Package 'corbouli'

January 9, 2025

Type Package

Title Corbae-Ouliaris Frequency Domain Filtering

Version 0.1.4

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Description Corbae-Ouliaris frequency domain filtering. According to Corbae and Ouliaris (2006) <doi:10.1017/CBO9781139164863.008>, this is a solution for extracting cycles from time series, like business cycles etc. when filtering. This method is valid for both stationary and non-stationary time series.

License GPL-3

Encoding UTF-8

URL https://github.com/cadam00/corbouli, https://cadam00.github.io/corbouli/

BugReports https://github.com/cadam00/corbouli/issues

LazyData true

Imports stats

Suggests Rfast, Rfast2, knitr, rmarkdown, testthat (>= 3.0.0)

VignetteBuilder knitr, rmarkdown

Config/testthat/edition 3

NeedsCompilation no

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Repository CRAN

Date/Publication 2025-01-09 21:10:02 UTC

Contents

`corbae_ouliaris` *Corbae-Ouliaris*

Description

Corbae-Ouliaris (2006) Frequency Domain Filter

Usage

```
corbae_ouliaris(x, low_freq = NULL, high_freq = NULL)
```

Arguments

`x`	Vector, `data.frame`, `matrix` or any similar 1D/2D object containing values for filtering.
`low_freq`	Number indicating the lowest period of oscillation as fractions of π. If `low_freq > 1`, indicating that the direct frequency of the data is provided, this is transformed internally into `2 / high_freq`. The default is `NULL`, meaning that the `ifelse(freq > 1, trunc(freq * 1.5), 2)` will be used.
`high_freq`	Number indicating the highest period of oscillation as radians of π. If `high_freq > 1`, indicating that the direct frequency of the data is provided, this is transformed internally into `2 / low_freq`. The default is `NULL`, meaning that the `trunc(freq * 8)` will be used.

Details

This is a pure R implementation of the filtering algorithm. `low_freq` and `high_freq` are connected with characteristics of the series, for example the business circle. `low_freq` and `high_freq` must be both either between 0 and 1, meaning that they are frequencies of the period as radians, or both >1, indicating that both are starting and ending periods of the cycle.

`low_freq` and `high_freq` are used for keeping the relevant frequencies. These are meant to be the ones inside the range $[low\_freq, high\_freq]$. Therefore, values outside this range are removed.

For 2-dimensional objects `x`, filtering per column is applied.

Value

Filtered object with the same length/dimensions and class as the input `x`.

References

Corbae, D., Ouliaris, S., & Phillips, P. (2002), Band Spectral Regression with Trending-Data. *Econometrica* **70**(3), pp. 1067-1109.

Corbae, D. & Ouliaris, S. (2006), Extracting Cycles from Nonstationary Data, in Corbae D., Durlauf S.N., & Hansen B.E. (eds.). *Econometric Theory and Practice: Frontiers of Analysis and Applied Research*. Cambridge: Cambridge University Press, pp. 167–177. doi:10.1017/CBO9781139164863.008.

Shaw, E.S. (1947), Burns and Mitchell on Business Cycles. *Journal of Political Economy*, **55**(4): pp. 281-298. doi:10.1086/256533.

See Also

dftse

Examples

```
# Apply on ts
data(USgdp)
res <- corbae_ouliaris(USgdp, low_freq = 0.0625, high_freq = 0.3333)
head(res)

# Apply on vector
data(USgdp)
res <- corbae_ouliaris(USgdp, low_freq = 0.0625, high_freq = 0.3333)
head(res)

# Apply on matrix per column
mat <- matrix(USgdp, ncol = 4)
res <- corbae_ouliaris(mat, low_freq = 0.0625, high_freq = 0.3333)
head(res)

# Apply on data.frame per column
dfmat <- as.data.frame(mat)
res <- corbae_ouliaris(dfmat, low_freq = 0.0625, high_freq = 0.3333)
head(res)
```

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dftse *Remove irrelevant frequencies*

Description

Remove irrelevant frequencies

Usage

```
dftse(x, low_freq = NULL, high_freq = NULL)
```

Arguments

x	Vector, data.frame, matrix or any similar 1D/2D object containing values for filtering.
low_freq	Number indicating the lowest period of oscillation as fractions of π. If low_freq > 1, indicating that the direct frequency of the data is provided, this is transformed internally into 2 / high_freq. The default is NULL, meaning that the ifelse(freq > 1, trunc(freq * 1.5), 2) will be used.
high_freq	Number indicating the highest period of oscillation as radians of π. If high_freq > 1, indicating that the direct frequency of the data is provided, this is transformed internally into 2 / low_freq. The default is NULL, meaning that the trunc(freq * 8) will be used.

Details

This is a pure R implementation of removing the irrelevant frequencies. First, DFT is applied on the data and this result is filtered according to `low_freq` and `high_freq`. Finally, an inverse DFT is performed on these relevant frequencies. Both `low_freq` and `high_freq` must be either between 0 and 1, meaning that they are frequencies of the period as radians, or both >1, indicating that both are starting and ending periods of the cycle.

`low_freq` and `high_freq` are used for keeping the relevant frequencies. These are meant to be the ones inside the range $[low\_freq, high\_freq]$. Therefore, values outside this range are removed.

For 2-dimensional objects `x`, this transformation is applied per column.

Value

Filtered object with length/dimensions same with the input `x`. Note that for inputs with dimensions (e.g. `matrix`, `data.frame`) a `matrix` object will be returned.

References

Corbae, D., Ouliaris, S., & Phillips, P. (2002), Band Spectral Regression with Trending-Data. *Econometrica* **70**(3), pp. 1067-1109.

Corbae, D. & Ouliaris, S. (2006), Extracting Cycles from Nonstationary Data, in Corbae D., Durlauf S.N., & Hansen B.E. (eds.). *Econometric Theory and Practice: Frontiers of Analysis and Applied Research*. Cambridge: Cambridge University Press, pp. 167–177. doi:10.1017/CBO9781139164863.008.

Shaw, E.S. (1947), Burns and Mitchell on Business Cycles. *Journal of Political Economy*, **55**(4): pp. 281-298. doi:10.1086/256533.

See Also

`corbae_ouliaris`

Examples

```
# Apply on ts object
data(USgdp)
res <- dftse(USgdp, low_freq = 0.0625, high_freq = 0.3333)
head(res)

# Apply on vector
res <- dftse(c(USgdp), low_freq = 0.0625, high_freq = 0.3333)
head(res)

# Apply on matrix per column
mat <- matrix(USgdp, ncol = 4)
res <- dftse(mat, low_freq = 0.0625, high_freq = 0.3333)
head(res)

# Apply on data.frame per column
dfmat <- as.data.frame(mat)
res <- dftse(dfmat, low_freq = 0.0625, high_freq = 0.3333)
head(res)
```

USgdp *USgdp*

Description

Quarterly US GDP in billions of chained 2017 dollars (Seasonally adjusted) series from 1947.1 to 2019.4.

number of observations : 292

observation : country

country : United States

Usage

```
data(USgdp)
```

Format

A monthly time series, in billions of chained 2017 dollars.

Value

A `ts` object.

Source

Bureau of Economic Analysis.

References

U.S. Bureau of Economic Analysis. (2024). Current-dollar and "real" GDP. Retrieved from BEA website. https://www.bea.gov/

Examples

```
# Apply on vector
data(USgdp)
USgdp
```

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