MpermutMax {MpermutMax} R Documentation

The Maximum Moving Cross-Correlation Method

Description

This method is a permutation method. It is used to test for significant correlations between the variables of both stationary and non-stationary multivariate time series. This method extended the Maximum Cross-Correlation method of Change et al. (2018) to account for non-stationary high-dimensional time series. Notice that the following library is needed to be installed before using the mpermutMax function: library(roll)

Usage

```
mpermutMax(x,w,l)
```

Arguments

`x`
a T-by-m data matrix, where the rows are "T" time points, and the columns are "m" variables

`w`
window width (i.e. window length)

`l`
number of lagged series

Value

The mpermutMax function produces a list that consists of the following elements:

`NoGroups`
returns the number of multivariate subgroups (i.e. subgroups with two components series or more

`Nos_of_Members`
returns the number of members (i.e. dimension) in each subgroup listed in NoGroups

`Groups`
returns the indices of components in each of the subgroups listed in NoGroups

`maxcorr`
returns a total of m(m-1)/2 values, which are the maximum moving cross-correlation statistics in decreasing order

`corrRatio`
returns the ratios of the consecutive values listed in maxcorr

`NoConnectedPairs`
returns the number of connected pairs

`Xpre`
returns the the prewhitened data

Note

See the example below.

Author(s)

Fayed Alshammri

References

Alshammri, F. and Pan, J. (2020). Generalized Principal Component Analysis for Non-Stationary Vector Time Series. Manuscript submitted for publication. Chang, J., Guo, B., and Yao, Q. (2018). Principal component analysis for second-order stationary vector time series. The Annals of Statistics, 46(5):2094-2124.

Examples

```
##This is Example 2 of Alshammri and Pan (2020).
##The data matrix X is a non-stationary time series with m=5 and T=1000.
m=5;T=1000
##Generate x_t
X=mat.or.vec(m,T)
u=arima.sim(list(order=c(1,1,3),ar=0.75,ma=c(1.5,0.5,0.2)),n=T+1,sd=1)
for(i in 1:2) X[i,]=u[i+1:T]
v=arima.sim(list(order=c(2,1,3),ar=c(-0.5,-0.4),ma=c(-1.2,-2.75,0.5)),n=T+1,sd=1)
for(i in 3:4) X[i,]=v[(i-1):(T+i-2)]
w=arima.sim(list(order=c(2,0,4),ar=c(-0.9,-0.45),ma=c(-1.1,-0.8,-0.6,-1.3)),n=T,sd=1)
X[5,]=w[1:T]
A=matrix(runif(m*m, -5, 5), ncol=m)
YY=A%*%X
YY=t(YY)
YY=ts(YY)
##here we have YY is the used data matrix (i.e. x=YY), the window size is 100, and we use 5 lags in the calculation of mw
FF=GTSPCA(YY,100,5)
##extract the transform segmented series X
X=FF$X
##On the transformed series "X", use the maximum moving cross-correlation method over 20 lags with a window of size 100:
S=mpermutMax(X,100,20)
S$Groups
```