

**irf** — Create and analyze IRFs, dynamic-multiplier functions, and FEVDs

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## Description

`irf` creates and manipulates IRF files that contain estimates of the IRFs, dynamic-multiplier functions, and forecast-error variance decompositions (FEVDs) created after estimation by `var`, `svar`, or `vec`; see [\[TS\] var](#), [\[TS\] var svar](#), or [\[TS\] vec](#).

`irf` creates and manipulates IRF files that contain estimates of the IRFs created after estimation by `arma`, `arfima`, or `dsge`; see [\[TS\] arma](#), [\[TS\] arfima](#), or [\[DSGE\] dsge](#).

IRFs and FEVDs are described below, and the process of analyzing them is outlined. After reading this entry, please see [\[TS\] irf create](#).

## Quick start

Fit a VAR model

```
var y1 y2 y3
```

Create impulse–response function `myirf` and IRF file `myirfs.irf`

```
irf create myirf, set(myirfs)
```

Graph orthogonalized impulse–response function for dependent variables `y1` and `y2` given a shock to `y1`

```
irf graph oirf, impulse(y1) response(y1 y2)
```

As above, but present results in a table

```
irf table oirf, impulse(y1) response(y1 y2)
```

Note: `irf` commands can be used after `var`, `svar`, `vec`, `arma`, `arfima`, or `dsge`; see [\[TS\] var](#), [\[TS\] var svar](#), [\[TS\] vec](#), [\[TS\] arma](#), [\[TS\] arfima](#), or [\[DSGE\] dsge](#).

See [\[TS\] irf add](#), [\[TS\] irf cgraph](#), [\[TS\] irf ctable](#), [\[TS\] irf describe](#), [\[TS\] irf drop](#), [\[TS\] irf graph](#), [\[TS\] irf ograph](#), [\[TS\] irf rename](#), [\[TS\] irf set](#), and [\[TS\] irf table](#) for additional Quick starts.

## Syntax

```
irf subcommand ... [ , ... ]
```

<i>subcommand</i>	Description
<code>create</code>	create IRF file containing IRFs, dynamic-multiplier functions, and FEVDs
<code>set</code>	set the active IRF file
<code>graph</code>	graph results from active file
<code>cgraph</code>	combine graphs of IRFs, dynamic-multiplier functions, and FEVDs
<code>ograph</code>	graph overlaid IRFs, dynamic-multiplier functions, and FEVDs
<code>table</code>	create tables of IRFs, dynamic-multiplier functions, and FEVDs from active file
<code>ctable</code>	combine tables of IRFs, dynamic-multiplier functions, and FEVDs
<code>describe</code>	describe contents of active file
<code>add</code>	add results from an IRF file to the active IRF file
<code>drop</code>	drop IRF results from active file
<code>rename</code>	rename IRF results within a file

IRF stands for impulse–response function; FEVD stands for forecast-error variance decomposition.

`irf` can be used after `var`, `svar`, `vec`, `arima`, `arfima`, or `dsge`; see [TS] `var`, [TS] `var svar`, [TS] `vec`, [TS] `arima`, [TS] `arfima`, or [DSGE] `dsge`.

## Remarks and examples

[stata.com](http://www.stata.com)

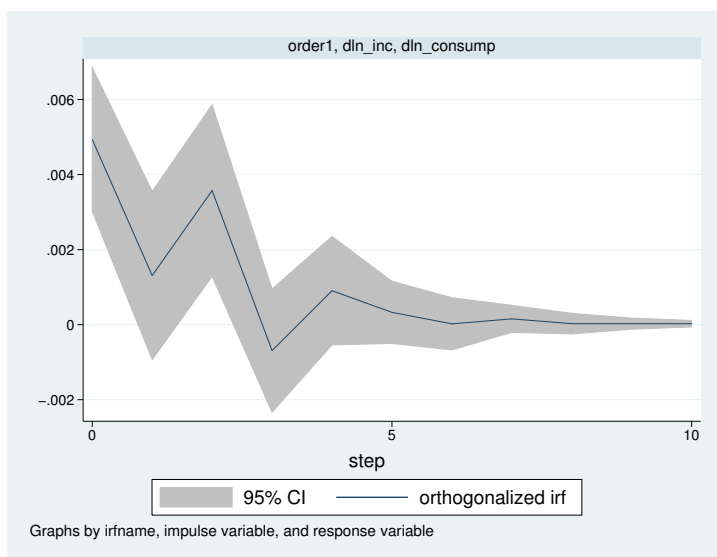
An IRF measures the effect of a shock to an endogenous variable on itself or on another endogenous variable; see Lütkepohl (2005, 51–63) and Hamilton (1994, 318–323) for formal definitions. Becketti (2013) provides an approachable, gentle introduction to IRF analysis. Of the many types of IRFs, `irf create` estimates the five most important: simple IRFs, orthogonalized IRFs, cumulative IRFs, cumulative orthogonalized IRFs, and structural IRFs.

A dynamic-multiplier function, or transfer function, measures the impact of a unit increase in an exogenous variable on the endogenous variables over time; see Lütkepohl (2005, chap. 10) for formal definitions. `irf create` estimates simple and cumulative dynamic-multiplier functions after `var`.

The forecast-error variance decomposition (FEVD) measures the fraction of the forecast-error variance of an endogenous variable that can be attributed to orthogonalized shocks to itself or to another endogenous variable; see Lütkepohl (2005, 63–66) and Hamilton (1994, 323–324) for formal definitions. Of the many types of FEVDs, `irf create` estimates the two most important: Cholesky and structural.

To analyze IRFs and FEVDs in Stata, you first fit a model, then use `irf create` to estimate the IRFs and FEVDs and save them in a file, and finally use `irf graph` or any of the other `irf` analysis commands to examine results:

```
. use http://www.stata-press.com/data/r15/lutkepohl2
(Quarterly SA West German macro data, Bil DM, from Lutkepohl 1993 Table E.1)
. var dln_inv dln_inc dln_consump if qtr<=tq(1978q4), lags(1/2) dfk
  (output omitted)
. irf create order1, step(10) set(myirf1)
(file myirf1.irf created)
(file myirf1.irf now active)
(file myirf1.irf updated)
. irf graph oirf, impulse(dln_inc) response(dln_consump)
```

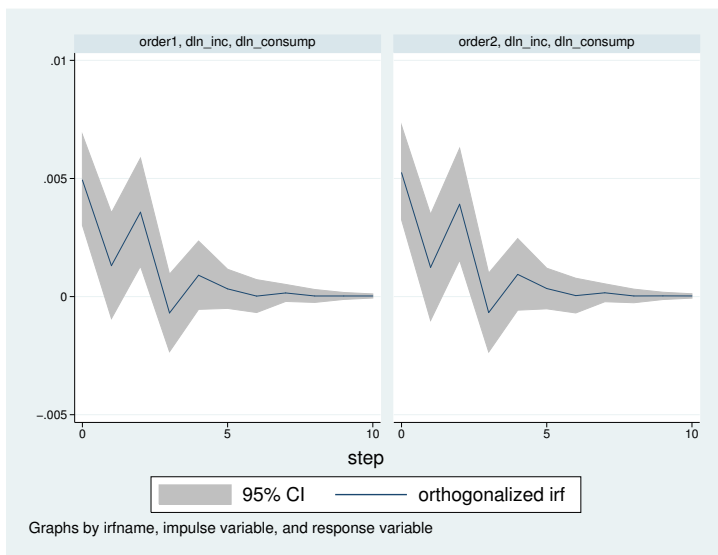


Multiple sets of IRFs and FEVDs can be placed in the same file, with each set of results in a file bearing a distinct name. The `irf create` command above created file `myirf1.irf` and put one set of results in it, named `order1`. The `order1` results include estimates of the simple IRFs, orthogonalized IRFs, cumulative IRFs, cumulative orthogonalized IRFs, and Cholesky FEVDs.

IRF files are just files: they can be erased by `erase`, listed by `dir`, and copied by `copy`; see [\[D\] erase](#), [\[D\] dir](#), and [\[D\] copy](#).

Below we use the same estimated `var` but use a different Cholesky ordering to create a second set of IRF results, which we will save as `order2` in the same file, and then we will graph both results:

```
. irf create order2, step(10) order(dln_inc dln_inv dln_consump)
(file myirf1.irf updated)
. irf graph oirf, irf(order1 order2) impulse(dln_inc) response(dln_consump)
```



We have compared results for one model under two different identification schemes. We could just as well have compared results of two different models. We now use `irf table` to display the results tabularly:

```
. irf table oirf, irf(order1 order2) impulse(dln_inc) response(dln_consump)
Results from order1 order2
```

step	(1) oirf	(1) Lower	(1) Upper	(2) oirf	(2) Lower	(2) Upper
0	.004934	.003016	.006852	.005244	.003252	.007237
1	.001309	-.000931	.003549	.001235	-.001011	.003482
2	.003573	.001285	.005862	.00391	.001542	.006278
3	-.000692	-.002333	.00095	-.000677	-.002347	.000993
4	.000905	-.000541	.002351	.00094	-.000576	.002456
5	.000328	-.0005	.001156	.000341	-.000518	.001201
6	.000021	-.000675	.000717	.000042	-.000693	.000777
7	.000154	-.000206	.000515	.000161	-.000218	.00054
8	.000026	-.000248	.0003	.000027	-.000261	.000315
9	.000026	-.000121	.000174	.00003	-.000125	.000184
10	.000026	-.000061	.000113	.000027	-.000065	.00012

95% lower and upper bounds reported  
 (1) irfname = order1, impulse = dln\_inc, and response = dln\_consump  
 (2) irfname = order2, impulse = dln\_inc, and response = dln\_consump

Both the table and the graph show that the two orthogonalized IRFs are essentially the same. In both functions, an increase in the orthogonalized shock to `dln_inc` causes a short series of increases in `dln_consump` that dies out after four or five periods.

## References

- Beckett, S. 2013. *Introduction to Time Series Using Stata*. College Station, TX: Stata Press.
- Box-Steffensmeier, J. M., J. R. Freeman, M. P. Hitt, and J. C. W. Pevehouse. 2014. *Time Series Analysis for the Social Sciences*. New York: Cambridge University Press.
- Hamilton, J. D. 1994. *Time Series Analysis*. Princeton, NJ: Princeton University Press.
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- Schenck, D. 2016a. Long-run restrictions in a structural vector autoregression. *The Stata Blog: Not Elsewhere Classified*. <http://blog.stata.com/2016/10/27/long-run-restrictions-in-a-structural-vector-autoregression/>.
- . 2016b. Vector autoregressions in Stata. *The Stata Blog: Not Elsewhere Classified*. <http://blog.stata.com/2016/08/09/vector-autoregressions-in-stata/>.

## Also see

- [TS] **arfima** — Autoregressive fractionally integrated moving-average models
- [TS] **arima** — ARIMA, ARMAX, and other dynamic regression models
- [TS] **var** — Vector autoregressive models
- [TS] **var svar** — Structural vector autoregressive models
- [TS] **varbasic** — Fit a simple VAR and graph IRFs or FEVDs
- [TS] **vec** — Vector error-correction models
- [TS] **var intro** — Introduction to vector autoregressive models
- [TS] **vec intro** — Introduction to vector error-correction models
- [DSGE] **dsge** — Linearized dynamic stochastic general equilibrium models