

**Package Name:** VARexog

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**Add-in Type:** Global

**Default Proc Name:** varexog

**Default Menu Text:** VAR with shock to exogenous var

**Interface:** Dialog and command line

## Description

The add-in estimates the impulse responses of VAR with shock to exogenous variable with Monte Carlo Integration (MCI) method. MCI is common method used to estimate the statistical significance of IRF and FEVD. MCI assumes a Normal likelihood for the residuals. The posterior distribution for the covariance matrix ( $\Sigma$ ) and the VAR lag coefficients ( $\beta$ ) under the standard “flat” prior for a multivariate regression model is derived easily (for example, see Uhlig 2005). First, we need to draw  $\Sigma$  from its unconditional distribution. Its inverse (the precision matrix of the residuals) has a Wishart distribution, which is a matrix generalization of a gamma. Conditional on  $\Sigma$ , the (stacked) coefficient vector for the VAR has mean equal to the OLS estimates and covariance matrix:

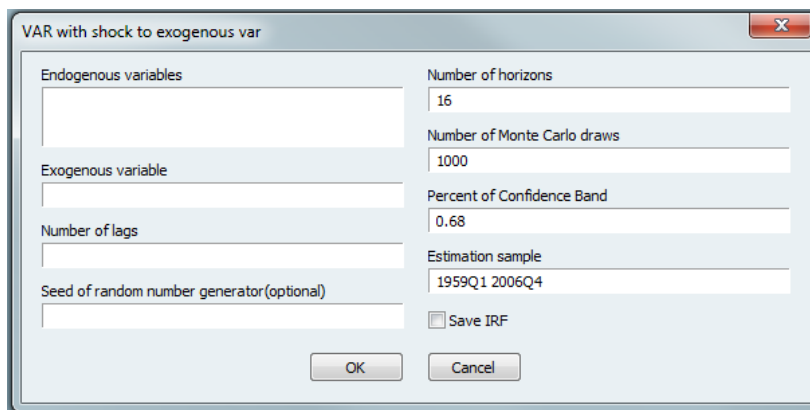
$$\Sigma \otimes \left( \sum x_t' x_t \right)^{-1}$$

where  $x_t$  is right hand-side variables of VAR. Drawing from a multivariate Normal requires a factor of the covariance matrix, which would be very time consuming at that size. Fortunately, a factor of a Kronecker product is a Kronecker product of factors. And since the second of the two factors depends only on the data, we can calculate it by Cholesky factorization.

The random part of the draw for  $\beta$  can be done with a specialized function which draws a multivariate Normal from a covariance matrix given by the Kronecker product of two factors. We need to add this to the OLS estimates to get a draw for the coefficient vector.

## Dialog

Upon running the add-in from the menus, a dialog will appear:



VAR with shock to exogenous var	
Endogenous variables	Number of horizons
	16
Exogenous variable	Number of Monte Carlo draws
	1000
Number of lags	Percent of Confidence Band
	0.68
Seed of random number generator(optional)	Estimation sample
	1959Q1 2006Q4
<input type="checkbox"/> Save IRF	
OK Cancel	

The first box lets you specify the endogenous variable for VAR model. On the next box enter exogenous variable (shock variable). On the third box enter number of the lag. Other boxes are optional.

### Command line:

```
varexog(options) exogenous_var lags @ endogenous_variable
```

#### for example:

```
varexog(seed=123456) ftb3 4 @ loggdp loginv logc
```

#### Options

seed	Seed of random number generator
hor	Impulse response horizon
ndraws	Number of Monte Carlo draws
frac	Percent of Confidence Band
sample	Estimation sample
save	Save IRF to matrix

#### References:

Uhlig, H. (2005), "What are the effects of monetary policy on output? Results from an agnostic identification procedure," *Journal of Monetary Economics*, 52, 381–419.