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

Quick start

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

```
veclmar
```

As above, but test the first 5 lags

```
veclmar, mlag(5)
```

As above, but perform test using stored estimates `myest` from a VECM

```
veclmar, mlag(5) estimates(myest)
```

Menu

```
Statistics > Multivariate time series > VEC diagnostics and tests > LM test for residual autocorrelation
```
Syntax

veclmar [, options]

options  Description

mlag(#)   use # for the maximum order of autocorrelation; default is mlag(2)

estimates(estname)   use previously stored results estname; default is to use active results

separator(#)   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.

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 VECMs is predicated on the errors’ not being autocorrelated. veclmar implements the LM test for autocorrelation in the residuals of a VECM discussed in Johansen (1995, 21–22). The test is performed at lags \( j = 1, \ldots, \text{mlag}(\) ). For each \( j \), the null hypothesis of the test is that there is no autocorrelation at lag \( j \).

Example 1

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

```
. use https://www.stata-press.com/data/r16/rdinc
. vec ln_ne ln_se
   (output omitted)
. veclmar, mlag(4)

Lagrange-multiplier test

<table>
<thead>
<tr>
<th>lag</th>
<th>chi2</th>
<th>df</th>
<th>Prob &gt; chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8.9586</td>
<td>4</td>
<td>0.06214</td>
</tr>
<tr>
<td>2</td>
<td>4.9809</td>
<td>4</td>
<td>0.28926</td>
</tr>
<tr>
<td>3</td>
<td>4.8519</td>
<td>4</td>
<td>0.30284</td>
</tr>
<tr>
<td>4</td>
<td>0.3270</td>
<td>4</td>
<td>0.98801</td>
</tr>
</tbody>
</table>
```

H0: 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.

**Stored results**

`veclmar` stores the following in `r()`:

Matrices
- `r(lm)`: $\chi^2$, df, and $p$-values

**Methods and formulas**

Consider a VECM without any trend:

$$\Delta y_t = \alpha \beta y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \epsilon_t$$

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

$$\hat{E}_t = \hat{\beta} y_t$$

(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 $\hat{E}_t$; in these cases, `veclmar` exits with an error message.

The VECM above can be rewritten as

$$\Delta y_t = \alpha \hat{E}_t + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \epsilon_t$$

which is just a VAR with $p - 1$ lags where the endogenous variables have been first-differenced and is augmented with the exogenous variables $\hat{E}$. `veclmar` fits this VAR 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 $\alpha$. As discussed in vec, the other four trend specifications considered by Johansen (1995, sec. 5.7) complicate the estimation of the free parameters in $\beta$ but do not alter the basic result that the $\hat{E}_t$ can be used as data in the subsequent VAR. Similarly, constraints on the parameters in $\alpha$ imply that the subsequent VAR must be estimated with these constraints applied, but $\hat{E}_t$ can still be used as data in the VAR.

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


Also see

[TS] **varlmar** — LM test for residual autocorrelation after var or svar
[TS] **vec** — Vector error-correction models
[TS] **vec intro** — Introduction to vector error-correction models