Package 'SlidingWindows'

October 12, 2022

Type Package

Title Methods for Time Series Analysis

Description A collection of functions to perform Detrended Fluctuation Analysis (DFA exponent), GUEDES et al. (2019) <doi:10.1016/j.physa.2019.04.132> , Detrended cross-correlation coefficient (RHOD-
CCA), GUEDES & ZEBENDE (2019) <doi:10.1016/j.physa.2019.121286>, DMCA cross-correlation coefficient and Detrended multiple cross-correlation coefficient (DMC), GUEDES & SILVA-
FILHO & ZEBENDE (2018) <doi:10.1016/j.physa.2021.125990>, both with sliding windows approach.

Version 0.2.0

Date 2021-04-10

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License GPL-3

URL https://github.com/efguedes/SlidingWindows

BugReports https://github.com/efguedes/SlidingWindows

NeedsCompilation no

Encoding UTF-8

Imports stats, DCCA, PerformanceAnalytics, nonlinearTseries, TSEntropies

Suggests xts, zoo, quantmod

RoxygenNote 7.1.1

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Repository CRAN

Date/Publication 2021-04-11 04:20:02 UTC

R topics documented:

`descritive.SlidingWindows`

Descritive statistics with sliding windows.

Description

This function generates descriptive statistics of a univariate time series with sliding windows approach.

Usage

```
descritive.SlidingWindows(y, w = 99, skewness = "moment", kurtosis = "moment")
```

Arguments

`y`	A vector containing univariate time series.
`w`	An integer value indicating the window size $w < length(y)$. If $w = length(y)$, will be computed the function will not slide.
`skewness`	A non-numeric value. See PerformanceAnalytics package.
`kurtosis`	A non-numeric value. See PerformanceAnalytics package.

Details

This function include following measures: min, max, mean, median, standard deviation, skewness and kurtosis.

Value

A list containing "w", "min","max","mean", "median", "standard deviation","skewness" and "kurtosis".

References

Guedes, E.F. Modelo computacional para análise de movimentos e co-movimentos de mercados financeiros, Ph.D. thesis, Programa de Pós-graduação em Modelagem Computacional e Tecnologia Industrial. Centro Universitário Senai Cimatec, 2019.

Examples

```
y <- rnorm(100)
descritive.SlidingWindows(y, w=99, skewness="moment", kurtosis="moment")
```

`dfa.SlidingWindows` *Detrended Fluctuation Analysis with sliding windows.*

Description

This function generates scaling exponents (long-range correlations) of a univariate time series with sliding windows approach.

Usage

```
dfa.SlidingWindows(y, w = 98, k = 10, npoints = 15)
```

Arguments

`y`	A vector containing univariate time series.
`w`	An integer value indicating the window size $w < length(y)$. If $w = length(y)$, will be computed the function will not slide.
`k`	An integer value indicating the boundary of the division (N/k). The smallest value of k is 4.
`npoints`	The number of different time scales that will be used to estimate the Fluctuation function in each zone. See nonlinearTseries package.

Details

This function include following measures: alpha_dfa, se_alpha_dfa, r2_alpha_dfa.

Value

A list contaning "w", "alpha_dfa", "se_alpha_dfa", "r2_alpha_dfa".

References

GUEDES, E.F.;FERREIRA, P.;DIONISIO, A.; ZEBENDE,G.F. An econophysics approach to study the effect of BREXIT referendum on European Union stock markets. PHYSICA A, v.523, p.1175-1182, 2019. doi = "doi.org/10.1016/j.physa.2019.04.132".

FERREIRA, P.; DIONISIO, A.;GUEDES, E.F.; ZEBENDE, G.F. A sliding windows approach to analyse the evolution of bank shares in the European Union. PHYSICA A, v.490, p.1355-1367, 2018. doi = "doi.org/10.1016/j.physa.2017.08.095".

Examples

```
y <- rnorm(100)
dfa.SlidingWindows(y,w=99,k=10,npoints=15)
```

`dmc.SlidingWindows` *Detrended multiple cross-correlation coefficient with sliding windows.*

Description

This function generates DMC Coefficient of three time series with sliding windows approach.

Usage

```
dmc.SlidingWindows(x1, x2, y, w = 98, k = 10, method = "rhodcca", nu = 0)
```

Arguments

x1	A vector containing univariate time series.
x2	A vector containing univariate time series.
y	A vector containing univariate time series.
w	An integer value indicating the window size $w < length(y)$. If $w = length(y)$, will be computed the function will not slide.
k	An integer value indicating the boundary of the division (N/k). The smallest value of k is 4.
method	A character string indicating which correlation coefficient is to be used. If method = "rhodcca" (default) the dmc coefficient is generated from the DCCA coefficient. If method = "dmca", the dmc coefficient is generated from the DMCA coefficient.
nu	An integer value. See the DCCA package.

Details

This function include following measures: w, timescale, dmc and cross-correlation between: yx1, yx2, x1x2

Value

A list containing "w", "dmc", "yx1", "yx2", "x1x2".

References

ZEBENDE, G.; SILVA-FILHO, A.M. Detrended multiple cross-correlation coefficient, Physica A 510, 91-97, 2018. doi="doi.org/10.1016/j.physa.2018.06.119".

GUEDES,E.F.;SILVA-FILHO, A.M.; ZEBENDE, G.F. Detrended multiple cross-correlation coefficient with sliding windows approach. Physica A, 125990, 2021. doi="doi.org/10.1016/j.physa.2021.125990".

Examples

```
x1 <- rnorm(100)
x2 <- rnorm(100)
y <- rnorm(100)
dmc.SlidingWindows(x1,x2,y,w=99,k=10,nu=0, method="rhodcca")
dmc.SlidingWindows(x1,x2,y,w=99,k=10,nu=0, method="dmca")
```

`dmca.SlidingWindows` *DMCA coefficient with sliding windows.*

Description

This function generates Detrending moving-average cross-correlation coefficient of two time series with sliding windows approach.

Usage

```
dmca.SlidingWindows(x, y, w = 98, k = 10)
```

Arguments

x	A vector containing univariate time series.
y	A vector containing univariate time series.
w	An integer value indicating the window size $w < length(y)$. If $w = length(y)$, will be computed the function will not slide.
k	An integer value indicating the boundary of the division (N/k). The smallest value of k is 4.

Details

This function include following measures: w, timescale, dmca

Value

A list containing "w", "timescale", "dmca".

References

KRISTOUFEK, L. Detrending moving-average cross-correlation coefficient: Measuring cross-correlations between non-stationary series. PHYSICA A, v.406, p.169-175, 2014. doi="doi.org/10.1016/j.physa.2014.03.015".

Examples

```
x <- rnorm(100)
y <- rnorm(100)
dmca.SlidingWindows(x,y,w=99,k=10)
```

`entropy.SlidingWindows` *Approximate entropy with sliding windows.*

Description

This function computes approximate entropy of a univariate time series with sliding windows approach.

Usage

```
entropy.SlidingWindows(y, w = 99, k = 4, dim = 2, r = 0.5, lag = 1)
```

Arguments

`y`	A vector containing univariate time series.
`w`	An integer value indicating the window size $w < length(y)$. If $w = length(y)$, will be computed the function will not slide.
`k`	An integer value indicating the boundary of the division (N/k). The smallest value of k is 4.
`dim`	The dimension of given time series. See TSEntropies package.
`r`	The radius of searched areas. See TSEntropies package.
`lag`	The downsampling. See TSEntropies package.

Details

This function return the list with time series sliding windows.

Value

A list contaning "w", "ApEn", "FastApEn".

References

Pincus, S.M. (1991). Approximate entropy as a measure of system complexity. Proc. Natl. Acad. Sci. USA, Vol. 88, pp. 2297–2301. doi="doi.org/10.1073/pnas.88.6.2297".

Examples

```
y <- rnorm(100)
entropy.SlidingWindows(y, w=99, k=4, dim=2, r=.2,lag=1)
```

`rhodcca.SlidingWindows` *Detrended Cross-Correlation Coefficient with sliding windows.*

Description

This function generates Detrended Cross-Correlation Coefficient of two time series with sliding windows approach.

Usage

```
rhodcca.SlidingWindows(x, y, w = 98, k = 10, nu = 0)
```

Arguments

x	A vector containing univariate time series.
y	A vector containing univariate time series.
w	An integer value indicating the window size $w < length(y)$. If $w = length(y)$, will be computed the function will not slide.
k	An integer value indicating the boundary of the division (N/k). The smallest value of k is 4.
nu	An integer value. See DCCA package.

Details

This function include following measures:

w, timescale, rhodcca

Value

A list containing "w", "timescale", "rhodcca".

References

GUEDES, E.F.; ZEBENDE, G.F. DCCA cross-correlation coefficient with sliding windows approach. PHYSICA A, v.527, p.121286, 2019. doi="doi.org/10.1016/j.physa.2010.10.022".

ZEBENDE, G.F. DCCA cross-correlation coefficient: Quantifying level of cross-correlation, Physica A, v. 390, n. 4, p. 614-618, 2011. doi="doi.org/10.1016/j.physa.2019.121286".

Examples

```
x <- rnorm(100)
y <- rnorm(100)
rhodcca.SlidingWindows(x,y,w=99,k=10,nu=0)
```

`SlidingWindows` *Sliding Windows.*

Description

This function generates sliding windows approach of a time series.

Usage

```
SlidingWindows(y, w = 99)
```

Arguments

`y`	A vector containing univariate time series.
`w`	An integer value indicating the window size $w < length(y)$. If $w = length(y)$, will be computed the function will not slide.

Details

This function return the matrix with time series sliding windows.

Value

A list containing "w", "SlidingWindows".

References

Guedes, E.F. Modelo computacional para análise de movimentos e co-movimentos de mercados financeiros, Ph.D. thesis, Programa de Pós-graduação em Modelagem Computacional e Tecnologia Industrial. Centro Universitário Senai Cimatec, 2019.

Examples

```
y <- rnorm(100)
SlidingWindows(y,w=99)
```

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