

Package ‘corbouli’

September 25, 2024

Type Package

Title Corbae-Ouliaris Frequency Domain Filtering

Version 0.1.1

Maintainer Christos Adam <econp266@econ.soc.uoc.gr>

Description Corbae-Ouliaris frequency domain filtering. According to Corbae and Ouliaris (2006) <[doi:10.1017/CBO9781139164863.008](https://doi.org/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 knitr, rmarkdown, testthat (>= 3.0.0)

VignetteBuilder knitr, rmarkdown

Config/testthat/edition 3

NeedsCompilation no

Author Christos Adam [aut, cre]

Repository CRAN

Date/Publication 2024-09-25 11:10:02 UTC

Contents

corbae_ouliaris	2
dftse	3
USgdp	5

Index	6
--------------	----------

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 <code>low_freq > 1</code> , indicating that the direct frequency of the data is provided, this is transformed internally into $2 / \text{high_freq}$. The default is <code>NULL</code> , meaning that the <code>ifelse(freq > 1, trunc(freq * 1.5), 2)</code> will be used.
high_freq	Number indicating the highest period of oscillation as radians of π . If <code>high_freq > 1</code> , indicating that the direct frequency of the data is provided, this is transformed internally into $2 / \text{low_freq}$. The default is <code>NULL</code> , meaning that the <code>trunc(freq * 8)</code> 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 cycle. `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 $[\text{low_freq}, \text{high_freq}]$. 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)
```

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 <code>low_freq > 1</code> , indicating that the direct frequency of the data is provided, this is transformed internally into $2 / \text{high_freq}$. The default is <code>NULL</code> , meaning that the <code>ifelse(freq > 1, trunc(freq * 1.5), 2)</code> will be used.
high_freq	Number indicating the highest period of oscillation as radians of π . If <code>high_freq > 1</code> , indicating that the direct frequency of the data is provided, this is transformed internally into $2 / \text{low_freq}$. The default is <code>NULL</code> , meaning that the <code>trunc(freq * 8)</code> 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
```

Index

corbae_ouliaris, [2](#), [4](#)

dftse, [3](#), [3](#)

USgdp, [5](#)