Package ‘acfMPeriod’

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Type Package
Title Robust Estimation of the ACF from the M-Periodogram
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Depends R (>= 3.2.2), MASS
Description Non-robust and robust computations of the sample autocovariance (ACOVF) and sample autocorrelation functions (ACF) of univariate and multivariate processes. The methodology consists in reversing the diagonalization procedure involving the periodogram or the cross-periodogram and the Fourier transform vectors, and, thus, obtaining the ACOVF or the ACF as discussed in Fuller (1995) <doi:10.1002/9780470316917>. The robust version is obtained by fitting robust M-regressors to obtain the M-periodogram or M-cross-periodogram as discussed in Reisen et al. (2017) <doi:10.1016/j.jspi.2017.02.008>.
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CovCorMP\text{er} \quad \textit{Robust covariance or correlation matrix from the MPer-ACF}

\textbf{Description}

Wrapper that computes the covariance or correlation matrix of \( x \) at lag 0 obtained from the robust MPer-ACF.

\textbf{Usage}

\begin{verbatim}
CovCorMP\text{er}(x, type = c("correlation", "covariance"))
\end{verbatim}

\textbf{Arguments}

\begin{itemize}
\item \( x \) \quad a numeric matrix
\item \texttt{type} \quad character string giving the type of acf to be computed. Allowed values are "correlation" (the default) or "covariance".
\end{itemize}

\textbf{Value}

a numeric matrix

\textbf{Examples}

\begin{verbatim}
data.set <- cbind(fdeaths, mdeaths)
CovCorMP\text{er}(data.set)
\end{verbatim}

CovCorPer \quad \textit{Covariance or correlation matrix from the Per-ACF}

\textbf{Description}

Wrapper that computes the covariance or correlation matrix of \( x \) at lag 0 obtained from the Per-ACF.

\textbf{Usage}

\begin{verbatim}
CovCor\text{Per}(x, type = c("correlation", "covariance"))
\end{verbatim}

\textbf{Arguments}

\begin{itemize}
\item \( x \) \quad a numeric matrix
\item \texttt{type} \quad character string giving the type of acf to be computed. Allowed values are "correlation" (the default) or "covariance".
\end{itemize}
**CrossPeriodogram**

**Value**

a numeric matrix

**Examples**

```r
data.set <- cbind(fdeaths, mdeaths)
CovCorPer(data.set)
```

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**Description**

This function computes the cross-periodogram using harmonic regression.

**Usage**

```r
CrossPeriodogram(series1, series2)
```

**Arguments**

- `series1` univariate time series
- `series2` univariate time series

**Value**

a numeric vector containing the estimates of the cross-spectral density

**Author(s)**

Higor Cotta, Valdério A. Reisen, Pascal Bondon and Céline Lévy-Leduc

**References**

**MCrossPeriodogram**  
*Robust M-cross-periodogram*

**Description**
This function computes the Robust M-cross-periodogram using M-regression.

**Usage**

```r
MCrossPeriodogram(series1, series2)
```

**Arguments**

- `series1`: univariate time series
- `series2`: univariate time series

**Value**

a numeric vector containing the estimates of the cross-spectral density

**Author(s)**
Higor Cotta, Valdério A. Reisen, Pascal Bondon and Céline Lévy-Leduc

**References**

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**MPerACF**  
*Robust autocorrelation or autocovariance function estimation from the robust M-periodogram*

**Description**
This function computer and plots(by default) the robust estimates of the autocovariance or the autocorrelation function for univariate and multivariate time series based on the M-periodogram and the M-cross-periodogram.

**Usage**

```r
MPerACF(x, lag.max = NULL, type = c("correlation", "covariance"), plot = TRUE, na.action = na.fail, demean = TRUE, ...)
```
Arguments

x a numeric vector or matrix.

lag.max maximum lag at which to calculate the acf. Default is \(10 \times \log_{10}(N/m)\) where \(N\) is the number of observations and \(m\) the number of series. Will be automatically limited to one less than the number of observations in the series.

type character string giving the type of acf to be computed. Allowed values are "cor-
relation" (the default) or "covariance". Accepts parcial names.

plot logical. If TRUE (the default) the acf is plotted.

na.action function to be called to handle missing values. na.pass can be used.

demean logical. Should the covariances be about the sample means?

... further arguments to be passed to plot.acf.

Value

An object of class "robacf", which is a list with the following elements:

lag A three dimensional array containing the lags at which the acf is estimated.

acf An array with the same dimensions as lag containing the estimated acf.

type The type of correlation (same as the type argument).

n.used The number of observations in the time series.

series The name of the series x.

snames The series names for a multivariate time series.

The result is returned invisibly if plot is TRUE.

Author(s)

Higor Cotta, Valderio Reisen, Pascal Bondon and Céline Lévy-Leduc. Part of the code re-used from the acf() function.

References

Fuller, Wayne A. Introduction to statistical time series. John Wiley & Sons, 2009

Examples

data.set <- cbind(fdeaths, mdeaths)
MPerACF(data.set)
### MPerioReg

**Robust M-periodogram**

**Description**

This function computes the univariate robust M-periodogram using M-regression.

**Usage**

```r
MPerioReg(series)
```

**Arguments**

- `series` univariate time series

**Value**

a numeric vector containing the robust estimates of the spectral density

**Author(s)**

Higor Cotta, Valdério A. Reisen, Pascal Bondon and Céline Lévy-Leduc.

**References**


**Examples**

```r
MPerioReg(ldeaths)
```

### PerACF

**Autocorrelation or autocovariance function estimation from the periodogram**

**Description**

This function computer and plots(by default) the estimates of the autocovariance or the autocorrelation function for univariate and multivariate time series based on the periodogram and the cross-periodogram.

**Usage**

```r
PerACF(x, lag.max = NULL, type = c("correlation", "covariance"), plot = TRUE, na.action = na.fail, demean = TRUE, ...)
```
**Arguments**

- **x**
  - a numeric vector or matrix.

- **lag.max**
  - maximum lag at which to calculate the acf. Default is $10\log_{10}(N/m)$ where $N$ is the number of observations and $m$ the number of series. Will be automatically limited to one less than the number of observations in the series.

- **type**
  - character string giving the type of acf to be computed. Allowed values are "correlation" (the default) or "covariance". Accepts parcial names.

- **plot**
  - logical. If TRUE (the default) the acf is plotted.

- **na.action**
  - function to be called to handle missing values. na.pass can be used.

- **demean**
  - logical. Should the covariances be about the sample means?

- **...**
  - further arguments to be passed to plot.acf.

**Value**

An object of class "acf", which is a list with the following elements:

- **lag**
  - A three dimensional array containing the lags at which the acf is estimated.

- **acf**
  - An array with the same dimensions as lag containing the estimated acf.

- **type**
  - The type of correlation (same as the type argument).

- **n.used**
  - The number of observations in the time series.

- **series**
  - The name of the series x.

- **snames**
  - The series names for a multivariate time series.

The result is returned invisibly if plot is TRUE.

**Author(s)**

Higor Cotta, Valderio Reisen, Pascal Bondon and Céline Lévy-Leduc. Part of the code re-used from the acf() function.

**References**


**Examples**

```r
data.set <- cbind(fdeaths, mdeaths)
PerACF(data.set)
PerACF(data.set, type = "covariance", lag.max = 10)
```
PerioReg  Periodogram

Description
This function computes the univariate periodogram using harmonic regression.

Usage
PerioReg(series)

Arguments
series  univariate time series

Value
a numeric vector containing the robust estimates of the spectral density

Author(s)
Higor Cotta, Valdério A. Reisen, Pascal Bondon and Céline Lévy-Leduc.

References

Examples
PerioReg(ldeaths)

plot.robacf  Plot Robust Autocovariance and Robust Autocorrelation Functions

Description
Plot method for objects of class "robacf". Mostly of the code re-used from the standard acf class.
Usage

## S3 method for class 'robacf'
plot(x, type = "h", xlab = "Lag", ylab = NULL,
     ylim = NULL, main = NULL, max.mfrow = 6, ask = Npgs > 1 &&
     dev.interactive(), mar = if (nser > 2) c(3, 2, 2, 0.8) else par("mar"),
     oma = if (nser > 2) c(1, 1.2, 1, 1) else par("oma"), mgp = if (nser >
     2) c(1.5, 0.6, 0) else par("mgp"), xpd = par("xpd"), cex.main = if
     (nser > 2) 1 else par("cex.main"), verbose = getOption("verbose"), ...)

Arguments

x an object of class "robacf".

type the type of plot to be drawn, default to histogram like vertical lines.

xlab the x label of the plot.

ylab the y label of the plot.

ylim numeric of length 2 giving the y limits for the plot.

main overall title for the plot.

max.mfrow positive integer; for multivariate x indicating how many rows and columns of
        plots should be put on one page, using par(mfrow = c(m,m))(see par).

ask logical; if TRUE, the user is asked before a new page is started.

mar, oma, mgp, xpd, cex.main
        graphics parameters as in par(*), by default adjusted to use smaller than default
        margins for multivariate x only.

verbose logical. Should R report extra information on progress?

... graphics parameters to be passed to the plotting routines.

Value

None

Contributions

plot.acf (stats) - R Core