Package 'FCUSUM'

November 12, 2025

Type Package

Title Fourier CUSUM Cointegration Test

Version 1.0.0

Description Implements the Fourier cumulative sum (CUSUM) cointegration test for detecting cointegration relationships in time series data with structural breaks. The test uses Fourier approximations to capture smooth structural changes and CUSUM statistics to test for cointegration stability. Based on methodology described in Zaghdoudi (2025) <doi:10.46557/001c.144076>. The corrected Akaike Information Criterion (AICc) is used for optimal frequency selection.

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Encoding UTF-8

Depends R (>= 3.5.0)

Imports stats

RoxygenNote 7.3.1

NeedsCompilation no

Author Taha Zaghdoudi [aut, cre]

Maintainer Taha Zaghdoudi <zedtaha@gmail.com>

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`fcum` *Fourier CUSUM Cointegration Test*

Description

Implements the Fourier CUSUM test for cointegration with structural breaks. The test uses Fourier approximations to model smooth structural changes and applies CUSUM statistics to test for cointegration stability.

Usage

```
fcum(y, x, kstar = 3)
```

Arguments

`y`	Numeric vector or matrix. Dependent variable time series.
`x`	Numeric vector or matrix. Independent variable(s) time series. Must have the same number of observations as y.
`kstar`	Positive numeric value. Maximum frequency parameter for Fourier approximation. Determines the flexibility of structural break modeling. Default is 3.

Details

The null hypothesis is that there exists a cointegrating relationship with stable parameters. The alternative hypothesis is that the cointegrating relationship is unstable or does not exist.

The test searches over a grid of frequencies from 0.1 to `kstar` and selects the optimal frequency using the corrected Akaike Information Criterion (AICc). The CUSUM statistic is then computed from the residuals of the best model.

Critical values are based on simulation studies and depend on:

- The number of regressors (p)
- The frequency parameter (k)

Value

An object of class `fcum` containing:

statistic The CUSUM test statistic

critical_values Critical values at 1%, 5%, and 10% significance levels

p Number of regressors used for critical value lookup

k Frequency parameter used for critical value lookup

kstar Maximum frequency parameter (user input)

best_frequency Optimal frequency selected by AICc criterion

decision Test decision (reject or fail to reject null hypothesis)

significance Significance level indicator (*, **, ***)

best_model The best fitting lm model object

call The matched function call

References

Zaghdoudi, T. (2025). Fourier CUSUM Cointegration Test Methodology.

Examples

```
# Generate sample data
set.seed(123)
n <- 100
x <- cumsum(rnorm(n))
y <- 2 + 1.5 * x + rnorm(n)

# Run the test
result <- fcum(y, x, kstar = 3)
print(result)
summary(result)
```

`print.fcum` *Print Method for fcum Objects*

Description

Print Method for fcum Objects

Usage

```
## S3 method for class 'fcum'
print(x, ...)
```

Arguments

`x`	An object of class `fcum`
`...`	Additional arguments (not used)

Value

Invisibly returns the input object

summary.fcum *Summary Method for fcum Objects*

Description

Summary Method for fcum Objects

Usage

```
## S3 method for class 'fcum'
summary(object, ...)
```

Arguments

object	An object of class fcum
...	Additional arguments (not used)

Value

Invisibly returns the input object

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