Package 'testcorr'

May 8, 2026

Type Package

Title Testing Zero Correlation

Version 0.4.0

Description Computes the test statistics for examining the significance of autocorrelation in univariate time series, cross-correlation in bivariate time series, Pearson correlations in multivariate series and test statistics for i.i.d. property of univariate series given in Dalla, Giraitis and Phillips (2022), <https://www.cambridge.org/core/journals/econometric-theory/article/abs/robust-tests-for-white-noise-and-crosscorrelation/4D77C12C52433F4C6735E584C779403A>, <https://elischolar.library.yale.edu/cowles-discussion-paper-series/57/>.

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Encoding UTF-8

Imports stats, ggplot2, scales, reshape2, forcats, knitr, methods, xts, zoo

Suggests testthat, rmarkdown

VignetteBuilder knitr

RoxygenNote 7.3.3

NeedsCompilation no

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Repository CRAN

Date/Publication 2026-04-20 13:20:02 UTC

Contents

`ac.test` *Testing zero autocorrelation*

Description

The function ac.test computes the test statistics for examining the null hypothesis of zero autocorrelation for univariate time series given in Dalla, Giraitis and Phillips (2022).

Usage

```
ac.test(x, max.lag, m0 = 1, alpha = 0.05, lambda = 2.576,
        plot = TRUE, var.name = NULL, scale.font = 1)
```

Arguments

`x`	A numeric vector or a univariate numeric time series (ts, xts, zoo) object or a data frame variable.
`max.lag`	Maximum lag at which to calculate the test statistics.
`m0`	Minimum lag at which to calculate the cumulative test statistics. Default is 1.
`alpha`	Significance level for hypothesis testing used in the plots. Default is 0.05.
`lambda`	Threshold in $\widetilde{Q}$ test statistics. Default is 2.576.
`plot`	Logical. If TRUE, 1) the sample autocorrelations with their confidence bands are plotted and 2) the cumulative test statistics with their critical values are plotted. Default is TRUE. Can be a logical vector for each of the plots 1)-2).
`var.name`	NULL or a character string specifying the variable name. If NULL and x has name, the name of x is used. If NULL and x has no name, the string "x" is used. Default is NULL.
`scale.font`	A positive number indicating the scaling of the font size in the plots. Default is 1.

Details

The standard t and robust $\widetilde{t}$ statistics are for testing the null hypothesis $H_0 : \rho_k = 0$ at lags $k = 1, ..., max.lag$, and the standard LB and robust $\widetilde{Q}$ statistics are for testing the null hypothesis $H_0 : \rho_{m_0} = ... = \rho_m = 0$ at lags $m = m_0, ..., max.lag$, where ρ_k denotes the autocorrelation of x_t at lag k.

Value

An object of class "ac.test", which is a list with the following components:

`lag`	The lags of the sample autocorrelations.
`ac`	The sample autocorrelations.

scb	The lower and upper limit of the confidence bands based on the standard test statistics.
rcb	The lower and upper limit of the confidence bands based on the robust test statistics.
t	The t test statistics.
pvt	The p-values for the t test statistics.
ttilde	The $\widetilde{t}$ test statistics.
pvttilde	The p-values for the $\widetilde{t}$ test statistics.
lagc	The lags of the cumulative test statistics.
lb	The LB test statistics.
pvlb	The p-values for the LB test statistics.
qtilde	The $\widetilde{Q}$ test statistics.
pvqtilde	The p-values for the $\widetilde{Q}$ test statistics.
alpha	Significance level for hypothesis testing used in the plots.
varname	The variable name used in the plots/table.

Note

Missing values are not allowed.

Author(s)

Violetta Dalla, Liudas Giraitis and Peter C. B. Phillips

References

Dalla, V., Giraitis, L. and Phillips, P. C. B. (2022). "Robust Tests for White Noise and Cross-Correlation". Econometric Theory, 38(5), 913-941, doi:10.1017/S0266466620000341. Cowles Foundation, Discussion Paper No. 2194RS, https://elischolar.library.yale.edu/cowles-discussion-paper-seri 57/.

Giraitis, L., Li, Y. and Phillips, P. C. B. (2024). "Robust Inference on Correlation under General Heterogeneity". Journal of Econometrics, 244(1), 105691, doi:10.1016/j.jeconom.2024.105691.

Examples

```
x <- rnorm(100)
ac.test(x, max.lag = 10)
```

`cc.test` *Testing zero cross-correlation*

Description

The function cc.test computes the test statistics for examining the null hypothesis of zero cross-correlation for bivariate time series given in Dalla, Giraitis and Phillips (2022).

Usage

```
cc.test(x, y, max.lag, m0 = 0, alpha = 0.05, lambda = 2.576,
        plot = TRUE, var.names = NULL, scale.font = 1)
```

Arguments

`x`	A numeric vector or a univariate numeric time series (ts, xts, zoo) object or a data frame variable.
`y`	A numeric vector or a univariate numeric time series (ts, xts, zoo) object or a data frame variable.
`max.lag`	Maximum lag at which to calculate the test statistics.
`m0`	Minimum lag at which to calculate the cumulative test statistics. Default is 0.
`alpha`	Significance level for hypothesis testing used in the plots. Default is 0.05.
`lambda`	Threshold in $\widetilde{Q}$ test statistics. Default is 2.576.
`plot`	Logical. If TRUE, 1) the sample cross-correlations with their confidence bands are plotted and 2) the cumulative test statistics with their critical values are plotted. Default is TRUE. Can be a logical vector for each of the plots 1)-2).
`var.names`	NULL or a character string specifying the variable names. If NULL and x,y have names, the names of x,y are used. If NULL and x,y have no names, the string c("x","y") is used. Default is NULL.
`scale.font`	A positive number indicating the scaling of the font size in the plots. Default is 1.

Details

The standard t and robust $\widetilde{t}$ statistics are for testing the null hypothesis $H_0 : \rho_k = 0$ at lags $k = -max.lag, ..., -1, 0, 1, max.lag$, and the standard HB and robust $\widetilde{Q}$ statistics are for testing the null hypothesis $H_0 : \rho_{m_0} = ... = \rho_m = 0$ at lags $m = -max.lag, ..., -1, 0, 1, max.lag$, where ρ_k denotes the cross-correlation of x_t and y_{t-k} at lag k.

Value

An object of class "cc.test", which is a list with the following components:

`lag`	The lags of the sample cross-correlations.
`cc`	The sample cross-correlations.

scb	The lower and upper limit of the confidence bands based on the standard test statistics.
rcb	The lower and upper limit of the confidence bands based on the robust test statistics.
t	The t test statistics.
pvt	The p-values for the t test statistics.
ttilde	The $\widetilde{t}$ test statistics.
pvtttilde	The p-values for the $\widetilde{t}$ test statistics.
lagc	The lags of the cumulative test statistics.
hb	The HB test statistics.
pvhb	The p-values for the HB test statistics.
qtilde	The $\widetilde{Q}$ test statistics.
pvqtilde	The p-values for the $\widetilde{Q}$ test statistics.
alpha	Significance level for hypothesis testing used in the plots.
varnames	The variable names used in the plots/table.

Note

Missing values are not allowed.

Author(s)

Violetta Dalla, Liudas Giraitis and Peter C. B. Phillips

References

Dalla, V., Giraitis, L. and Phillips, P. C. B. (2022). "Robust Tests for White Noise and Cross-Correlation". Econometric Theory, 38(5), 913-941, doi:10.1017/S0266466620000341. Cowles Foundation, Discussion Paper No. 2194RS, https://elischolar.library.yale.edu/cowles-discussion-paper-seri 57/.

Giraitis, L., Li, Y. and Phillips, P. C. B. (2024). "Robust Inference on Correlation under General Heterogeneity". Journal of Econometrics, 244(1), 105691, doi:10.1016/j.jeconom.2024.105691.

Examples

```
x <- rnorm(100)
y <- rnorm(100)
cc.test(x, y, max.lag = 10)
```

`iid.test` *Testing iid property*

Description

The function iid.test computes the test statistics for examining the null hypothesis of i.i.d. property for univariate series given in Dalla, Giraitis and Phillips (2022).

Usage

```
iid.test(x, max.lag, m0 = 1, alpha = 0.05,
         plot = TRUE, var.name = NULL, scale.font = 1)
```

Arguments

`x`	A numeric vector or a univariate numeric time series (ts, xts, zoo) object or a data frame variable.
`max.lag`	Maximum lag at which to calculate the test statistics.
`m0`	Minimum lag at which to calculate the cumulative test statistics. Default is 1.
`alpha`	Significance level for hypothesis testing used in the plots. Default is 0.05.
`plot`	Logical. If TRUE, 1) the test statistics (J) and their critical values are plotted and 2) the cumulative test statistics (C) with their critical values are plotted. Default is TRUE. Can be a logical vector for each of the plots 1)-2).
`var.name`	NULL or a character string specifying the variable name. If NULL and x has name, the name of x is used. If NULL and x has no name, the string "x" is used. Default is NULL.
`scale.font`	A positive number indicating the scaling of the font size in the plots. Default is 1.

Details

The $J_{x,|x|}$ and J_{x,x^2} statistics are for testing the null hypothesis of i.i.d. at lag k, $k = 1, ..., max.lag$, and the $C_{x,|x|}$ and C_{x,x^2} statistics are for testing the null hypothesis of i.i.d. at lags $m_0, ..., m$, $m = m_0, ..., max.lag$.

Value

An object of class "iid.test", which is a list with the following components:

`lag`	The lags of the test statistics.
`jab`	The $J_{x,|x|}$ test statistics.
`pvjab`	The p-values for the $J_{x,|x|}$ test statistics.
`jsq`	The J_{x,x^2} test statistics.
`pvjsq`	The p-values for the J_{x,x^2} test statistics.

lagc	The lags of the cumulative test statistics.
cab	The $C_{x,\|x\|}$ test statistics.
pvcab	The p-values for the $C_{x,\|x\|}$ test statistics.
csq	The C_{x,x^2} test statistics.
pvcsq	The p-values for the C_{x,x^2} test statistics.
alpha	Significance level for hypothesis testing used in the plots.
varname	The variable name used in the plots/table.

Note

Missing values are not allowed.

Author(s)

Violetta Dalla, Liudas Giraitis and Peter C. B. Phillips

References

Dalla, V., Giraitis, L. and Phillips, P. C. B. (2022). "Robust Tests for White Noise and Cross-Correlation". Econometric Theory, 38(5), 913-941, doi:10.1017/S0266466620000341. Cowles Foundation, Discussion Paper No. 2194RS, https://elischolar.library.yale.edu/cowles-discussion-paper-seri 57/.

Examples

```
x <- rnorm(100)
iid.test(x, max.lag = 10)
```

---

rcorr.test *Testing zero Pearson correlation*

Description

The function rcorr.test computes the test statistics for examining the null hypothesis of zero Pearson correlation for multivariate series in Dalla, Giraitis and Phillips (2022).

Usage

```
rcorr.test(x, plot = TRUE, var.names = NULL, scale.font = 1)
```

Arguments

x	A numeric matrix or a multivariate numeric time series object (ts, xts, zoo) or a data frame.
plot	Logical. If TRUE the sample Pearson correlations and the p-values for significance are plotted. Default is TRUE.
var.names	NULL or a character string specifying the variable names. If NULL and x has names, the names of x are used. If NULL and x has no names, the string c("x[1]","x[2]",...) is used. Default is NULL.
scale.font	A positive number indicating the scaling of the font size in the plots. Default is 1.

Details

The p-value of the robust $\widetilde{t}$ statistic is for testing the null hypothesis $H_0 : \rho_{i,j} = 0$, where $\rho_{i,j}$ denotes the correlation of x_i and x_j.

Value

An object of class "rcorr.test", which is a list with the following components:

pc	The sample Pearson correlations.
pv	The p-values for the $\widetilde{t}$ test statistics.
varnames	The variable names used in the plot/table.

Note

Missing values are not allowed.

Author(s)

Violetta Dalla, Liudas Giraitis and Peter C. B. Phillips

References

Dalla, V., Giraitis, L. and Phillips, P. C. B. (2022). "Robust Tests for White Noise and Cross-Correlation". Econometric Theory, 38(5), 913-941, doi:10.1017/S0266466620000341. Cowles Foundation, Discussion Paper No. 2194RS, https://elischolar.library.yale.edu/cowles-discussion-paper-seri 57/.

Giraitis, L., Li, Y. and Phillips, P. C. B. (2024). "Robust Inference on Correlation under General Heterogeneity". Journal of Econometrics, 244(1), 105691, doi:10.1016/j.jeconom.2024.105691.

Examples

```
x <- matrix(rnorm(400), 100)
rcorr.test(x)
```

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