Package: cointests (via r-universe)

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Type Package

Title Comprehensive Cointegration Tests with Fourier and Panel Methods

Version 1.0.0

Description A unified toolkit for cointegration testing including Fourier-based cointegration tests (FADL, FEG, FEG2, Tsong) that accommodate smooth structural breaks via flexible Fourier terms, and panel CADF cointegration tests with structural breaks using the Common Correlated Effects (CCE) estimator following Banerjee, Arcabic and Lee (2017) <doi:10.1016/j.econmod.2017.03.004>, Tsong, Lee, Tsai and Hu (2016) <doi:10.1007/s00181-015-1028-6>, and Banerjee and Carrion-i-Silvestre (2025) <doi:10.1080/07350015.2024.2327844>.

License GPL-3

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Depends R (>= 3.5.0)

Imports stats

Suggests testthat (>= 3.0.0)

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Repository https://muhammedalkhalaf.r-universe.dev

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Contents

`fcoint` *Fourier Cointegration Tests for Time Series*

Description

Implements four Fourier-based cointegration tests that accommodate smooth structural breaks via flexible Fourier terms: FADL, FEG, FEG2, and Tsong.

Usage

```
fcoint(y, x, test = c("fadl", "feg", "feg2", "tsong", "all"),
  model = c("constant", "trend"), max_freq = 5L, max_lag = 0L,
  criterion = c("aic", "bic"), dols_lags = 0L)
```

Arguments

`y`	Numeric vector. Dependent (left-hand side) time-series variable.
`x`	Numeric matrix or vector. Independent (right-hand side) variables.
`test`	Character. Which test to run: `"fadl"`, `"feg"`, `"feg2"`, `"tsong"`, or `"all"`. Default is `"fadl"`.
`model`	Character. Deterministic component: `"constant"` (default) or `"trend"`.
`max_freq`	Integer. Maximum Fourier frequency to search over (1–5). Default is `5`.
`max_lag`	Integer. Maximum lag order. `0` selects automatically via the information criterion. Default is `0`.
`criterion`	Character. Information criterion for lag selection: `"aic"` (default) or `"bic"`.
`dols_lags`	Integer. Leads and lags for the DOLS estimator used in the Tsong test. Default is `0` (automatic).

Details

The Fourier approach allows for smooth, nonlinear breaks in the deterministic components by augmenting standard cointegration regressions with one or more pairs of sine and cosine terms.

FADL (Banerjee, Arcabic & Lee, 2017): An ADL-type residual-based test. The optimal Fourier frequency k^* and lag order are chosen jointly by minimising the selected information criterion over a grid.

FEG and FEG2 (Banerjee & Lee): Engle-Granger style residual-based tests augmented with Fourier terms. FEG2 includes an additional R^2 correction.

Tsong et al. (2016): A DOLS-based cointegration test with Fourier terms. Reports both a CI statistic and an F-statistic for joint significance of Fourier terms.

Value

A list of class `"fcoint"` containing:

test Character. Name(s) of the test(s) performed.

results Named list of individual test results.

model Character. Deterministic component used.

criterion Character. Information criterion used.

nobs Integer. Effective number of observations.

References

Banerjee, P., Arcabic, V., & Lee, H. (2017). Fourier ADL cointegration test to approximate smooth breaks with new evidence from crude oil market. *Economic Modelling*, 67, 114–124. doi:10.1016/j.econmod.2017.03.004

Tsong, C.-C., Lee, C.-F., Tsai, L.-J., & Hu, T.-C. (2016). The Fourier approximation and testing for the null of cointegration. *Empirical Economics*, 51(3), 1085–1113. doi:10.1007/s0018101510286

Examples

```
set.seed(42)
n <- 80
x <- cumsum(rnorm(n))
y <- 0.5 * x + rnorm(n, sd = 0.3)
res <- fcoint(y, x, test = "fadl", max_freq = 3)
print(res)
```

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print.fcoint *Print Method for fcoint Objects*

Description

Prints a formatted summary of Fourier cointegration test results.

Usage

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

Arguments

`x`	An object of class `"fcoint"`.
`...`	Further arguments passed to or from other methods (unused).

Value

Invisibly returns `x`.

Examples

```
set.seed(1)
n <- 60
x <- cumsum(rnorm(n))
y <- 0.5 * x + rnorm(n)
res <- fcoint(y, x, test = "fadl", max_freq = 2)
print(res)
```

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

Description

Prints a formatted summary of an `"xtcadfcoint"` result.

Usage

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

Arguments

`x`	An object of class `"xtcadfcoint"`.
`...`	Additional arguments (ignored).

Value

Invisibly returns `x`.

`summary.xtcadfcoint` *Summary Method for xtcadfcoint Objects*

Description

Prints a summary of an `"xtcadfcoint"` result.

Usage

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

Arguments

`object`	An object of class `"xtcadfcoint"`.
`...`	Additional arguments (ignored).

Value

Invisibly returns `object`.

`xtcadfcoint` *Panel CADF Cointegration Test with Structural Breaks*

Description

Tests the null hypothesis of no cointegration in panel data using the cross-sectionally augmented Dickey-Fuller (CADF) approach of Banerjee and Carrion-i-Silvestre (2025). Accounts for cross-sectional dependence via the Common Correlated Effects (CCE) estimator and allows for structural breaks.

Usage

```
xtcadfcoint(formula, data, index, model = 1, breaks = 0,
            trimming = 0.15, maxlags = 4, lagselect = "bic",
            nfactors = 1, brk_slope = FALSE, brk_loadings = FALSE,
            cce = TRUE, simulate = 0, level = 95)
```

Arguments

`formula`	A formula of the form `y ~ x1 + x2 + ...`.
`data`	A data frame in long format.
`index`	Character vector of length 2: `c("id_var", "time_var")`.
`model`	Integer (0-5) specifying the deterministic component.
`breaks`	Integer (0, 1, or 2). Number of structural breaks.
`trimming`	Numeric. Trimming fraction for break date search. Default 0.15.
`maxlags`	Maximum lag order for ADF augmentation. Default 4.
`lagselect`	Lag selection: `"bic"`, `"aic"`, `"maic"`, `"mbic"`, or `"fixed"`.
`nfactors`	Integer. Number of common factors for CCE. Default 1.
`brk_slope`	Logical. Allow breaks in cointegrating vector slopes.
`brk_loadings`	Logical. Allow breaks in factor loadings.
`cce`	Logical. Apply CCE augmentation. Default `TRUE`.
`simulate`	Integer. Bootstrap replications for critical values (0 = skip).
`level`	Confidence level in percent. Default 95.

Value

An object of class `"xtcadfcoint"` containing panel CIPS statistics, individual CADF statistics, estimated break dates, and coefficient estimates.

References

Banerjee, A. and Carrion-i-Silvestre, J.L. (2024). Panel Data Cointegration Testing with Structural Instabilities. *Journal of Business & Economic Statistics*, 43, 122–133. doi:10.1080/07350015.2024.2327844

Examples

```
set.seed(42)
n <- 5; tt <- 30
uid  <- rep(1:n, each = tt)
tval <- rep(1:tt, times = n)
x_it <- cumsum(rnorm(n * tt))
y    <- x_it + rnorm(n * tt, sd = 0.5)
dat  <- data.frame(id = uid, time = tval, y = y, x = x_it)
res  <- xtcadfcoint(y ~ x, data = dat, index = c("id", "time"), model = 1)
print(res)
```

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