Package ‘cif’

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crossing

computes at which observation a vector \( y \) crosses \( y_{ref} \) for the first time if it is not crossed, then 0 is returned

Usage

crossing(yfor, ref = 0)

Arguments

- \( yfor \): \( yfor \) is either a vector and a matrix
- \( ref \): \( ref \) is the reference value

Value

whensign, a matrix with observation number at which there is crossing

Author(s)

P. Berta, P. Paruolo, S. Verzillo, PG. Lovaglio
**diffe**

*appends NA at beginning of \textit{diff}(y)*

**Description**

appends NA at beginning of \textit{diff}(y) and creates column names accordingly when \textit{y} is either a vector and a matrix

**Usage**

diffe(\textit{y})

**Arguments**

\textit{y}  
either a vector and a matrix

**Value**

\textit{Dy} contains the differences of \textit{y}, with NA appended at the start

**Author(s)**

P. Paruolo

**References**

Berta et al. 2020

---

**ec.companion**

*computes companion matrix of the VAR*

**Description**

builds the companion matrix of the VAR

**Usage**

ec.companion(\textit{est}, \textit{p} = 2, \textit{nlag} = 4)

**Arguments**

\textit{est}  
is the output of ec.EG1.R
\textit{p}  
(positive integer) is the dimension of the VAR
\textit{nlag}  
(positive integer) is the number of lags in the VAR
ec.datadet1

prepares deterministics $D^*(1)$

Description
Prepares deterministic data

Usage
ec.datadet1(n, befpn, breaks)

Arguments
- **n** is the number of obs in available data
- **befpn** is a vector with (begtrim,endtrim,nforecast,npred,nhstar)
- **breaks** is a vector of integers where the trend breaks should be

Value
matdet1 a matrix with the following columns (1_vec, t_vec) and (n+npred) rows

Author(s)
P. Berta, P. Paruolo, S. Verzillo, PG. Lovaglio

References
Berta et al. 2020
ec.datadet2

prepares deterministics $D^2(2)$

Description
Prepares deterministic dummies for de-meaned daily seasonal and difference point dummies

Usage
ec.datadet2(det1, booseas = NA, pntdates = NA)

Arguments
- **det1**: is the det term with constant and trend created by ec.datadet1.R
- **booseas**: is a boolean for daily seasonal dummies
- **pntdates**: is a vector of integers where the point dummies should be

Value
det2mat a matrix with the following columns (daily_seas, point_dummies) and n+npred rows

Author(s)
P. Berta, P. Paruolo, S. Verzillo, PG. Lovaglio

References
Berta et al. 2020

ec.datalag

prepares $Dy, y_1, Dy_1, ... Dy_{nlag-1}$ for estimation

Description
Prepares data for estimation

Usage
ec.datalag(y, nlag = 4)

Arguments
- **y**: is the data matrix of variables in the VAR
- **nlag**: is the number of lags in the VAR (min = 2)
ec.EG1 estimates the VECM with the 2-stage procedure of Engle & Granger

Description
Estimates the EC with EG. Cointegration rank fixed at 1

Usage
ec.EG1(det1, det2, ymat, npl, befpn, ndet, drop1 = NA, drop2 = NA)

Arguments
- det1: deterministic matrix of constant(s) and trend(s)
- det2: deterministic matrix of seasonals and point dummies
- ymat: matrix of lags
- npl: n, p, nlag
- befpn: begtrim, endtrim, nforecast, npred
- ndet: order of the model d(i,j)
- drop1: selection of det1 regressors in first stage to drop
- drop2: selection of det1 regressors in second stage to drop

Value
out a list with estimates

Author(s)
P. Berta, P. Paruolo, S. Verzillo, P.G. Lovaglio

References
Berta et al. 2020
ec.gfd  
*plots forecasts of difference with confidence bars*

**Description**
plots forecasts of difference with confidence bars

**Usage**
```
ec.gfd(obj, whichseries = 1, nsigma = 3, xvec, yvec, cal, lar = 0.025, ...)
```

**Arguments**
- `obj`: output of ec.main
- `whichseries`: series number
- `nsigma`: how many standard deviations in confidence bars
- `xvec`: vector of dates to place on x axis
- `yvec`: vector of exp(y) values to display on y axis
- `cal`: calendar vector
- `lar`: length of arrows in error bars
- `...`: other plot parameters

**Value**
does not return output, just creates a graph

**Author(s)**
P. Paruolo,

---

ec.gfl  
*plots level forecasts with confidence bars*

**Description**
plots level forecasts with confidence bars

**Usage**
```
ec.gfl(obj, whichseries = 1, nsigma = 3, xvec, yvec, cal, lar = 0.025, ...)
```
ec.gfld plots forecasts of levels and difference with confidence bars

Arguments

- **obj**: output of ec.main
- **whichseries**: series number
- **nsigma**: how many standard deviations in confidence bars
- **xvec**: vector of dates to place on x axis
- **yvec**: vector of exp(y) values to display on y axis
- **cal**: calendar vector
- **lar**: length of arrows in error bars
- **...**: other plot parameters

Value

does not return output, just creates a graph

Author(s)

P. Paruolo

Usage

```r
ec.gfld(
  obj,
  whichseries = 1,
  nsigma = 3,
  jointboo = TRUE,
  epsboo = TRUE,
  filename = "whatever",
  xvec,
  yvec,
  cal,
  lar = 0.025,
  ...
)
```
Arguments

- **obj**: output of ec.main
- **whichseries**: series number
- **nsigma**: how many standard deviations in confidence bars
- **jointboo**: boolean: TRUE if 1x2 graph, FALSE otherwise
- **epsboo**: boolean: TRUE eps graph, FALSE pdf graph
- **filename**: string, name of the file (no extension)
- **xvec**: vector of dates to place on x axis
- **yvec**: vector of \( \exp(y) \) values to display on y axis
- **cal**: calendar vector
- **lar**: length of arrows in error bars
- ...: other plot parameters

Value

does not return output, just creates a double graph

Author(s)

P. Paruolo

---

**ec.ifp**

*Computes Indices of Forecast Performance*

Description

indices of forecast performance

Usage

```r
ec.ifp(afdlin, rwsigma, rwabsmean, kval = 1.959964)
```

Arguments

- **afdlin**: actual + forecast values + fcse
- **rwsigma**: standard deviation of Random Walk in sample
- **rwabsmean**: mean absolute deviation of Random Walk in sample
- **kval**: how many se to use, default kval = 1.959964

Value

list of indices of forecast performance 1: index for model forecast 0: index for Random Walk forecast
Author(s)

P. Berta, P. Paruolo, S. Verzillo, PG. Lovaglio

References

Berta et al. 2020

---

**ec.main**

*Forecast with Vector Error Correction Model*

Description

This function estimates a VECM model. Selects begtrim and entrim period, defines lag and run.

Usage

```r
ec.main(
  y,
  ndet = c(2, 1),
  nlag,
  befpn,
  breaks = NA,
  booseas = NA,
  pntdates = NA,
  drop1 = NA,
  drop2 = NA,
  cal,
  kval = 1.959964
)
```

Arguments

- `y`: matrix with time across rows and variables in columns
- `ndet`: vector of length 3, (i,j,q): i for EG1-st stage, j for EG-2nd stage, q number of breaks i,j=0 no deterministics i,j=1 constant i,j=2 constant and trend
- `nlag`: number of lags in the VAR
- `bepn`: begtrim, endtrim, nforecast, npred
- `breaks`: vector with observation numbers for T1,T2,...
- `booseas`: boolean =T if seasonal dummies, =F otherwise
- `pntdates`: vector with observation numbers for point dummies
- `drop1`: selection of det1 regressors in first stage to drop
- `drop2`: selection of det1 regressors in second stage to drop
- `cal`: calendar for the y matrix
- `kval`: how many se to use, default kval=1.959964
Value

results Output contains the a set of estimates and forecasting results.

Author(s)

P. Berta, P. Paruolo, S. Verzillo, PG. Lovaglio

References

Berta et al. 2020

does not return output, just creates a graph
ec.plotroots

Author(s)

P. Paruolo

References

Berta et al. 2020

ec.plotroots

Companion matrix of the VAR

Description

plots roots and the unit circle

Usage

ec.plotroots(roots)

Arguments

roots are the roots of the companion matrix, see ec.companion.R

Value

does not return output, just creates a graph

Author(s)

P. Berta, P. Paruolo, S. Verzillo, PG. Lovaglio

References

Berta et al. 2020
ec.predict  produces predictions for the VECM via its VAR companion form

Description
Predicts both in-sample (1 step ahead) and out-of-sample (1 step ahead and dynamic forecasts)

Usage
ec.predict(est, det1, det2, ymat, npl, befpn, ndet, cal, kval = 1.959964)

Arguments
- `est`: output from estimation by ec.EG1.R
- `det1`: deterministic matrix of constant(s) and trend(s)
- `det2`: deterministic matrix of seasonals and point dummies
- `ymat`: matrix of lags
- `npl`: n, p, nlag
- `befpn`: begtrim, endtrim, nforecast, npred, nhstar
- `ndet`: order of the model d(i,j)
- `cal`: calendar, should match the number of rows in ymat
- `kval`: how many se to use, default kval = 1.959964

Value
list with contains: afl (actual and 1 step ahead fitted levels) afd (actual and 1 step ahead fitted differences) fit (1 step ahead fit) dynpred (dynamic predictions) mA mB (companion matrix and selection of it) Sigmah (Sigmah for dyn forecasts) forstartdate (starting date for dyn forecast) outcal (dates for the prediction) h1star (h1star) cspred (table with change in sign of pred for Dx_1) indexfa (indices of forecast accuracy)

Author(s)
P. Berta, P. Paruolo, S. Verzillo, PG. Lovaglio

References
Berta et al. 2020
### ec.searchbreaks

**search for breaks dates for given q (=1,2,3,4)**

**Description**

Search for location of break points in 1st-stage of Engle-Granger

**Usage**

```r
ec.searchbreaks(qse, ymat, npl, befpn, ndet, gfillmin = 10, fixed = NA)
```

**Arguments**

- `qse`: q: number of (additional) breaks, s: start date for search, e: end date for search
- `ymat`: matrix of lags
- `npl`: n, p, nlag
- `befpn`: begtrim, endtrim, nforecast, npred
- `ndet`: order of the model d(i,j)
- `gfillmin`: gfill value
- `fixed`: vector of breaks to be taken as fixed (not between s=start and e=end)

**Value**

out list with break dates and values of regression average sum of squares

**Author(s)**

P. Paruolo

**References**

Berta et al. 2020

---

### iculomb

**Data from Italian Civil Protection**

**Description**

Data from Italian Civil Protection

**Usage**

```r
data(iculomb)
```
**Format**

A dataset including 324 obs and 24 columns.

**Source**


**References**

Italian Civil Protection

**Examples**

`data(iculomb)`

---

**Description**

`lagn(y, j, fill = NA)` produces lag `j` of matrix or vector `y`, with fill in missing `j` cells. REM: alternative to "lead-lag" dplyr which applies to vector `y`.

**Usage**

`lagn(y, j, fill = NA)`

**Arguments**

- `y`: column vector or matrix
- `j`: number of lags
- `fill`: value to be used to fill the missing values at the beginning, default = NA

**Value**

`y` lagged `j` cells, with fill in the missing `j` positions

**Author(s)**

P. Berta, P. Paruolo, S. Verzillo, PG. Lovaglio

**References**

Berta et al. 2020
**listsize**

*listsize number of terms in the search for 1,2,3,4 number of breaks*

**Description**

computes length-4 vector with number of terms in the search for 1,2,3,4 number of breaks

**Usage**

```r
listsize(myT, gfill, start)
```

**Arguments**

- `myT`: sample size
- `gfill`: number of gap periods
- `start`: beginning

**Value**

a vector of 4 elements, with the number of candidate models for 1,2,3,4 breaks

**Author(s)**

P. Paruolo

**mls**

*Multivariate Least-Squares regression*

**Description**

Multivariate Least-Squares regression \( y = x \beta + u \)

**Usage**

```r
mls(y, x, df_flag = FALSE)
```

**Arguments**

- `y`: left hand side data matrix (one or more columns)
- `x`: right hand side data matrix (one or more columns)
- `df_flag`: flag = TRUE for degrees of freedom correction for the variance

**Value**

out regression coefficients and related statistics
**summary.cif**

**Author(s)**

P. Berta, P. Paruolo, S. Verzillo, PG. Lovaglio

**References**

Berta et al. 2020

---

**summary.cif  summary function for cif**

---

**Description**

Summary function for presize

**Usage**

```r
## S3 method for class 'cif'
summary(object, ..., digits = 4)
```

**Arguments**

- `object` is the name of the cif object created by cif
- `...` other parameters
- `digits` integer indicating the number of decimal places (round) or significant digits (signif) to be used.

**Value**

returns summary output from model estimation and forecasting

**Author(s)**

P. Berta, P. Paruolo, S. Verzillo, PG. Lovaglio

**References**

Berta et al. 2020
Wald.mls

Wald test for Multivariate Least-Squares regression

Description
Wald test for multivariate Least-Squares regression

Usage
Wald.mls(mlsresults)

Arguments
mlsresults output of mls, mlsresults<-mls(y, x, df_flag)

Value
wald table of Wald tests on significance of single regressors and pvalues based on chi square distribution

Author(s)
P. Paruolo

References
Berta et al. 2020
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