Package 'testcorr'

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Type Package

Title Testing Zero Correlation

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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 (2019), <https://cowles.yale.edu/sites/default/files/files/pub/d21/d2194.pdf>.

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R topics documented:

`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 (2019).

Usage

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

Arguments

x	A numeric vector or a univariate numeric time series object or a data frame.
max.lag	Maximum lag at which to calculate the test statistics.
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 the sample autocorrelations with their confidence bands and the cumulative statistics with their critical values are plotted. Default is TRUE.
table	Logical. If TRUE the sample autocorrelations, the confidence bands, the test statistics and their p-values are printed out. Default is TRUE.
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 $H_0 : \rho_1 = ... = \rho_m = 0$ at lags $m = 1, ..., max.lag$, 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 used.
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.
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.

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. (2019). "Robust Tests for White Noise and Cross-Correlation". Cowles Foundation, Discussion Paper No. 2194, https://cowles.yale.edu/sites/default/files/files/pub/d21/d2194.pdf.

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 (2019).

Usage

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

Arguments

x	A numeric vector or a univariate numeric time series object or a data frame.
y	A numeric vector or a univariate numeric time series object or a data frame.
max.lag	Maximum lag at which to calculate the test statistics.
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 the sample cross-correlations with their confidence bands and the cumulative statistics with their critical values are plotted. Default is TRUE.
table	Logical. If TRUE the sample cross-correlations, the confidence bands, the test statistics and their p-values are printed out. Default is TRUE.
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 $H_0 : \rho_0 = ... = \rho_m = 0$ 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 used.
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.
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.

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. (2019). "Robust Tests for White Noise and Cross-Correlation". Cowles Foundation, Discussion Paper No. 2194, https://cowles.yale.edu/sites/default/files/files/pub/d21/d2194.pdf.

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 (2019).

Usage

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

Arguments

x	A numeric vector or a univariate numeric time series object or a data frame.
max.lag	Maximum lag at which to calculate the test statistics.
alpha	Significance level for hypothesis testing used in the plots. Default is 0.05.
plot	Logical. If TRUE the test statistics and their critical values are plotted. Default is TRUE.
table	Logical. If TRUE the test statistics and their p-values are printed out. Default is TRUE.
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 $1, ..., m$, $m = 1, ..., max.lag$.

Value

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

lag	The lags used.
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.
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.

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. (2019). "Robust Tests for White Noise and Cross-Correlation". Cowles Foundation, Discussion Paper No. 2194, https://cowles.yale.edu/sites/default/files/files/pub/d21/d2194.pdf.

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 (2019).

Usage

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

Arguments

x   A numeric matrix or a multivariate numeric time series object or a data frame.

plot   Logical. If TRUE the sample Pearson correlations and the p-values for significance are plotted. Default is TRUE.

table   Logical. If TRUE the sample Pearson correlations and the p-values for significance are printed out. 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.

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. (2019). "Robust Tests for White Noise and Cross-Correlation". Cowles Foundation, Discussion Paper No. 2194, https://cowles.yale.edu/sites/default/files/files/pub/d21/d2194.pdf.

Examples

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

Index