

**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 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)
```

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## Syntax

```
veclmar [ , options ]
```

<i>options</i>	Description
<code>m<sup>lag</sup>(#)</code>	use # for the maximum order of autocorrelation; default is <code>m<sup>lag</sup>(2)</code>
<code>estimates(estname)</code>	use previously stored results <i>estname</i> ; default is to use active results
<code>separator(#)</code>	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

[stata.com](https://www.stata.com)

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  $j = 1, \dots, m<sup>lag</sup>()$ . 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/r17/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

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(1m)`  $\chi^2$ , df, and  $p$ -values

## Methods and formulas

Consider a VECM without any trend:

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

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

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

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 VECM above can be rewritten as

$$\Delta \mathbf{y}_t = \alpha \widehat{\mathbf{E}}_t + \sum_{i=1}^{p-1} \Gamma_i \Delta \mathbf{y}_{t-i} + \epsilon_t$$

which is just a VAR with  $p - 1$  lags where the endogenous variables have been first-differenced and is augmented with the exogenous variables  $\widehat{\mathbf{E}}$ . `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  $\widehat{\mathbf{E}}_t$  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  $\widehat{\mathbf{E}}_t$  can still be used as data in the VAR.

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 after var or svar

[TS] [vec](#) — Vector error-correction models

[TS] [vec intro](#) — Introduction to vector error-correction models