

# Package ‘WeightedPortTest’

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**Type** Package

**Title** Weighted Portmanteau Tests for Time Series Goodness-of-Fit

**Version** 1.1

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**Description** An implementation of the Weighted Portmanteau Tests described in “New Weighted Portmanteau Statistics for Time Series Goodness-of-Fit Testing” published by the Journal of the American Statistical Association, Volume 107, Issue 498, pages 777-787, 2012.

**License** GPL (>= 3)

**LazyLoad** yes

**NeedsCompilation** no

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 WeightedPortTest-package

*Weighted Portmanteau Test procedures for Time Series Goodness-of-fit*

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### Description

Two functions that implement the Weighted Portmanteau Statistics from Fisher and Gallagher (2012). The first is essentially a weighted Ljung-Box type test that can be used for fitted ARMA processes or detecting non-linear effects. The second function can be utilized to check the adequacy of a fitted ARCH process. Both are written for backward compatibility.

### Details

Package:	WeightedPortTest
Type:	Package
Version:	1.1
Date:	2023-05-23
License:	GPL (>=3)
LazyLoad:	yes

The two functions, `Weighted.Box.test()` and `Weighted.LM.test()`, can be used in a similar to the `Box.test()` function.

### Author(s)

Thomas J. Fisher and Colin M. Gallagher

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<code>Weighted.Box.test</code>	<i>Weighted Portmanteau Test</i>
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### Description

Weighted portmanteau tests for testing the null hypothesis of adequate ARMA fit and/or for detecting nonlinear processes. Written in the style of `Box.test()` and is capable of performing the traditional Box Pierce (1970), Ljung Box (1978) or Monti (1994) tests.

### Usage

```
Weighted.Box.test(x, lag = 1,
  type = c("Box-Pierce", "Ljung-Box", "Monti"),
  fitdf = 0, sqrd.res = FALSE,
  log.sqrd.res = FALSE, abs.res = FALSE,
  weighted = TRUE)
```

**Arguments**

<code>x</code>	a numeric vector or univariate time series, or residuals of a fitted time series
<code>lag</code>	the statistic will be based on <code>lag</code> autocorrelation coefficients. <code>lag=1</code> by default
<code>type</code>	test to be performed, partial matching is used. "Box-Pierce" by default
<code>fitdf</code>	number of degrees of freedom to be subtracted if <code>x</code> is a series of residuals, set at 0 by default
<code>sqr.res</code>	A flag, should the series/residuals be squared to detect for nonlinear effects?, FALSE by default
<code>log.sqr.res</code>	A flag, should a log of the squared series/residuals be used to detect for nonlinear effects? FALSE by default
<code>abs.res</code>	A flag, should the absolute series or residuals be used to detect for nonlinear effects? FALSE by default
<code>weighted</code>	A flag determining if the weighting scheme should be utilized. TRUE by default. If set to FALSE, the traditional test is performed with no weights

**Details**

These test are traditionally applied to a time series for detecting autocorrelation, or to the residuals of an ARMA( $p, q$ ) fit to check the adequacy of that fit or to detect nonlinear (i.e. GARCH) effects in the time/residual series. The weighting scheme utilized here is asymptotically similar to the results found in Pena and Rodriguez (2002) and Mahdi and McLeod (2012) (i.e. the `portest` package).

**Value**

A list with class "htest" containing the following components:

<code>statistic</code>	the value of the test statistic
<code>parameter</code>	The approximate shape and scale parameters for the weighted statistic or degrees of freedom of the chi-squared distribution if the weighted flag is set to false.
<code>p.value</code>	The p-value of the test
<code>method</code>	a character string indicating which type of test was performed.
<code>data.name</code>	a character string giving the name of the data

**Note**

Like the `Box.test()` function, missing values are not handled

**Author(s)**

Thomas J. Fisher

## References

- Box, G. E. P. and Pierce, D. A. (1970), Distribution of residual correlations in autoregressive-integrated moving average time series models. *Journal of the American Statistical Association*, 65, 1509-1526.
- Fisher, T. J. and Gallagher, C. M. (2012), New Weighted Portmanteau Statistics for Time Series Goodness-of-Fit Testing. *Journal of the American Statistical Association*, 107(498), 777-787.
- Ljung, G. M. and Box, G. E. P. (1978), On a measure of lack of fit in time series models. *Biometrika* 65, 297-303.
- Mahdi, E. and McLeod, A. I. (2012), Improved multivariate portmanteau test. *Journal of Time Series Analysis* 65(2), 297-303.
- Monti, A. C. (1994), A proposal for a residual autocorrelation test in linear models. *Biometrika* 81(4), 776-780.
- Pena, D. and Rodriguez, J. (2002) A powerful portmanteau test of lack of fit for time series. *Journal of the American Statistical Association* 97(458), 601-610.

## Examples

```
set.seed(1)
x <- rnorm(100);
Weighted.Box.test(x, lag=10, type="Ljung");
Weighted.Box.test(x, lag=10, type="Ljung", sqrd.res=TRUE);
```

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Weighted.LM.test	<i>Weighted Portmanteau Test for Fitted ARCH process</i>
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## Description

A weighted portmanteau test for testing the null hypothesis of adequately fitted ARCH process. This is essentially a weighted version of the statistic proposed by Li and Mak (1994)

## Usage

```
Weighted.LM.test(x, h.t, lag = 1,
                 type = c("correlation", "partial"),
                 fitdf = 1, weighted = TRUE)
```

## Arguments

<code>x</code>	a numeric vector or univariate time series, or residuals of a fitted time series
<code>h.t</code>	a numeric vector of the conditional variances
<code>lag</code>	the statistic will be based on lag autocorrelation coefficients.
<code>type</code>	type of test to be performed, either based on the autocorrelations or partial-autocorrelations.
<code>fitdf</code>	the number of ARCH parameters fit to the model, default=1 since at least some ARCH model must be fit to find h.t

`weighted` A flag determining if the weighting scheme should be utilized. TRUE by default, if FALSE, it performs the test from Li and Mak (1994)

### Details

These test can be performed after fitting an ARCH process to a time series. The theoretical work was originally developed in Li and Mak (1994) and has recently been extended in Fisher and Gallagher (2012).

### Value

A list with class "htest" containing the following components:

<code>statistic</code>	the value of the test statistic
<code>parameter</code>	The approximate shape and scale parameters for the weighted statistic or degrees of freedom of the chi-squared distribution if the weighted flag is set to FALSE.
<code>p.value</code>	The p-value of the test
<code>method</code>	a character string indicating which type of test was performed.
<code>data.name</code>	a character string giving the name of the data

### Note

Similar to the `Box.test()` and `Weighted.Box.test()` functions

### Author(s)

Thomas J. Fisher

### References

Fisher, T. J. and Gallagher, C. M. (2012), New Weighted Portmanteau Statistics for Time Series Goodness-of-Fit Testing. *Journal of the American Statistical Association*, 107(498), 777-787.

Li, W. K. and Mak, T. K. (1994), On the squared residual autocorrelations in non-linear time series with conditional heteroskedasticity. *Journal of Time Series Analysis* 15(6), 627-636.

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