Package 'W2CWM2C'

November 23, 2012

Type Package

Title The W2CWM2C package is a set of functions to produce new graphical tools for wavelet correlation (bivariate and multivariate cases) using some routines from the waveslim and wavemulcor packages

Version 1.0

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Depends R (>= 2.10.0), waveslim, wavemulcor

Description
The W2CWM2C package is a set of routines that improves the graphical presentations of the functions 'wave.correlation' and 'spin.correlation' (wavelet cross correlation) (Waveslim package, Whitcher 2012) and the 'wave.multiple.correlation' and 'wave.multiple.cross.correlation' (Wavemulcor package, Fernandez-Macho 2012)

License GPL (>= 2)

Repository CRAN

LazyLoad yes

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W2CWM2C-package *The W2CWM2C package is a set of functions that improves the graphical presentations of the functions 'wave.correlation' and 'spin.correlation' (wavelet cross correlation) (Waveslim package) and the 'wave.multiple.correlation' and 'wave.multiple.cross.correlation' (Wavemulcor package).*

Description

The W2CWM2C package improves the plots of the Wavelet (Cross) Correlation (bivariate case) from the *waveleslim* package (Whitcher 2012) and the Wavelet Multiple (Cross) Correlation (multivariate case) from the *wavemulcor* package (Fernandez-Macho 2012). The W2CWM2C package also helps to handle the (input data) multivariate time series easily as a list of N elements (times series) and provides a multivariate data set (dataexample) to exemplify its use.

Details

Package:	W2CWM2C
Type:	Package
Version:	1.0
Date:	2012-10-15
License:	GPL (>= 2)
LazyLoad:	yes

The W2CWM2C package contains four functions: the *WC* (that perform and plot the Wavelet correlation, bivariate case), the *WCC* (that perform and plot the Wavelet Cross Correlation, bivariate case), the *WMC* (that perform and plot the Wavelet Multiple Correlation, multivariate case) and the *WMCC* (that perform and plot the Wavelet Multiple Cross Correlation, multivariate case).

Note

Dependencies: *waveslim* and *wavemulcor*.

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References

Fernandez-Macho, J.. Wavelet multiple correlation and cross-correlation: A multiscale analysis of euro zone stock markets. *Physica A: Statistical Mechanics and its Applications*, 391(4):1097-1104, 2012.

Fernandez-Macho, J. (2012). Wavemulcor Reference manual. The Comprehensive R Archive Network (CRAN), http://cran.r- project.org/web/packages/wavemulcor/index.html

Gencay, R., F. Selcuk and B. Whitcher (2001) *An Introduction to Wavelets and Other Filtering Methods in Finance and Economics*, Academic Press.

Polanco-Martinez, J. and J. Fernandez-Macho (2012). An empirical analysis of some peripheral EU stock market indices: A Wavelet cross-correlation approach. Under review *Physica A: Statistical Mechanics and its Applications*. (Manuscript Number: PHYSA-12867).

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Whitcher, B. (2012). Waveslim reference manual. The Comprehensive R Archive Network (CRAN), http://cran.r-project.org/web/packages/waveslim/index.html

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`dataexample` *Stock market indexes (daily closing prices).*

Description

Seven European stock market indexes (daily closing prices): MIB30 (Italy), IBEX35 (Spain), DAX30 (Germany), CAC40 (France), AEX25 (Netherlands), ATX20 (Austria) and NBEL20 (Belgium) spanning from January 2, 2004 to June 29, 2012.

Usage

```
data(dataexample)
```

Format

A list containing 2216 elements and 7 variables

Source

http://finance.yahoo.com

WC *Wavelet correlation (bivariate case) pairwise comparisons.*

Description

The *WC* function (bivariate case) computes the Wavelet correlation by means of the function *wave.correlation* of the *waveslim* package to several time series and make a pairwise comparisons and plot the wavelet correlation as a single pdf file plot. The input data are multivariate time series and this function only tackle arrays with N x C (elements x columns, where the number of columns are between 2 and 7) dimensions.

Usage

```
WC(inputDATA, Wname, J, Hpdf, Wpdf)
```

Arguments

inputDATA	An array of multivariate time series as a *ts* object (please, check the *ts* manual to get more information about the *ts* function in R).
Wname	The wavelet function or filter to use in the decomposition.
J	Specifies the depth of the decomposition.
Hpdf	The height of the pdf file (output plot).
Wpdf	The width of the pdf file (output plot).

Details

The *WC* function compute the wavelet correlation among time series and plots the results in a single pdf file (*WCplot.pdf*) showing the WC values as a table (please, see the Figure 1 of Polanco-Martinez and Fernandez-Macho 2012). The *WC* code is based on the *wave.correlation* routine from Brandon Whitcher's *waveslim* R package Version: 1.7.1, which is based mainly on wavelet methodology developed in Whitcher, B., P. Guttorp and D.B. Percival (2000) and Gencay, Selcuk and Whitcher (2001).

Value

Output:

Output pdf file: *WCplot.pdf*.

wavcor.modwtsDAT: matrix with as many rows as levels in the wavelet transform object. The first column provides the point estimate for the wavelet correlation followed by the lower and upper bounds from the confidence interval.

to3DpL: A matrix (the matrix table added in the WCplot.pdf plot) with a J (number of wavelet scales) X C (the number of pairwise comparisons) dimensions.

Note

Needs *waveslim* package to calculate *modwt*, *brick.wall* and the *wave.correlation*.

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Gencay, R., F. Selcuk and B. Whitcher (2001). *An Introduction to Wavelets and Other Filtering Methods in Finance and Economics*, Academic Press.

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Whitcher, B., P. Guttorp, and D.B. Percival. Wavelet analysis of covariance with application to atmospheric time series. *Journal of Geophysical Research - Atmospheres*, 105(D11):941-962, 2000.

Whitcher, B. (2012). Waveslim reference manual. The Comprehensive R Archive Network (CRAN), http://cran.r-project.org/web/packages/waveslim/index.html

Examples

```
## See the Figure 1 of Polanco-Martinez and Fernandez-Macho
## 2012 (to be submitted under review to Journal of
## Statistical Software).

 library("waveslim")
 library("W2CWM2C")
 data(dataexample)

 #:: Convert. log returns using: ln(t + deltat) - ln(t)
 #:: The application in this example is with stock market
 #:: indexes and it is common to use log returns instead
 #:: raw data. Other kinds of pre-processing data are possible.

 dataexample  <- dataexample[-1] # remove dates!
 dataexample  <- dataexample[,1:5]
 lrdatex      <- apply(log(dataexample), 2, diff)
 tslrdat      <- ts(lrdatex, start=1, frequency=1)

 #Input parameters
  Wname       <- "la8"
  J           <- 8
  Hp          <- 6
  Wp          <- 10
  tslrdat     <- tslrdat[,1:5]
```

```
compWC      <- WC(tslrdat, Wname, J, Hp, Wp)
```

WCC *Wavelet cross-correlation (bivariate case).*

Description

The *WCC* function (bivariate case) computes the wavelet cross correlation using the *spin.correlation* function of the *waveslim* package for two time series and presents the result as a novel plot that reduce the number of plots of the classical function *spin.correlation*.

Usage

```
WCC(inputDATA, Wname, J, lmax, Hpdf, Wpdf)
```

Arguments

inputDATA	A couple of time series as a *ts* object (please, check the *ts* manual to get more information about the *ts* function in R).
Wname	The wavelet function or filter to use in the decomposition.
J	Specifies the depth of the decomposition.
lmax	The maximum lag.
Hpdf	The height of the pdf file (output plot).
Wpdf	The width of the pdf file (output plot).

Details

The *WCC* function compute the Wavelet cross-correlation between two time series and plot the results in a single pdf file (*'wcc + var1 + var2.pdf'*) (please, see the Figure 3 of Polanco-Martinez and Fernandez-Macho 2012). The *WCC* code is based on the *spin.correlation* routine from Brandon Whitcher's *waveslim* R package Version: 1.7.1, which is based mainly on wavelet methodology developed in Whitcher, B., P. Guttorp and D.B. Percival (2000) and Gencay, Selcuk and Whitcher (2001).

Value

Output:

Output pdf file: *wcc_ + var1 + var 2 .pdf*

returns.cross.cor: a matrix with the WCC values.

Note

Needs *waveslim* package to calculate *modwt*, *brick.wall* and *spin.correlation*.

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Polanco-Martinez, J. and J. Fernandez-Macho (2012). The package 'W2CWM2C': description, features and applications. To be submitted under review to *Journal of Statistical Software*.

Whitcher, B., P. Guttorp, and D.B. Percival. Wavelet analysis of covariance with application to atmospheric time series. *Journal of Geophysical Research - Atmospheres*, 105(D11):941-962, 2000.

Whitcher, B. (2012). Waveslim reference manual. The Comprehensive R Archive Network (CRAN), http://cran.r-project.org/web/packages/waveslim/index.html

Examples

```
## See the Figure 3 of Polanco-Martinez and Fernandez-Macho
## 2012 (to be submitted under review to Journal of
## Statistical Software).

 library("waveslim")
 library("W2CWM2C")
 data(dataexample)

 #:: Convert. log return using: ln(t + deltat) - ln(t)
 #:: The application in this example is with stock market
 #:: indexes and it is common to use log returns instead
 #:: raw data. Other kinds of pre-processing data are possible.

 dataexample  <- dataexample[-1] #remove the dates!
 DAXCAC       <- dataexample[,c(3,4)]
 lrdatex      <- apply(log(DAXCAC), 2, diff)
 tslrdat      <- ts(lrdatex, start=1, frequency=1)

 Wname   <- "la8"
 J       <- 8
 Hp      <- 6
 Wp      <- 10
 lmax    <- 30
 compWCC <- WCC(tslrdat, Wname, J, lmax, Hp, Wp)
```

WMC *Wavelet multiple correlation (multivariate case).*

Description

The *WMC* function only generates a pdf plot (*WMC_plot.pdf*) to the Wavelet routine for multiple correlation (*wave.multiple.correlation*) from the *wavemulcor* package (Fernandez-Macho 2012), but also provides a way to handle multivariate time series easily as a list of N elements (time series).

Usage

```
WMC(inputDATA, Wname, J, Hpdf, Wpdf)
```

Arguments

inputDATA	A couple of time series as a *ts* object (please, check the *ts* manual to get more information about the *ts* function in R).
Wname	The wavelet function or filter to use in the decomposition.
J	Specifies the depth of the decomposition.
Hpdf	The height of the pdf file (output plot).
Wpdf	The width of the pdf file (output plot).

Details

The *WMC* function helps to make easily the plot (in pdf format) of the multiple correlation routine (*wave.multiple.correlation*) of the *wavemulcor* package (Fernandez-Macho 2012). The *WMC* function also helps to manage easily multivariate time series to use the Wavelet multiple correlation routine.

Value

Output:

Output pdf file: *WMC_plot.pdf*.

Output data: The same list of elements of the funtion *wave.multiple.correlation* of the *wavemulcor* package (Fernandez-Macho 2012).

Note

Needs *wavemulcor* (to compute the *wave.multiple.correlation*) and *waveslim* packages (to compute the *modwt* and the *brick.wall*).

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References

Fernandez-Macho, J.. Wavelet multiple correlation and cross-correlation: A multiscale analysis of euro zone stock markets. *Physica A: Statistical Mechanics and its Applications*, 391(4):1097-1104, 2012.

Fernandez-Macho, J. (2012). Wavemulcor Reference manual. The Comprehensive R Archive Network (CRAN), http://cran.r-project.org/web/packages/wavemulcor/index.html.

Examples

```
library("wavemulcor")
library("W2CWM2C")
data(dataexample)

#:: Convert. log return using: ln(t + deltat) - ln(t)
#:: The application in this example is with stock market
#:: indexes and it is common to use log returns instead
#:: raw data. Other kinds of pre-processing data are possible.

dataexample  <- dataexample[-1] #remove the dates!
dataexample  <- dataexample[,1:5]
lrdatex      <- apply(log(dataexample), 2, diff)
tslrdat      <- ts(lrdatex, start=1, frequency=1)

#Input parameters
 Wname       <- "la8"
 J           <- 8
 Hp          <- 6
 Wp          <- 10
 tslrdat     <- tslrdat[,1:5]
 compWMC     <- WMC(tslrdat, Wname, J, Hp, Wp)
```

WMCC *Wavelet Multiple cross-correlation (multivariate case).*

Description

The *WMCC* function (multivariate case) computes the Wavelet Multiple cross correlation by means of the function *wave.multiple.cross.correlation* from the *wavemulcor* package (Fernandez-Macho 2012) and present the result as a novel plot that reduce the number of plots of the classical function *wave.multiple.cross.correlation*. The *WMC* function also provides a way to handle multivariate time series easily as a list of N elements (time series).

Usage

```
WMCC(inputDATA, Wname, J, lmax, Hpdf, Wpdf)
```

Arguments

inputDATA	An array of multivariate time series as a *ts* object (please, check the *ts* manual to get more information about the *ts* function in R).
Wname	The wavelet function or filter to use in the decomposition.
J	Specifies the depth of the decomposition.
lmax	The maximum lag.
Hpdf	The height of the pdf file (output plot).
Wpdf	The width of the pdf file (output plot).

Details

The *WMCC* function compute the Wavelet Multiple Cross Correlation using the function *wave.multiple.cross.correlation* from the *wavemulcor* package (Fernandez-Macho 2012), but the *WMCC* function incorporates some graphical improvements (please, see the Figure 5 of Polanco-Martinez and Fernandez-Macho 2012), such as the reduction of the number of plots to present the results of the function *wave.multiple.cross.correlation*.

Value

Output:
Output pdf file: *WMCC_plot.pdf*.

Output data: The same list of elements of the function *wave.multiple.cross.correlation* of the *wavemulcor* package (Fernandez-Macho 2012).

Note

Needs *wavemulcor* (to compute the *wave.multiple.cross.correlation*) and *waveslim* packages (to compute the *modwt* and the *brick.wall*).

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References

Fernandez-Macho, J.. Wavelet multiple correlation and cross-correlation: A multiscale analysis of euro zone stock markets. *Physica A: Statistical Mechanics and its Applications*, 391(4):1097-1104, 2012.

Fernandez-Macho, J. (2012). Wavemulcor Reference manual. The Comprehensive R Archive Network (CRAN), http://cran.r-project.org/web/packages/wavemulcor/index.html.

Polanco-Martinez, J. and J. Fernandez-Macho (2012). The package 'W2CWM2C': description, features and applications. To be submitted under review to *Journal of Statistical Software*.

Examples

```
library("wavemulcor")
library("W2CWM2C")
data(dataexample)

#:: Convert. log return using: ln(t + deltat) - ln(t)
#:: The application in this example is with stock market
#:: indexes and it is common to use log returns instead
#:: raw data. Other kinds of pre-processing data are possible.

dataexample  <- dataexample[-1] #remove the dates!
lrdatex      <- apply(log(dataexample), 2, diff)
tslrdat      <- ts(lrdatex, start=1, frequency=1)

Wname   <- "la8"
J       <- 8
Hp      <- 6
Wp      <- 10
lmax    <- 30
compWCC <- WMCC(tslrdat, Wname, J, lmax, Hp, Wp)
```

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