957 U.S. cities
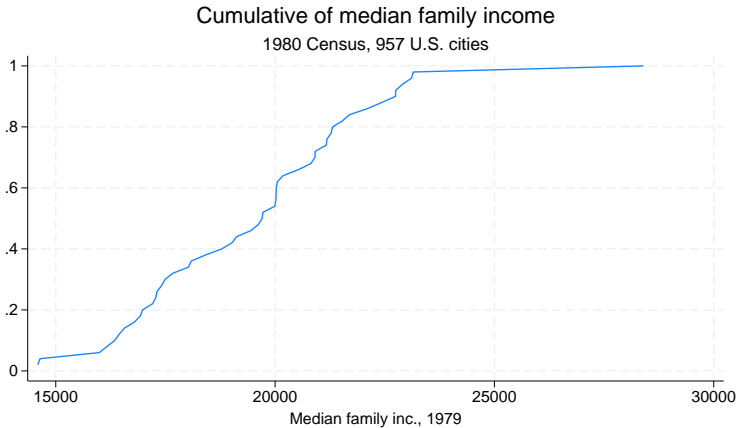
It would have been enough to type line cum faminc, but we wanted to make the graph look better; see [G-2] **graph twoway line**.

If we had wanted a weighted cumulative, we would have typed cumul faminc [w=pop] at the first step.   ◁

▷ Example 2

To graph two (or more) cumulatives on the same graph, use cumul and stack; see [D] **stack**. For instance, we have data on the average January and July temperatures of 956 U.S. cities:

```
. use https://www.stata-press.com/data/r18/citytemp, clear
(City temperature data)
. cumul tempjan, gen(cjan)
. cumul tempjuly, gen(cjuly)
. stack cjan tempjan cjuly tempjuly, into(c temp) wide clear
. line cjan cjuly temp, sort ytitle("") xtitle("Temperature (F)")
> title("Cumulatives:" "Average January and July temperatures")
> subtitle("956 U.S. cities") legend(label(1 January) label(2 July))
```
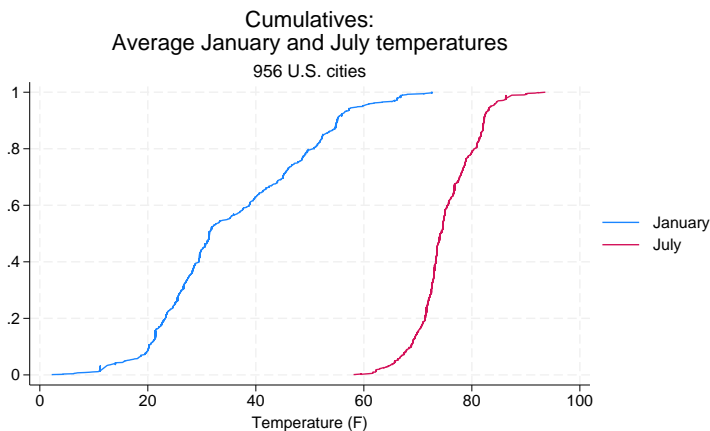
As before, it would have been enough to type `line cjan cjuly temp, sort`. See [D] **stack** for an explanation of how the `stack` command works.

◁

❑ Technical note

According to Beniger and Robyn (1978), Fourier (1821) published the first graph of a cumulative frequency distribution, which was later given the name "ogive" by Galton (1875).

❑

> Jean Baptiste Joseph Fourier (1768–1830) was born in Auxerre in France. As a young man, Fourier became entangled in the complications of the French Revolution. As a result, he was arrested and put into prison, where he feared he might meet his end at the guillotine. When he was not in prison, he was studying, researching, and teaching mathematics. Later, he served Napolean's army in Egypt as a scientific adviser. Upon his return to France in 1801, he was appointed Prefect of the Department of Isère. While prefect, Fourier worked on the mathematical basis of the theory of heat, which is based on what are now called Fourier series. This work was published in 1822, despite the skepticism of Lagrange, Laplace, Legendre, and others—who found the work lacking in generality and even rigor—and disagreements of both priority and substance with Biot and Poisson.

Acknowledgment

References

Beniger, J. R., and D. L. Robyn. 1978. Quantitative graphics in statistics: A brief history. *American Statistician* 32: 1–11. https://doi.org/10.2307/2683467.

Fourier, J. B. J. 1821. Notions générales, sur la population. *Recherches Statistiques sur la Ville de Paris et le Département de la Seine* 1: 1–70.

Galton, F. 1875. Statistics by intercomparison, with remarks on the law of frequency of error. *Philosophical Magazine* 49: 33–46. https://doi.org/10.1080/14786447508641172.

Wilk, M. B., and R. Gnanadesikan. 1968. Probability plotting methods for the analysis of data. *Biometrika* 55: 1–17. https://doi.org/10.2307/2334448.

Also see

[R] **Diagnostic plots** — Distributional diagnostic plots

[R] **kdensity** — Univariate kernel density estimation

[D] **stack** — Stack data

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