

Package ‘GMZTests’

March 18, 2021

Type Package

Title Statistical Tests

Description

A collection of functions to perform statistical tests of the following methods: Detrended Fluctuation Analysis, RHODCCA coefficient, <doi:10.1103/PhysRevE.84.066118>, DMC coefficient, SILVA-FILHO et al. (2021) <doi:10.1016/j.physa.2020.125285>, Delta RHODCCA coefficient, Guedes et al. (2018) <doi:10.1016/j.physa.2018.02.148> and <doi:10.1016/j.dib.2018.03.080>, Delta DMCA coefficient and Delta DMC coefficient.

Version 0.1.4

Date 2021-03-19

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URL <https://github.com/efguedes/GMZTests>

BugReports <https://github.com/efguedes/GMZTests>

NeedsCompilation no

Encoding UTF-8

LazyData true

Imports stats, DCCA, PerformanceAnalytics, nonlinearTseries, fitdistrplus, fgpt, tseries

Suggests xts, zoo, quantmod, fracdiff

RoxygenNote 7.1.1

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Repository CRAN

Date/Publication 2021-03-18 13:10:04 UTC

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deltadmc.test	<i>Statistical test for Delta DMC Multiple Detrended Cross-Correlation Coefficient</i>
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Description

This function performs the statistical test for Delta DMC cross-correlation coefficient from three univariate ARFIMA process.

Usage

```
deltadmc.test(x1, x2, y, k, m, nu, rep, method)
```

Arguments

x1	A vector containing univariate time series.
x2	A vector containing univariate time series.
y	A vector containing univariate time series.
k	An integer value indicating the boundary of the division (N/k). The smallest value of k is 4.
m	an integer value or a vector of integer values indicating the size of the window for the polinomial fit.
nu	An integer value. See the DCCA package.
rep	An integer value indicating the number of repetitions.
method	A character string indicating which correlation coefficient is to be used. If method = "rhodcca" the dmc coefficient is generated from the DCCA coefficient. If method = "dmca", the dmc coefficient is generated from the DMCA coefficient.

Details

This function include following measures: timescale, dmc_before, dmc_after, deltamc

Value

An list containing "timescale" "dmc_before", "dmc_after", "deltadmca", "CI_0.90", "CI_0.95", "CI_0.99".

References

ZEBENDE, G.F.; SILVA-FILHO, A.M. Detrended Multiple Cross-Correlation Coefficient. PHYSICA A, v.510, p.91-97, 2018.

SILVA-FILHO,A.M; ZEBENDE,G.; CASTRO,A.P.; GUEDES,E. Statistical test for multiple detrended cross-correlation coefficient, Physica A, v.562, 125285, 2021.

KRISTOUFEK, L. Detrending moving-average cross-correlation coefficient: Measuring cross-correlations between non-stationary series. PHYSICA A, v.406, p.169-175, 2014.

Examples

```
x1 <- rnorm(100)
x2 <- rnorm(100)
y <- rnorm(100)
deltadmca.test(x1,x2,y, k=10, m=c(4:6), nu=0, rep=10, method="rhodcca")

deltadmca.test(x1,x2,y, k=10, m=c(4:6), nu=0, rep=10, method="dmca")
```

deltadmca.test	<i>Statistical test for Statistical test for DMCA cross-correlation coefficient.</i>
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Description

This function performs the statistical test for Detrending moving-average cross-correlation coefficient from two univariate ARFIMA process.

Usage

```
deltadmca.test(x, y, k, m, rep)
```

Arguments

x	A vector containing univariate time series.
y	A vector containing univariate time series.
k	An integer value indicating the boundary of the division (N/k). The smallest value of k is 4.
m	an integer value or a vector of integer values indicating the size of the window for the polinomial fit.
rep	An integer value indicating the number of repetitions.

Details

This function include following measures: timescale, rho_before, rho_after, deltarho

Value

An list containing "timescale", "mean", "sd", "rho_before", "rho_after", "deltarho", "CI_0.90", "CI_0.95", "CI_0.99".

References

Guedes, et al. Statistical test for DCCA cross-correlation coefficient, *Physica A*, v.501, 134-140, 2018.

Guedes, et al. Statistical test for DCCA: Methods and data, *Data in Brief*, v. 18, 795-798, 2018.

Examples

```
x <- rnorm(1000)
y <- rnorm(1000)
deltadmca.test(x,y,k=100,m=c(4:6),rep=10)
```

deltarhodcca.test	<i>Statistical test for Statistical test for Delta RHODCCA cross-correlation coefficient.</i>
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Description

This function performs the statistical test for Delta RHODCCA cross-correlation coefficient from two univariate ARFIMA process.

Usage

```
deltarhodcca.test(x, y, k, m, nu, rep)
```

Arguments

x	A vector containing univariate time series.
y	A vector containing univariate time series.
k	An integer value indicating the boundary of the division (N/k). The smallest value of k is 4.
m	an integer value or a vector of integer values indicating the size of the window for the polinomial fit.
nu	An integer value. See the DCCA package.
rep	An integer value indicating the number of repetitions.

Details

This function include following measures: timescale, rho_before, rho_after, deltarho

Value

An list containing "timescale", "mean", "sd", "rho_before", "rho_after", "deltarho", "CI_0.90", "CI_0.95", "CI_0.99".

References

Guedes, et al. Statistical test for DCCA cross-correlation coefficient, *Physica A*, v.501, 134-140, 2018.

Guedes, et al. Statistical test for DCCA: Methods and data, *Data in Brief*, v. 18, 795-798, 2018.

Examples

```
x <- rnorm(1000)
y <- rnorm(1000)
deltarhodcca.test(x,y,k=100,m=c(4:6),nu=0,rep=10)
```

 dfa.test

Statistical test for Detrended Fluctuation Analysis.

Description

This function performs the statistical test for the long-range correlation exponents obtained by the Detrended Fluctuation Analysis method.

Usage

```
dfa.test(y, npoints, rep, ts.sim, prob)
```

Arguments

y	A vector containing univariate time series.
npoints	The number of different window sizes that will be used to estimate the Fluctuation function in each zone. See nonlinearTseries package.
rep	An integer value indicating the number of repetitions.
ts.sim	An logical value. If TRUE, the confidence interval for alpha_dfa is obtained from a White Gaussian Noise. If FALSE, the confidence interval for alpha_dfa is obtained from the shuffling of the original series.
prob	An numeric value indicating the quantile of probability to be used in estimating confidence intervals by N(0,1).

Details

This function include following measures alpha_dfa, se_alpha_dfa, r2_alpha_dfa, min_test, max_test, mean_test, median_test, sd_test, skewness_test, kurtosis_test, Jarquebera_test_pvalue, CL_lower_test, CL_upper_test

Value

An rbind matrix containing "alpha_dfa", "se_alpha_dfa", "r2_alpha_dfa", "min_alpha_dfa", "max_test", "mean_test", "median_test", "sd_test", "skewness_test", "kurtosis_test", "jarquebera_test_pvalue", and confidence interval: "CI_lower_test", "CI_upper_test".

References

KRISTOUFEK, L. Rescaled Range Analysis and Detrended Fluctuation Analysis: Finite Sample Properties and Confidence Intervals. AUCO Czech Economic Review, v.4,n.3, p.315-329, 2010.

Examples

```
y=rnorm(1000)
dfa.test(y, npoints=15, rep=10, ts.sim="TRUE", prob=.95)
```

dmc.test

Statistical test for Multiple Detrended Cross-Correlation Coefficient

Description

This function performs the statistical test for DMC Cross-Correlation Coefficient based in White Gaussian Noise process.

Usage

```
dmc.test(N, k, m, method, nu, rep)
```

Arguments

N	An integer value for the time series length.
k	An integer value indicating the boundary of the division (N/k). The smallest value of k is 4.
m	an integer value or a vector of integer values indicating the size of the window for the polinomial fit.
method	A character string indicating which correlation coefficient is to be used. If method = "rhodcca" 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.
rep	An integer value indicating the number of repetitions.

Details

This function include following measures: w, timescale, dmc, rhodcca_yx1, rhodcca_yx2, rhodcca_x1x2

Value

An list containing "timescale", parameters of beta distribution: "shape1", "se1", "shape2", "se2" and confidence interval: "CI_0.90_upper", "CI_0.95_upper", "CI_0.99_upper".

References

SILVA-FILHO,A.M; ZEBENDE,G.; CASTRO,A.P.; GUEDES,E. Statistical test for multiple de-trended cross-correlation coefficient, Physica A, v.562, 125285, 2021.

KRISTOUFEK, L. Detrending moving-average cross-correlation coefficient: Measuring cross-correlations between non-stationary series. PHYSICA A, v.406, p.169-175, 2014.

Examples

```
dmc.test(N=100, k=10, m=c(4:6), method="rhodcca", nu=0, rep=10)
dmc.test(N=100, k=10, m=c(4:6), method="dmca", nu=0, rep=10)
```

dmca.test

Statistical test for DMCA cross-correlation coefficient.

Description

This function performs the statistical test for Detrending moving-average cross-correlation coefficient based in White Gaussian Noise process.

Usage

```
dmca.test(N, k, m, rep)
```

Arguments

N	An integer value for the time series length.
k	An integer value indicating the boundary of the division (N/k). The smallest value of k is 4.
m	an integer value or a vector of integer values indicating the size of the window for the polinomial fit.
rep	An integer value indicating the number of repetitions.

Details

This function include following measures: timescale and cross-correlation yx.

Value

An list containing "timescale", "mean", "sd" and confidence interval: "CI_0.90", "CI_0.95", "CI_0.99".

References

B. Podobnik, Z.-Q. Jiang, W.-X. Zhou, H. E. Stanley, Statistical tests for power-law cross-correlated processes, Phys. Rev.,E 84, 066118, 2011.

Examples

```
dmca.test(N=100, k=10, m=c(4:6), rep=10)
```

```
rhodcca.test
```

Statistical test for detrended cross-correlation coefficient

Description

This function performs the statistical test for RHODCCA cross-correlation coefficient based in White Gaussian Noise process.

Usage

```
rhodcca.test(N, k, m, nu, rep)
```

Arguments

N	An integer value for the time series length.
k	An integer value indicating the boundary of the division (N/k). The smallest value of k is 4.
m	an integer value or a vector of integer values indicating the size of the window for the polinomial fit.
nu	An integer value. See the DCCA package.
rep	An integer value indicating the number of repetitions.

Details

This function include following measures: timescale and cross-correlation yx.

Value

An list containing "timescale", "mean", "sd" and confidence interval: "CI_0.90", "CI_0.95", "CI_0.99".

References

B. Podobnik, Z.-Q. Jiang, W.-X. Zhou, H. E. Stanley, Statistical tests for power-law cross-correlated processes, Phys. Rev.,E 84, 066118, 2011.

Examples

```
rhodcca.test(N=100, k=10, m=c(4:6), nu=0, rep=10)
```


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