Package ‘bootCT’

October 12, 2022

Type Package
Title Bootstrapping the ARDL Tests for Cointegration
Version 1.1.1
Date 2022-09-27
Author Gianmarco Vacca, Stefano Bertelli
Maintainer Gianmarco Vacca <gianmarco.vacca@unicatt.it>
Description The bootstrap ARDL tests for cointegration is the main functionality of this package. It also acts as a wrapper of the most common ARDL testing procedures for cointegration: the bound tests of Pesaran, Shin and Smith (PSS; 2001 - <doi:10.1002/jae.616>) and the asymptotic test on the independent variables of Sam, McNown and Goh (SMG: 2019 - <doi:10.1016/j.econmod.2018.11.001>). Bootstrap and bound tests are performed under both the conditional and unconditional ARDL models.
License GPL (>= 2)
Encoding UTF-8
Imports Rcpp, pracma, aod, ARDL, dynmac, vars, gtools, dplyr, stringr, usethis
LinkingTo Rcpp, RcppArmadillo
Depends R (>= 3.5.0)
RoxygenNote 7.2.1
LazyData true
NeedsCompilation yes
Repository CRAN
Date/Publication 2022-09-27 10:00:02 UTC

R topics documented:

  boot_ardl .......................... 2
  ger_macro .......................... 3
  lag_mts ............................ 4
  sim_vecm_ardl ...................... 4
  smk_crit ........................... 7
  summary.bootCT ..................... 7
**boot_ardl**

**Index**

| boot_ardl | Bootstrap ARDL |

**Description**

This is the main function of the package. It performs the bootstrap version of the ARDL bound test for cointegration.

**Usage**

```r
boot_ardl(
  data,
  yvar = NULL,
  Xvar = NULL,
  difflags = NULL,
  maxlag = 5,
  p.ardl = 0.05,
  p.vecm = 0.05,
  B = 2000,
  case = 3,
  crit.H0 = c(0.05, 0.025, 0.01),
  print = T
)
```

**Arguments**

- **data**: Input dataset. Must contain a dependent and a set of independent variables.
- **yvar**: Name of the dependent variable, enclosed in quotation marks. If NULL, the first variable will be used.
- **Xvar**: Vector of names of the independent variables, each enclosed in quotation marks. If NULL, all variables except the first will be used.
- **difflags**: Fixed lagged differences for the short term part of the ARDL equation.
- **maxlag**: Max number of lags for the auto_ardl procedure.
- **p.ardl**: Threshold p-value for the short-term ARDL coefficients significance in the bootstrap procedure.
- **p.vecm**: Threshold p-value for the short-term VECM coefficients significance in the bootstrap procedure.
- **B**: Number of bootstrap replications.
- **case**: Model case, pertaining to the treatment of intercept and trend. Must be integer from 1 to 5. Defaults to 3.
- **crit.H0**: Probability/ies by which the critical quantiles of the bootstrap distribution(s) must be calculated.
- **print**: Show the progress bar.
**Value**

List of several elements including:

- ARDL: the conditional and unconditional ARDL models applied on the data
- pssbounds: the PSS bound test output
- smgbounds: the SMG bound test critical values
- fov.st: the test statistics on the conditional and unconditional Fov tests
- t.st: the test statistics on the conditional and unconditional t tests
- find.st: the test statistics on the conditional and unconditional Find tests
- quantFOV: the bootstrap conditional and unconditional F Overall test critical value(s)
- quantt: the bootstrap conditional and unconditional t test critical value(s)
- quantFIND: the bootstrap conditional and unconditional F Independent test critical value(s)

**Examples**

```r
## Not run:
data(ger_macro)
LNDATA = as.data.frame(log(ger_macro[, -1]))
colnames(LNDATA) = c("LNINVEST", "LNINCOME", "LNCONS")

boot_res = boot_ardl(LNDATA, yvar = "LNINCOME", Xvar = c("LNCONS", "LNINVEST"), maxlag = 5, B = 2000)
summary(boot_res)
## End(Not run)
```

**Description**

The data set contains quarterly, seasonally adjusted time series for West German fixed investment, disposable income, and consumption expenditures in billions of DM from 1960Q1 to 1982Q4. It was produced from file E1 of the data sets associated with Lutkepohl (2007). Originally obtained from Deutsche Bundesbank.

**Usage**

`gerMacro`

**Format**

A data frame with 92 rows and 4 variables:

- **DATE** Quarter
- **INVEST** Fixed investment (DM Billions)
- **INCOME** Disposable income (DM Billions)
- **CONS** Consumption expenditures (DM Billions)
Source

http://www.jmulti.de/download/datasets/e1.dat

lag_mts

Create matrix of lagged variables

Description

This function lags a set of variables in a matrix, each with a separate index. It is also possible to retain only the last lag order.

Usage

lag_mts(X, k, last.only = F)

Arguments

X numeric matrix whose columns are subject to lagging
k vector of lag orders
last.only If TRUE only the k-th order lag will be computed, otherwise all lags from 1 to k

Value

a matrix whose columns are the original variables and the k-th order lagged variables. Column name suffix ".lx".

Examples

data(ger_macro)

lag_mts(X = ger_macro, k = 3, last.only = FALSE)

sim_vecm_ardl

Generate data from a VECM/ARDL equation

Description

Generate data from a VECM/ARDL equation
Usage

```r
sim_vecm_ardl(
  nobs,
  case = 1,
  sigma.in = diag(3),
  gamma.in,
  Axx.in,
  ayxUC.in,
  ayy.in,
  mu.in,
  eta.in,
  azeroy.in = 0,
  aoney.in = 0,
  burn.in,
  seed.in = NULL
)
```

Arguments

- **nobs**: number of observations.
- **case**: case related to intercept and trend.
- **sigma.in**: error covariance matrix.
- **gamma.in**: list of short-run parameter matrices.
- **Axx.in**: long-run relationships between the independent variables.
- **ayxUC.in**: long-run unconditional relationship between dependent and independent variables, \( a_{yx}^{(UC)} \). The second component ayxC, derived from conditioning, is calculated as \( a_{yx}^{(C)} = -\omega' A_{xx} \).
- **ayy.in**: long-run relationship for the dependent variable \( ay_y \).
- **mu.in**: VAR intercept vector.
- **eta.in**: VAR trend vector.
- **azeroy.in**: Conditional ARDL intercept. Overridden if CASE I or CASE II.
- **aoney.in**: Conditional ARDL trend. Overridden if CASE IV.
- **burn.in**: burn-in number of observations.
- **seed.in**: optional seed number for random error generation.

Value

A list that includes

- **dims**: a vector with the dataset dimension.
- **case**: the case given as input.
- **data**: the generated data.
- **diffdata**: the data first difference.
- **ut**: the generated random error matrix.
• $\sigma$: the error covariance matrix $\Sigma$.
• $\omega$: the $\omega$ vector of parameters generated via conditioning
• $A_{t}$: the conditional long-run parameter matrix $\tilde{A}$
• $a_{y,x}^\text{UC}$: the unconditional subvector of the ARDL equation $a_{y,x}$
• $a_{y,x}$: the conditional subvector of the ARDL equation $a_{y,x} = a_{y,x}^\text{UC} - \omega' A_{x}$
• $\Gamma_{j}$: the list of unconditional $\Gamma_{j}$ parameter matrices
• $\psi_{y,x,j}$: the list of conditional $\psi_{y,x,j}$ parameter matrices
• $\text{azeroy}$: the unconditional VECM intercept
• $\text{aoney}$: the unconditional VECM trend
• $\text{interc.ardl}$: the conditional ARDL intercept
• $\text{aone}$: the unconditional VECM trend
• $\text{aone.c}$: the conditional VECM trend
• $\text{interc.ardl}$: the conditional ARDL trend
• $\text{vmu}$: the VAR intercept
• $\text{veta}$: the VAR trend

Examples

```r
# PARAMETERS

# Sigma
corr = matrix(0, ncol = 3, nrow = 3)
corr[2,1] = 0.25
corr[3,1] = 0.4
corr[3,2] = -0.25
Corr = (corr + t(corr)) + diag(3)
sds = diag(c(1.3, 1.2, 1))
Sigma = (sds %*% Corr %*% t(sds))

# Gamma

# DATA GENERATION

data_sim = sim_vecm_ardl(nobs = 200,
case = 3,
sigma.in = Sigma,
gamma.in = gamma,
Axx.in = matrix(c(0.3, 0.5, 0.4, 0.3), nrow = 2, ncol = 2),
ayxUC.in = c(0.5,0.6),
ayy.in = 0.7,
mu.in = rep(0.3, 3),
eta.in = rep(0, 3),
azeroy.in = 0.4,
aoney.in = 0,
burn.in = 50,
```
Critical values of the F-test on the independent variables in the conditional ARDL model.

**Description**
This internal data contains critical values of the Find test of Sam et al (2018), for several sample sizes and lag orders. Applicable only for cases I, III, and V. Critical values at significance levels 1%, 2.5%, 5% and 10%.

**Usage**

```r
smk_crit
```

**Format**
A data frame with 144 rows and 17 variables

- **case**: case related to intercept and trend specification. Only I, III or V
- **prob**: significance levels. 0.01, 0.025, 0.05 or 0.10
- **num**: sample size, 30 to 80 and beyond for asymptotic critical values
- **I0_x**: right threshold for accepting the null of zero coefficients in the F rodztest. x: 1 to 7
- **I1_x**: left threshold for rejecting the null of zero coefficients in the F rodztest. x: 1 to

**Summary method**

**Description**
This function summarizes the ARDL bootstrap test and all the other asymptotic procedures all together.

**Usage**

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

**Arguments**

- **object**: an object of class "bootCT"
- **...**: not parsed, added for compatibility
**Value**

the function returns a list of summary statistics, already present in the function `boot.ar.dl`, and displays them in an appropriate manner.
Index

* datasets
  ger_macro, 3
  smk_crit, 7

boot_ardl, 2

ger_macro, 3

lag_mts, 4

sim_vecm_ardl, 4
smk_crit, 7
summary.bootCT, 7