Package 'SDD'

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Type Package

Title Serial Dependence Diagrams

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

License GPL-2

LazyLoad yes

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SDD-package *SDD - Serial Dependence Diagrams.*

Description

Allows for serial dependence diagrams applicable to both linear and nonlinear time series.

Details

Package:	SDD
Type:	Package
Version:	1.2
Date:	2015-02-24
License:	GNU-2

Author(s)

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References

Bagnato L, De Capitani L, Mazza A, Punzo A (2015). SDD: An R Package for Serial Dependence Diagrams. *Journal of Statistical Software*, **64**(2), 1-19. URL: http://www.jstatsoft.org/v64/c02/

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Bagnato L, De Capitani L, Punzo A (2013b). Testing Serial Independence via Density-Based Measures of Divergence. *Methodology and Computing in Applied Probability*, **16**(3), 627-641.

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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, Mazza A, Punzo A (2015). SDD: An R Package for Serial Dependence Diagrams. *Journal of Statistical Software*, **64**(2), 1-19. URL: http://www.jstatsoft.org/v64/c02/

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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, Mazza A, Punzo A (2015). SDD: An R Package for Serial Dependence Diagrams. *Journal of Statistical Software*. **64**(2), 1-19 URL: http://www.jstatsoft.org/v64/c02/

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See Also

SDD-package,ADF, plot.SDD

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