**ArchTest**

*ARCH test*

**Description**
Computes the Lagrange multiplier test for conditional heteroscedasticity of Engle (1982), as described by Tsay (2005, pp. 101-102).

**Usage**
```
ArchTest(x, lags = 12, demean = FALSE)
```

**Arguments**
- `x`: numeric vector
- `lags`: positive integer number of lags
- `demean`: logical: If TRUE, remove the mean before computing the test statistic.

**Examples**
```
reg<-nardl(food~inf,fod,ic="aic",maxlag = 4,graph = TRUE,case=3)
x<-reg$selresidu
nlag<-reg$n1
ArchTest(x,lags=nlag)
```

---

**bp2**

*LM test for serial correlation*

**Description**
LM test for serial correlation

**Usage**
```
bp2(object, nlags, fill = NULL, type = c("F", "Chi2"))
```

**Arguments**
- `object`: fitted lm model
- `nlags`: positive integer number of lags
- `fill`: starting values for the lagged residuals in the auxiliary regression. By default 0.
- `type`: Fisher or Chisquare statistics
The `cumsq` function calculates the cumulative square of the recursive errors. It is used in the context of time series analysis, specifically in the context of the NARDL (Non-Linear Autoregressive Distributed Lag) model. The function is defined as follows:

\[
\text{cumsq}(e, k, n)
\]

where:
- \(e\) is the recursive errors
- \(k\) is the estimated coefficients length
- \(n\) is the recursive errors length

**Examples**

```r
reg <- nardl(food ~ inf, fod, ic = "aic", maxlag = 4, graph = TRUE, case = 3)
e <- reg$rece
k <- reg$k
n <- reg$n
cumsq(e = e, k = k, n = n)
```

The `cusum` function is another function that is used in conjunction with the NARDL model. It calculates the cumulative sum of the recursive errors. The function is defined as follows:

\[
\text{cusum}(e, k, n)
\]

where:
- \(e\) is the recursive errors
- \(k\) is the estimated coefficients length
- \(n\) is the recursive errors length

**Examples**

```r
reg <- nardl(food ~ inf, fod, ic = "aic", maxlag = 4, graph = TRUE, case = 3)
e <- reg$rece
k <- reg$k
n <- reg$n
cusum(e = e, k = k, n = n)
```
Arguments

- \( e \) is the recursive errors
- \( k \) is the estimated coefficients length
- \( n \) is the recursive errors length

Examples

```r
reg<-nardl(food~inf,fod,ic="aic",maxlag = 4,graph = TRUE,case=3)
e<-reg$rece
k<-reg$k
n<-reg$n
cusum(e=e,k=k,n=n)
```

---

**fod**

*Indian yearly data of inflation rate and percentage food import to total import*

Description

The data frame `fod` contains the following variables:

- food: percentage food import to total import
- inf: inflation rate
- year: the year

Usage

`data(fod)`

Format

A data frame with 54 rows and 2 variables
nardl

Nonlinear ARDL function

Description

Nonlinear ARDL function

Usage

nardl(formula, data, ic = c("aic", "bic"), maxlag = 4, graph = FALSE, case = 3)

Arguments

- **formula**: food~inf or food~inf^2
- **data**: the dataframe
- **ic**: c("aic","bic") criteria model selection
- **maxlag**: maximum lag number
- **graph**: TRUE to show stability tests plot
- **case**: case number 3 for (unrestricted intercept, no trend) and 5 (unrestricted intercept, unrestricted trend), 1 2 and 4 not supported

Examples

```
# Fit the nonlinear cointegrating autoregressive distributed lag model
# Load data
data(fod)
# example 1: auto selected lags (maxlags=TRUE)
reg<-nardl(food~inf,fod,ic="aic",maxlag = 4,graph = FALSE,case=3)
summary(reg)

# example 2: Cusum and CusumQ plot (graph=TRUE)
reg<-nardl(food~inf,fod,ic="aic",maxlag = 4,graph = TRUE,case=3)
```
Description

display the necessary critical values to conduct the Pesaran, Shin and Smith 2001 bounds test for
cointegration. See http://andyphilips.github.io/pssbounds/.

Usage

pssbounds(obs, fstat, tstat = NULL, case, k)

Arguments

obs number of observations
fstat value of the F-statistic
tstat value of the t-statistic
case case number
k number of regressors appearing in lag levels

Details

pssbounds is a module to display the necessary critical values to conduct the Pesaran, Shin and
Smith (2001) bounds test for cointegration. Critical values using the F-test are the default; users
can also include the critical values of the t-test with the tstat parameter.

As discussed in Philips (2016), the upper and lower bounds of the cointegration test are non-
standard, and depend on the number of observations, the number of regressors appearing in lev-
els, and the restrictions (if any) placed on the intercept and trend. Asymptotic critical values are
provided by Pesaran, Shin, and Smith (2001), and small-sample critical values by Narayan (2005).
The following five cases are possible: I (no intercept, no trend), II (restricted intercept, no trend),
III (unrestricted intercept, no trend), IV (unrestricted intercept, restricted trend), V (unrestricted
intercept, unrestricted trend). See Pesaran, Shin and Smith (2001) for more details; Case III is the
most common.

More details are available at http://andyphilips.github.io/pssbounds/.

Value

None

Author(s)

Soren Jordan, <sorenjordanpols@gmail.com>
Andrew Q Philips, <aphilips@pols.tamu.edu>
References

If you use pssbounds, please cite:

Jordan, Soren and Andrew Q. Philips. "pss: Perform bounds test for cointegration and perform dynamic simulations."

and

Philips, Andrew Q. "Have your cake and eat it too? Cointegration and dynamic inference from autoregressive distributed lag models" Working Paper.


Examples

reg<-nardl(food~inf,fod,ic="aic",maxlag = 4,graph = TRUE,case=3)
pssbounds(case=reg$case,fstat=reg$fstat,obs=reg$Nobs,k=reg$k)
# F-stat concludes I(1) and cointegrating, t-stat concludes I(0).

summary.nardl

Summary of a nardl model

Description

summary method for a nardl model.

Usage

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

Arguments

object is the object of the function

... not used

Value

an object of the S3 class summary.nardl with the following components:
Index

ArchTest, 2
bp2, 2
cumsq, 3
cusum, 3
fod, 4
nardl, 5, 7
pssbounds, 6
summary.nardl, 7