Description

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]
```

<table>
<thead>
<tr>
<th>options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>mlag(#)</code></td>
<td>use # for the maximum order of autocorrelation; default is <code>mlag(2)</code></td>
</tr>
<tr>
<td><code>estimates(estname)</code></td>
<td>use previously stored results <code>estname</code>; default is to use active results</td>
</tr>
<tr>
<td><code>separator(#)</code></td>
<td>draw separator line after every # rows</td>
</tr>
</tbody>
</table>

`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 $j = 1, \ldots, mlag()$. 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 http://www.stata-press.com/data/r14/rdinc
. vec ln_ne ln_se
    (output omitted)
. veclmar, mlag(4)
```

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