Title

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

Syntax Description Remarks and examples References Also see

Syntax

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

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

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

`irf` can be used only after `var`, `svar`, `vec`, `arima`, or `arfima`; see [TS] **var**, [TS] **var svar**, [TS] **vec**, [TS] **arima**, and [TS] **arfima**.

See [TS] **irf create**, [TS] **irf set**, [TS] **irf graph**, [TS] **irf cgraph**, [TS] **irf ograph**, [TS] **irf table**, [TS] **irf ctable**, [TS] **irf describe**, [TS] **irf add**, [TS] **irf drop**, and [TS] **irf rename** for details about subcommands.

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 `arima` or `arfima`; see [TS] **arima** or [TS] **arfima**.

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

Remarks and examples

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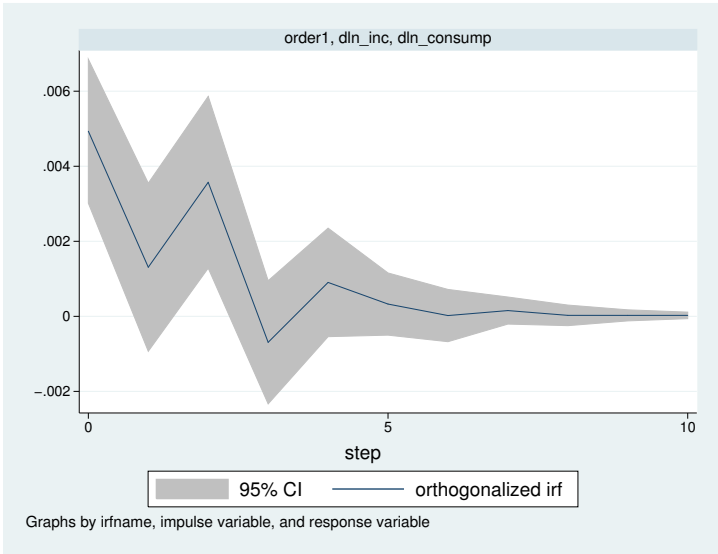
An IRF measures the effect of a shock to an endogenous variable on itself or on another endogenous variable; see Lütkepohl (2005, 51–63) and Hamilton (1994, 318–323) for formal definitions. Becketti (2013) provides an approachable, gentle introduction to IRF analysis. Of the many types of IRFs, `irf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

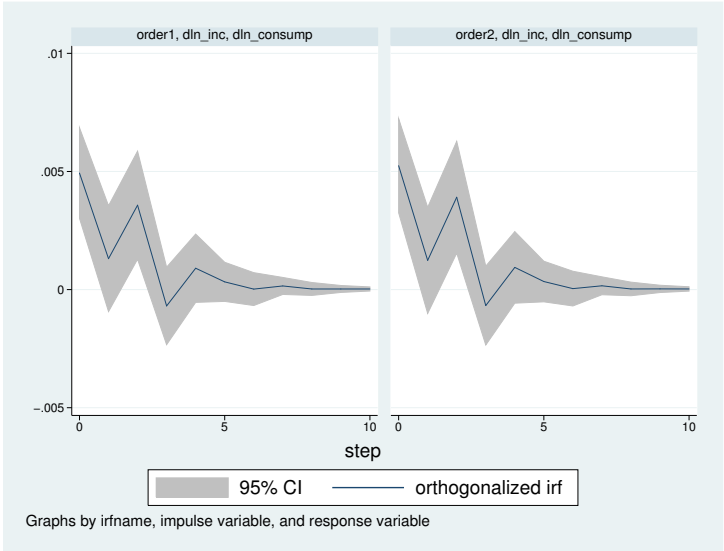
```
. use http://www.stata-press.com/data/r13/lutkepohl2
(Quarterly SA West German macro data, Bil DM, from Lutkepohl 1993 Table E.1)
. var dln_inv dln_inc dln_consump if qtr<=tq(1978q4), lags(1/2) dfk
  (output omitted)
. irf create order1, step(10) set(myirf1)
(file myirf1.irf created)
(file myirf1.irf 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.

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

Becketti, S. 2013. *Introduction to Time Series Using Stata*. College Station, TX: Stata Press.

Hamilton, J. D. 1994. *Time Series Analysis*. Princeton: Princeton University Press.

Lütkepohl, H. 1993. *Introduction to Multiple Time Series Analysis*. 2nd ed. New York: Springer.

——. 2005. *New Introduction to Multiple Time Series Analysis*. New York: Springer.

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