Package 'WeightedPortTest'

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Type Package

Title Weighted Portmanteau Tests for Time Series Goodness-of-fit

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Description This packages contains the Weighted Portmanteau Tests as described in "New Weighted Portmanteau Statistics for Time Series Goodness-of-Fit Testing' accepted for publication by the Journal of the American Statistical Association.

License GPL (>= 3)

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R topics documented:

`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:	1.0
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LazyLoad:	yes

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

Author(s)

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`Weighted.Box.test` *Weighted Portmanteau Test*

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

`x`	a numeric vector or univariate time series, or residuals of a fitted time series
`lag`	the statistic will be based on `lag` autocorrelation coefficients. lag=1 by default
`type`	test to be performed, partial matching is used. "Box-Pierce" by default
`fitdf`	number of degrees of freedom to be subtracted if `x` is a series of residuals, set at 0 by default
`sqrd.res`	A flag, should the series/residuals be squared to detect for nonlinear effects?, FALSE by default

log.sqrd.res	A flag, should a log of the squared series/residuals be used to detect for nonlinear effects? FALSE by default
abs.res	A flag, should the absolute series or residuals be used to detect for nonlinear effects? FALSE by default
weighted	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 portes package).

Value

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

statistic	the value of the test statistic
parameter	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.
p.value	The p-value of the test
method	a character string indicating which type of test was performed.
data.name	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, accepted.

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);
```

`Weighted.LM.test` *Weighted Portmanteau Test for Fitted ARCH process*

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

`x`	a numeric vector or univariate time series, or residuals of a fitted time series
`h.t`	a numeric vector of the conditional variances
`lag`	the statistic will be based on `lag` autocorrelation coefficients.
`type`	type of test to be performed, either based on the autocorrelations or partial-autocorrelations.
`fitdf`	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:

`statistic`	the value of the test statistic
`parameter`	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.
`p.value`	The p-value of the test
`method`	a character string indicating which type of test was performed.
`data.name`	a character string giving the name of the data

Note

Similiar 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, accepted.

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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