veclmar - LM test for residual autocorrelation after vec

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Description

veclmar implements a Lagrange multiplier (LM) test for autocorrelation in the residuals of vector error-correction (VEC) models.

Quick start

Test of residual autocorrelation for the first two lags of the residuals after vec veclmar

Same as above, but test the first 5 lags

veclmar, mlag(5)

Same as above, but perform test using stored estimates myest from a VEC model veclmar, mlag(5) estimates(myest)

Menu

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Syntax

veclmar [, options]

options	Description
<u>ml</u> ag(#)	use # for the maximum order of autocorrelation; default is mlag(2)
<u>est</u> imates(<i>estname</i>)	use previously stored results <i>estname</i> ; default is to use active results
<u>sep</u> arator(#)	draw separator line after every # rows

veclmar can be used only after vec; see [TS] vec.

You must tsset your data before using veclmar; see [TS] tsset.

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

Options

- mlag(#) specifies the maximum order of autocorrelation to be tested. The integer specified in mlag()
 must be greater than 0; the default is 2.
- estimates (*estname*) requests that veclmar use the previously obtained set of vec estimates stored as *estname*. By default, veclmar uses the active results. See [R] **estimates** for information on manipulating estimation results.
- separator(#) specifies how many rows should appear in the table between separator lines. By default, separator lines do not appear. For example, separator(1) would draw a line between each row, separator(2) between every other row, and so on.

Remarks and examples

Estimation, inference, and postestimation analysis of VEC models is predicated on the errors' not being autocorrelated. veclmar implements the LM test for autocorrelation in the residuals of a VEC model discussed in Johansen (1995, 21–22). The test is performed at lags $j = 1, \ldots, mlag()$. For each j, the null hypothesis of the test is that there is no autocorrelation at lag j.

Example 1

We fit a VEC model using the regional income data described in [TS] vec and then call veclmar to test for autocorrelation.

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

```
. vec ln_ne ln_se
```

(output omitted)

```
. veclmar, mlag(4)
```

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	8.9586	4	0.06214
2	4.9809	4	0.28926
3	4.8519	4	0.30284
4	0.3270	4	0.98801

HO: no autocorrelation at lag order

At the 5% level, we cannot reject the null hypothesis that there is no autocorrelation in the residuals for any of the orders tested. Thus this test finds no evidence of model misspecification.

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Stored results

veclmar stores the following in r():

Matrices r(lm)

 χ^2 , df, and *p*-values

Methods and formulas

Consider a VEC model without any trend:

$$\Delta \mathbf{y}_t = \boldsymbol{\alpha} \boldsymbol{\beta} \mathbf{y}_{t-1} + \sum_{i=1}^{p-1} \boldsymbol{\Gamma}_i \Delta \mathbf{y}_{t-i} + \epsilon_t$$

As discussed in [TS] vec, as long as the parameters in the cointegrating vectors, β , are exactly identified or overidentified, the estimates of these parameters are superconsistent. This implies that the $r \times 1$ vector of estimated cointegrating relations

$$\widehat{\mathbf{E}}_t = \widehat{\boldsymbol{\beta}} \mathbf{y}_t \tag{1}$$

can be used as data with standard estimation and inference methods. When the parameters of the cointegrating equations are not identified, (1) does not provide consistent estimates of $\widehat{\mathbf{E}}_t$; in these cases, veclmar exits with an error message.

The VEC model above can be rewritten as

$$\Delta \mathbf{y}_t = \boldsymbol{\alpha} \widehat{\mathbf{E}}_t + \sum_{i=1}^{p-1} \boldsymbol{\Gamma}_i \Delta \mathbf{y}_{t-i} + \boldsymbol{\epsilon}_t$$

which is just a vector autoregressive (VAR) model with p-1 lags where the endogenous variables have been first-differenced and is augmented with the exogenous variables $\widehat{\mathbf{E}}$. veclmar fits this VAR model and then calls varlmar to compute the LM test for autocorrelation.

The above discussion assumes no trend and implicitly ignores constraints on the parameters in α . As discussed in vec, the other four trend specifications considered by Johansen (1995, sec. 5.7) complicate the estimation of the free parameters in β but do not alter the basic result that the $\hat{\mathbf{E}}_t$ can be used as data in the subsequent VAR model. Similarly, constraints on the parameters in α imply that the subsequent VAR model must be estimated with these constraints applied, but $\hat{\mathbf{E}}_t$ can still be used as data in the VAR model.

See [TS] varlmar for more information on the Johansen LM test.

Reference

Johansen, S. 1995. Likelihood-Based Inference in Cointegrated Vector Autoregressive Models. Oxford: Oxford University Press.

Also see

- [TS] varlmar LM test for residual autocorrelation
- [TS] vec Vector error-correction models
- [TS] vec intro Introduction to vector error-correction models

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