**Syntax**

```
wnetestq varname [if] [in] [, lags(#) ]
```

You must `tsset` your data before using `wnetestq`; see `[TS] tsset`. Also the time series must be dense (nonmissing with no gaps in the time variable) in the specified sample.

`varname` may contain time-series operators; see [U] 11.4.4 Time-series varlists.

**Menu**

Statistics > Time series > Tests > Portmanteau white-noise test

**Description**

`wnetestq` performs the portmanteau (or $Q$) test for white noise.

**Option**

`lags(#)` specifies the number of autocorrelations to calculate. The default is to use $\min(\lfloor n/2 \rfloor - 2, 40)$, where $\lfloor n/2 \rfloor$ is the greatest integer less than or equal to $n/2$.

**Remarks and examples**

Box and Pierce (1970) developed a portmanteau test of white noise that was refined by Ljung and Box (1978). See also Diggle (1990, sec. 2.5).

**Example 1**

In the example shown in `[TS] wntestb`, we generated two time series. One ($x_1$) was a white-noise process, and the other ($x_2$) was a white-noise process with an embedded cosine curve. Here we compare the output of the two tests.

```stata
. drop _all
. set seed 12393
. set obs 100
  obs was 0, now 100
. generate x1 = rnormal()
. generate x2 = rnormal() + cos(2*_pi*(_n-1)/10)
. generate time = _n
. tsset time
    time variable:  time, 1 to 100
    delta: 1 unit
```
. wntestb x1, table
Cumulative periodogram white-noise test

<table>
<thead>
<tr>
<th>Bartlett’s (B) statistic</th>
<th>0.7093</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob &gt; B</td>
<td>0.6957</td>
</tr>
</tbody>
</table>

. wntestq x1
Portmanteau test for white noise

<table>
<thead>
<tr>
<th>Portmanteau (Q) statistic</th>
<th>32.6863</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob &gt; chi2(40)</td>
<td>0.7875</td>
</tr>
</tbody>
</table>

. wntestb x2, table
Cumulative periodogram white-noise test

<table>
<thead>
<tr>
<th>Bartlett’s (B) statistic</th>
<th>1.8323</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob &gt; B</td>
<td>0.0024</td>
</tr>
</tbody>
</table>

. wntestq x2
Portmanteau test for white noise

<table>
<thead>
<tr>
<th>Portmanteau (Q) statistic</th>
<th>129.4436</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob &gt; chi2(40)</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

This example shows that both tests agree. For the first process, the Bartlett and portmanteau tests result in nonsignificant test statistics: a \( p \)-value of 0.9053 for \texttt{wntestb} and one of 0.9407 for \texttt{wntestq}.

For the second process, each test has a significant result to 0.0010.

\[ Q \]

**Stored results**

\texttt{wntestq} stores the following in \( r() \):

<table>
<thead>
<tr>
<th>Scalars</th>
<th>( Q ) statistic</th>
<th>( r(p) ) probability value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( r(stat) )</td>
<td>( Q ) statistic</td>
<td>probability value</td>
</tr>
<tr>
<td>( r(df) )</td>
<td>degrees of freedom</td>
<td></td>
</tr>
</tbody>
</table>

**Methods and formulas**

The portmanteau test relies on the fact that if \( x(1), \ldots, x(n) \) is a realization from a white-noise process. Then

\[
Q = n(n + 2) \sum_{j=1}^{m} \frac{1}{n-j} \hat{\rho}^2(j) \rightarrow \chi^2_m
\]

where \( m \) is the number of autocorrelations calculated (equal to the number of lags specified) and \( \rightarrow \) indicates convergence in distribution to a \( \chi^2 \) distribution with \( m \) degrees of freedom. \( \hat{\rho}_j \) is the estimated autocorrelation for lag \( j \); see \[TS\] \texttt{corrgram} for details.
References


Also see

* [TS] `tsset` — Declare data to be time-series data
* [TS] `corrgram` — Tabulate and graph autocorrelations
* [TS] `cumsp` — Cumulative spectral distribution
* [TS] `pergram` — Periodogram
* [TS] `wntestb` — Bartlett’s periodogram-based test for white noise