Package 'SDD'

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Type Package

Title Serial Dependence Diagrams

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Description This package allows for computing (and by default plotting) different types of serial dependence diagrams.

License GPL-2

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SDD-package *SDD - Serial Dependence Diagrams.*

Description

This package allows for serial dependence diagrams applicable to both linear and nonlinear time series.

Details

Package:	SDD
Type:	Package
Version:	1.1
Date:	2014-02-21
License:	GNU-2

Author(s)

Luca Bagnato, Lucio De Capitani, Angelo Mazza and Antonio Punzo

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References

Bagnato L, De Capitani L, Punzo A (2013a). Improving the autodependogram using the Kulback-Leibler divergence. *Communications in Statistics - Simulation and Computation*. (Submitted).

Bagnato L, De Capitani L, Punzo A (2013b). Testing Serial Independence via Density-Based Measures of Divergence. *Methodology and Computing in Applied Probability*. doi:10.1007/s11009-013-9320-4.

Bagnato L, De Capitani L, Punzo A (2014). Detecting Serial Dependencies with the Reproducibility Probability Autodependogram. *Advances in Statistical Analysis*, **98**(1), 35-61.

Bagnato L, Punzo A (2010). On the Use of χ^2 Test to Check Serial Independence. *Statistica & Applicazioni*, **VIII**(1), 57-74.

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Bagnato L, Punzo A, Nicolis O (2012). The autodependogram: a graphical device to investigate serial dependencies. *Journal of Time Series Analysis*, **33**(2), 233-254.

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See Also

ADF, plot.SDD, SMI

ADF *Serial Dependence Diagrams*

Description

The function computes (and by default plots) different types of serial dependence diagrams.

Usage

```
ADF(x, dtype = c("ADF", "CADF", "RPADF", "DeltaADF", "ACF"),
    lag.max = floor(10 * log10(length(x))), alpha = 0.05,
    num.clas, B = 99, bandwidth, delta = "Delta_1", fres = ".Perm",
    fdenest = ".denest", fdiv, argacf, R = 1:lag.max,
    p.adjust.method =  p.adjust.methods, plot = TRUE,
    ...)
## S3 method for class 'SDD'
print(x, digits=3, ...)
```

Arguments

x	an "ADF" object or a univariate numeric time series object or a numeric vector.
dtype	an optional character string. It specifies the type of autodependence function and must be: • "ADF" (default; see Bagnato, Punzo, Nicolis, 2012) • "CADF" (see Bagnato, Punzo, Nicolis, 2012) • "RPADF" (see Bagnato, De Capitani, Punzo, 2014) • "DeltaADF" (see Bagnato, De Capitani, Punzo, 2013) • "ACF"
lag.max	maximum lag at which to calculate the ADF. Default is 10*log10(n) where n is the length of the series .
alpha	significance level of the tests of lag-independence (related to each bar). Default value is 0.05.
num.clas	when dtype="ADF" or "CADF" or "RPADF", it sets the number of equifrequency classes for each of the two marginal distributions of the contingency table. If not specified, it is determined internally using a rule of thumb described in Bagnato, Punzo, Nicolis (2012).
B	when dtype="DeltaADF", it sets the number of permutations used. Default value is 99 (see Bagnato, De Capitani, Punzo, 2013a,b).
bandwidth	when dtype="DeltaADF", it sets the bandwidth used for the Gaussian kernel density estimator. Default value is computed with likelihood cross-validation (see Bagnato, De Capitani, Punzo, 2013a,b).

`delta` a character vector; when `dtype="DeltaADF"`, it specifies the type of divergence measure used (see Bagnato, De Capitani, Punzo, 2013b); for each element in `delta` a different plot is produced. Possible values are:

- `"Delta_1"` (default)
- `"Delta_0.5"`
- `"Delta_2"`
- `"Delta_3"`
- `"Delta_4"`
- `"Delta_SD"`
- `"Delta_L1"`
- `"Delta_ST"`
- `"Delta_fdiv"`; in this case, the external function named `fdiv` is used to compute divergence.

`fres` an optional character string which specifies, when `dtype="DeltaADF"`, the name of the external `function(x,B)` specifying the resampling method from the raw series, where `x` is a time series and `B` the number of resamples; the function should return a matrix with `B` rows and `length(x)` columns. If not specified, permutations are randomly generated.

`fdenest` an optional character string which specifies when `dtype="DeltaADF"`, the name of the external `function(x,m,ngrid,bandwidth)` to use for univariate and bivariate density estimation, where `x` is the time series, `m` is the lag considered, `ngrid` is the number of points in the grid, and `bandwidth` is the bandwidth; the function should return:

- `fi`, a matrix of dimension `ngrid` x `ngrid` containing conjoint density estimates for lag `m`
- `gi`, a matrix of dimension `ngrid` x `ngrid` containing conjoint density estimates in case of independence, for lag `m`
- `ngi`, is equal to `ngrid`.

If `fdenest` is not specified, the Gaussian kernel density estimation is used (see Bagnato, De Capitani, Punzo, 2013a,b).

`fdiv` an optional character string which specifies, when `dtype="DeltaADF"` and `delta="Delta_fdiv"`, the name of the external `function(fi,gi,ngi)` to use to compute divergence; its arguments are defined as in `fdenest`; the function should return a scalar.

`plot` if `TRUE` (default), the specified ADF is displayed.

`argacf` when `dtype="ACF"`, it is a list with optional arguments for function `acf()`.

`R` a vector. It specifies the lags on which to test for simultaneous independence (see Bagnato, Punzo, 2010, 2012 and Bagnato, De Capitani, Punzo, 2013b). Default value is `1:lag.max`

`p.adjust.method` a character string. It specifies the method to be used in the simultaneous independence test. It must be one of `p.adjust.methods`.

`...` optional arguments to be passed to the `plot.SDD` method, such as graphical parameters.

`digits` minimal number of significant digits.

Details

There are print and data.frame methods for objects of class "ADF".

Value

Returned from this function is a SDD object which is a list with the following components:

`res` a data frame. According to `dtype`, it may contain:

- `lag`, a numeric vector containing the lags at which the bars of the diagrams are computed
- `vbar`, height of the bars of the diagram
- `pvalue`, p-values associated to the bars of the diagram
- `pstar`, transformed p-values associated to the bars of the diagram. If `dtype="DeltaADF"` transformed p-values are `vbar`
- `n`, vector of length `lag.max`, containing the effective number of pairs considered for each lag
- `crit.val`, vector, of length lag.max, with the critical values
- `xmin` vector of length `lag.max`, containing the non-centrality parameters for each bar of the RP-ADF

`dtype` a character string. It specifies the type of serial dependence diagram generated.

`delta` a character string. It specifies, when `type="DeltaADF"`, the type divergence measure used.

`num.clas` a scalar. It is the number of classes in each contingency table.

`alpha` a scalar. It specifies the significance level of the tests of lag independence (related to each bar).

`df` a scalar. It contains the degrees of freedom of the reference chi-square distribution used when `dtype` is one of: `"ADF"`, `"RPADF"`, or `"CADF"`.

`bandwidth` a scalar. It is the bandwidth used in kernel density estimation.

`series` the name of the series `x`.

`R` a vector. It specifies the lags to test in the simultaneous independence tests.

`p.adjust.method` a character string. It specifies the method to be used in the simultaneous independence tests. It must be one of `p.adjust.methods`.

`p.adjust` a vector. It contains the adjusted probabilities for the simultaneous independence tests.

Author(s)

Luca Bagnato, Lucio De Capitani, Angelo Mazza and Antonio Punzo

References

Bagnato L, De Capitani L, Punzo A (2013a). Improving the autodependogram using the Kulback-Leibler divergence. *Communications in Statistics - Simulation and Computation*. (Submitted).

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See Also

SDD-package, plot.SDD, SMI, acf

Examples

```
# Dependence Diagrams on raw data

data("SMI")
ADF(SMI^2, dtype="ACF", main="")
ADF(SMI, main="")
ADF(SMI, dtype="RPADF", main="")

# Dependence Diagrams on residuals from a fitted model

library("tseries")
residuals <- garch(SMI, order=c(1,1))$residuals[-1]
ADF(residuals^2, dtype="ACF", main="")
ADF(residuals, dtype="RPADF", main="")
```

plot.SDD *Plot Method for SDD objects*

Description

Plot method for objects of class "SDD".

Usage

```
 ## S3 method for class 'SDD'
plot(x, norm = FALSE, stability = FALSE, step = 5, ...)
```

Arguments

x	a SDD object
norm	an optional logical; if TRUE, when dtype="ADF" or when dtype="ACF", the "normalized" p-values of the ADF are computed.
stability	an optional logical; if TRUE, when dtype="RPADF", to evaluate the stability of the test-results a graphical representation of the confidence interval is displayed.
step	an optional scalar; it sets the step between x-ticks in plot. Default value is 5.
...	graphics parameters to be passed to the plotting routines.

Value

No values are returned from the plot function.

Author(s)

Luca Bagnato, Lucio De Capitani, Angelo Mazza and Antonio Punzo

See Also

SDD-package, ADF, SMI

Examples

```
data("SMI")
res <- ADF(SMI, plot=FALSE)
plot(res)
```

SMI *Swiss Market Index*

Description

The SMI dataset consists of 660 daily returns of the Swiss Market Index spanning the period from August 12th, 2009, to March 6th, 2012 (the share prices used to compute the daily returns are downloadable from http://finance.yahoo.com/).

Usage

```
data(SMI)
```

Format

A time series object

Source

Yahoo!Finance (2013) http://finance.yahoo.com/

References

Bagnato L, De Capitani L, Punzo A (2014). Detecting Serial Dependencies with the Reproducibility Probability Autodependogram. *Advances in Statistical Analysis*, **98**(1), 35-61.

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See Also

SDD-package,ADF, plot.SDD

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