Package ‘pdR’

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Type Package

Title Threshold Model and Unit Root Tests in Cross-Section and Time Series Data

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Description
Threshold model, panel version of Hylleberg et al. (1990) <DOI:10.1016/0304-4076(90)90080-D> seasonal unit root tests, and panel unit root test of Chang (2002) <DOI:10.1016/S0304-4076(02)00095-7>.

License GPL (>= 2)

LazyData TRUE

LazyLoad yes

Depends R (>= 3.5.0)

Imports plm, pglm, lme4, glmmTMB, uroot

NeedsCompilation no

Repository CRAN

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Contents

`pdR-package` *Panel Data Regression: Threshold Model and Unit Root Tests*

Description

Functions for analysis of panel data, including the panel threshold model of Hansen (1999,JE), panel unit root test of Chang(2002,JE) based upon instuments generating functions (IGF), and panel seasonal unit root test based upon Hylleberg et al.(1990,JE).

Details

This version offers formatted output. This package designs a specification function ptm() to estimate the panel threshold model of Hansen(1999). The key feature of ptm() is to generalize Hansen's original code to allow multiple (more-than-one) regime-dependent right-hand-side independent variables; Dr. Hansen's original code admits only 1 regime-dependent right-hand-side independent variable. This version also includes panel unit root tests based on the instrument generating functions(IGF), proposed by Chang (2002, J. of Econometrics), and the panel version of Hylleberg et al.(1990) seasonal unit root test, proposed by Otero, et al. (2005, 2007).

Author(s)

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References

Chang, Y. (2002) Nonlinear IV Unit Root Tests in Panels with Cross-Sectional Dependency. Journal of Econometrics, 110, 261-292.

Hansen B. E. (1999) Threshold effects in non-dynamic panels: Estimation, testing and inference. Journal of Econometrics,93, 345-368.

Hylleberg, S., Engle, R.F., Granger, C.W.J., and Yoo, B.S.(1990) Seasonal integration and cointegration. Journal of Econometrics,44, 215-238.

Otero, J., Smith, J., and Giulietti, M. (2005) Testing for seasonal unit roots in heterogeneous panels. Economics Letters, 86, 229-235.

Otero, J., Smith, J., and Giulietti, M. (2007) Testing for seasonal unit roots in heterogeneous panels in the presence of cross section dependence. Economics Letters, 86, 179-184.

Pesaran M. Hashem (2007) A simple panel unit root test in the presence of cross-section dependence. Journal of Applied Econometrics, 22, 265-312.

`bank_income` *Panel data of bank,2001Q1~2010Q1*

Description

A quarterly panel data frame with 1000 observations on the following 7 variables, unbalanced panel data ranges from 2001Q1~2010Q1.

Usage

```
data("bank_income")
```

Format

`ID` a numeric vector

`Qtr` a numeric vector

`preTax_Income` a numeric vector

`shortRatio` a numeric vector

`longRatio` a numeric vector

`Current_ratio` a numeric vector

`LoanDeposit_ratio` a numeric vector

Examples

```
data(bank_income)
```

cigaretts — *Cigaretts consumption of US states*

Description

Cigaretts consumption of US states

Usage

```
data(cigaretts)
```

Format

A data frame of 48 US states' cigaretts consumption

`State` State abbreviation, N

`Year` Year, t

`Y_SALES` Cigarette sales in packs per capita, deflated by population

`X1_PRICE` P=Real price per pack of cigarettes, deflated by 1983 CPI.

`X2_PIMIN` Real minimum price in adjoining states per pack of cigarettes, deflated by CPI

`X3_NDI` Per capita disposable income

References

Baltagi Badi H. (2005) Econometric Analysis of Panel Data. John Wiley.

Examples

```
data(cigaretts)
head(cigaretts)
```

crime — *Annual crime dataset of US counties*

Description

Annual crime dataset of US counties

Usage

```
data(crime)
```

Format

A data frame of US counties

`county` counties index, N

`year` Year, t

`crmrte` crime rate(crime/population)

`prbarr` probability of arrest (arrests/offenses)

`prbconv` probability of conviction, given arrest

`prbpris` probability of a prison, given conviction

`avgsen` sanction severity(average prison sentence in days)

`polpc` ability of police force to detect crime(# of police per capita)

`density` population density(POP/area)

`taxpc` Taxpayment per capita

`region` region index of county

`smsa` =1 if SAMA, POP>50000; =0 else

`pctmin` See Baltagi(2006) for details

`wcon` See Baltagi(2006) for details

`wtuc` See Baltagi(2006) for details

`wtrd` See Baltagi(2006) for details

`wfir` See Baltagi(2006) for details

`wser` See Baltagi(2006) for details

`wmfg` See Baltagi(2006) for details

`wfed` See Baltagi(2006) for details

`wsta` See Baltagi(2006) for details

`wloc` See Baltagi(2006) for details

`mix` See Baltagi(2006) for details

`pctymle` See Baltagi(2006) for details

References

Baltagi Badi H. (2005) Econometric Analysis of Panel Data. John Wiley. Baltagi Badi H. (2006) Estimating an Economic Model of Crime Using Panel Data from North Carolina. J.of Applied Econometrics 21: 543¡V547.

dur_john *The cross-country growth data in Durlauf and Johnson(1995)*

Description

The Durlauf-Johnson data manupipulated by Hansen(2000),excluding missing variables and oil states

Usage

```
data(dur_john)
```

Format

A data frame with 19 countries

`gdpGrowth` Economic growth measured by GDP of 1960 and 1985

`logGDP60` log Per capita GDP in 1960

`Inv_GDP` Average ratio of investment (including Government Investment) to GDP from 1960 to 1985

`popGrowth` Average growth rate of working-age population 1960 to 1985

`School` Average fraction of working-age population enrolled in secondary school from 1960 to 1985

`GDP60` Per capita GDP in 1960

`Literacy` fraction of the population over 15 years old that is able to read and write in 1960

Details

Steven N. Durlauf and Paul A. Johnson, "Multiple Regimes and Cross-Country Growth Behavior," Journal of Applied Econometrics, Vol. 10, No. 4, 1995, 365-384.

Examples

```
data(dur_john)
head(dur_john)
```

htest_pglm *Specification test for panel glm models*

Description

This function performs Hausman specification test for panel glm.

Usage

```
htest_pglm(RE, FE, re.method)
```

Arguments

RE	Random effect objects. Support pglm, glmer, glmmTMB
FE	Fixed effect objects.
re.method	Method that used to estimate the random effect estimation, in addition to "pglm", it also supports "glmmTMB" of package glmmTMB, and "glmer" of package lme4.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, modifed from phtest() of plm

References

Hausman J.A. (1978). Specification Tests in Econometrics. Econometrica, 46, 1251-1271.

Examples

```
data(ship)
library(pglm)
Eq1="accident  ~  op_75_79+co_65_69+co_70_74+co_75_79"
FE.pois <- pglm(Eq1,data=ship,family = "poisson",model = "within",index = 'ship',R=10)

RE.pois <- pglm::pglm(Eq1,data=ship,family = "poisson", model = "random", index = 'ship')

## Hausman test
htest_pglm(RE=RE.pois,  FE=FE.pois, re.method="pglm")

Eq2=accident  ~  op_75_79+co_65_69+co_70_74+co_75_79 + (1 | ship)
re.glmmTMB=glmmTMB::glmmTMB(Eq2,data=ship, family="poisson")

## Hausman test
htest_pglm(RE=re.glmmTMB,  FE=FE.pois, re.method="glmmTMB")
```

IGF *Unit root test based on Change(2002)*

Description

This function estimates the unit root regression based on instrument generating function of Change(2002) and returns useful outputs.

Usage

```
IGF(y, maxp, ic, spec)
```

Arguments

`y`	A univariate time series data
`maxp`	the max number of lags
`ic`	Information criteria, either "AIC" or "BIC"
`spec`	regression model specification. =0, no intercept and trend. =1, intercept only. =2, intercept and trend.

Details

Estimate univariate unit root test of Chang(2002).

Value

`tstat.IGF`	IGF unit root test
`beta`	regression coefficients. The first one is the AR(1) coefficient of unit root, and the last one is the intercept or trend
`sdev`	The IGF standard error for unit root coefficient
`cV`	The scalar C in IGF equation
`p`	The optimal number of lag

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

References

Chang, Y. (2002) Nonlinear IV Unit Root Tests in Panels with Cross-Sectional Dependency. Journal of Econometrics, 110, 261-292.

Examples

```
data(inf19)
y <- inf19[,1]
IGF(y,maxp=35,ic="BIC",spec=2)$tstat.IGF
```

---

inf19 *Monthly inflation time series of 19 countries*

Description

Monthly inflation time series of 19 countries, 1984.1~2011.3

Usage

```
data(inf19)
```

Format

A data frame with 19 countries

`AUSTRIA` inflation of Austria

`BELGIUM` inflation of Belgium

`CANADA` inflation of Canada

`DENMARK` inflation of Denmark

`FINLAND` inflation of Finland

`FRANCE` inflation of France

`GREECE` inflation of Greece

`ICELAND` inflation of Iceland

`ITALY` inflation of Italy

`JAPAN` inflation of Japan

`LUXEMBOURG` inflation of Luxembourg

`NETHERLANDS` inflation of Netherlands

`NORWAY` inflation of Norway

`PORTUGAL` inflation of Portugal

`SPAIN` inflation of Spain

`SWEDEN` inflation of Sweden

`SWITZERLAND` inflation of Switzerland

`UK` inflation of UK

`USA` inflation of USA

Details

Monthly CIP, seasonaly differenced of log CPI of 19 countries

Examples

```
data(inf19)
head(inf19)
```

`inf_M` *Monthly inflation time series of 20 countries*

Description

Monthly inflation time series of 19 countries, 1971.1~2011.12

Usage

```
data(inf_M)
```

Format

A data frame with 20 countries

`AUSTRALIA` inflation of Austrlia

`AUSTRIA` inflation of Austria

`BELGIUM` inflation of Belgium

`CANADA` inflation of Canada

`DENMARK` inflation of Denmark

`FINLAND` inflation of Finland

`FRANCE` inflation of France

`GREECE` inflation of Greece

`ICELAND` inflation of Iceland

`ITALY` inflation of Italy

`JAPAN` inflation of Japan

`LUXEMBOURG` inflation of Luxembourg

`NETHERLANDS` inflation of Netherlands

`NORWAY` inflation of Norway

`PORTUGAL` inflation of Portugal

`SPAIN` inflation of Spain

`SWEDEN` inflation of Sweden

`SWITZERLAND` inflation of Switzerland

`UK` inflation of UK

`USA` inflation of USA

Details

Monthly CIP, seasonaly differenced of log CPI of 20 countries

Examples

```
data(inf_M)
head(inf_M)
```

---

inf_Q *Quarterly inflation time series of 20 countries*

Description

Quarterly inflation time series of 19 countries, 1971Q1~2014Q4

Usage

```
data(inf_Q)
```

Format

A data frame with 19 countries

`AUSTRLIA` inflation of Austrlia

`AUSTRIA` inflation of Austria

`BELGIUM` inflation of Belgium

`CANADA` inflation of Canada

`DENMARK` inflation of Denmark

`FINLAND` inflation of Finland

`FRANCE` inflation of France

`GREECE` inflation of Greece

`ICELAND` inflation of Iceland

`ITALY` inflation of Italy

`JAPAN` inflation of Japan

`LUXEMBOURG` inflation of Luxembourg

`NETHERLANDS` inflation of Netherlands

`NORWAY` inflation of Norway

`PORTUGAL` inflation of Portugal

`SPAIN` inflation of Spain

`SWEDEN` inflation of Sweden

`SWITZERLAND` inflation of Switzerland

`UK` inflation of UK

`USA` inflation of USA

Details

Quarterly CIP, seasonaly differenced of log CPI of 20 countries

Examples

```
data(inf_Q)
head(inf_Q)
```

`invest` *investment data of 565 listed companies, 1973-1987*

Description

investment data of 565 listed companies, 1973-1987, from Hansen's example

Usage

```
data(invest)
```

Format

A pooled data frame

`invest[,1]` investment/assets

`invest[,2]` Tobin's Q

`invest[,3]` cash-flow/assets

`invest[,4]` debt/assets

Details

This is a pooled data frame, without date (T) and cross-section(N) ID columes

Examples

```
#data(invest)
#head(invest)
```

`ipsHEGY` *IPS-HEGY seasonal unit root test in panel data, Otero et al.(2007).*

Description

This function performs panel data-based HEGY seasonal unit root test, the asymptotics is based upon Otero et al.(2007).

Usage

```
ipsHEGY(data,deterministic =c(1,0,0),lag.method="AIC",maxlag=12,CIPS = TRUE)
```

Arguments

`data`	Panel data, T by N
`deterministic`	Options for deterministic components. c(1,0,0), intercept only. c(0,1,0), trend only. c(0,0,1),, season dummy only.
`lag.method`	Selection of optimal lags, having for options: "fixed","AIC", "BIC", "AICc".
`maxlag`	Maximum number of lags for searching optimal criteria.
`CIPS`	Logical. If TRUE, using Pesaran(2007) to account for cross-section correlation. The default is TRUE.

Details

Mode for selectlags has four options, AIC,AICc and BIC use R built-in functions for linear model and their meanings are popular and straightforward. "fixed" fixes maxlag as the number of lags.
The critical values for panel HEGY are standard normal for individual t-ratios, however,you need to perform simulation for the critical values of F joint test, at pdR 1.3. To this end, you are encouraged to work this out for yourself: using arima.sim() to sample seasonal time series with unit root (1-order difference) and obtain their statistics under the null using ipsHEGY(), then it is streightforward to obtain critical values.
Otero et al. (2007) provide critical values for quarterly frequency.
The univariate HEGY is based on R package `uroot`, simply modified to include cross-secionaal average.

Value

`P_HEGY`	Panel HEGY statistics.
`U_HEGY`	Idividual HEGY statistics of N units.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

References

Otero, J., Smith, J., and Giulietti, M. (2005) Testing for seasonal unit roots in heterogeneous panels. Economics Letters, 86, 229-235.
Otero, J., Smith, J., and Giulietti, M. (2007) Testing for seasonal unit roots in heterogeneous panels in the presence of cross section dependence. Economics Letters, 86, 179-184.
Pesaran M. Hashem (2007) A simple panel unit root test in the presence of cross-section dependence. Journal of Applied Econometrics, 22, 265-312.

Examples

```
data(inf_M)

#Seasonal dummy only takes quarters 1:3,
#becasue of the presence of common intercept.

OUT<-ipsHEGY(inf_M, deterministic = c(1,1,1), lag.method = "AIC", maxlag = 12,CIPS=TRUE)
OUT$P_HEGY
OUT$U_HEGY


# Simulation of critical values
```

`lagSelect` *Select the optimal number of lags, given criteria*

Description

Determine the optimal number of lags for dynamic regression

Usage

```
lagSelect(y, maxp, ic)
```

Arguments

y	A univariate time series data
maxp	the max number of lags
ic	Information criteria, either "AIC" or "BIC"

Details

Information criteria "AIC" and "BIC" use the R built-in functions.

Value

It returns an integer, indicating the optimal lags

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
#library(pdR)
#data(inf19)
#y<-inf19[,1]
#lagSelect(y,maxp=25,ic="BIC")
```

---

model — *Estimate specified panel threshold model*

Description

This function is the main function estimating threshold regression for function ptm()

Usage

```
model(r, trim, rep, it, qq1, cf, xt, ct, thresh, tt, qn1, n, qn, cc, yt, ty, k)
```

Arguments

`r`	vector of threshold estimate(s).
`trim`	value of trimmed percentage.
`rep`	number bootstrap repetition.
`it`	number of regime during computation, used in a for loop.
`qq1`	defined parameter.
`cf`	special declaration, e.g. lag().
`xt`	regime independent variables.
`ct`	trace of regime dependent variables.
`thresh`	threshold variable.
`tt`	length of time period.
`qn1`	as defined by nrow(qq1).
`n`	number of cross-section units.

`qn`	number of quantiles to examine.
`cc`	as defined by 2*log(1-sqrt(conf_lev)).
`yt`	vectorized dependent variable.
`ty`	trace of yt.
`k`	number of regime-independent independent variables.

Note

Original code offered by Dr. B. E.Hansen (http://www.ssc.wisc.edu/~bhansen/).

References

Hanse B. E. (1999) Threshold effects in non-dynamic panels: Estimation, testing and inference. Journal of Econometrics,93, 345-368.

`pIGF` *Panel unit root test of Chang(2002)*

Description

Compute the panel unit root test statistic of Chang(2002).

Usage

```
pIGF(datamat, maxp, ic, spec)
```

Arguments

`datamat`	T by N panel data.T is the time length,N is the number of cross-section units.
`maxp`	the max number of lags
`ic`	Information criteria, either "AIC" or "BIC".
`spec`	model specification. =0, no intercept and trend. =1, intercept only. =2, intercept and trend.

Details

This function estimates the panel unit root test based on univariate instrument generating function of (Chang,2002).

Value

`panel.tstat`	panel IGF test statistics
`pvalue`	P-value of the panel.tstat

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

References

Chang,Y.(2002) Nonlinear IV Unit Root Tests in Panels with Cross-Sectional Dependency. Journal of Econometrics, 110, 261-292.

Examples

```
data(inf19)
datam <- inf19
pIGF(datam,maxp=25,ic="BIC",spec=2)
```

---

productivity *Productivity data of 48 US state,1970-1986*

Description

Gross state production data

Usage

```
data(productivity)
```

Format

A data frame with US production

state US state index, 1-48

year Year index

y_gsp Gross state product

x1_hwy Expediture of public utility- highway construction

x2_water Expediture of public utility- water

x3_other Expediture of others

x4_private Private consumption of each state

x5_emp Employment rate of each state

x6_unemp Unemployment rate of each state

Examples

```
data(productivity)
head(productivity)
```

ptm *Threshold specification of panel data*

Description

A generalized specification for estimating panel threshold model.

Usage

```
ptm(dep, ind1, ind2, d, bootn, trimn, qn, conf_lev, t, n)
```

Arguments

dep	Dependent variable
ind1	Independent variables: regime dependent
ind2	Independent variables:regime independent
d	Threshold variable
bootn	Vector of bootstrap repetition
trimn	Vector of trimmed percentage
qn	Number of quantiles to examine
conf_lev	Confidence level
t	Length of time period
n	Number of cross-section units

Details

This code fits only balanced panel data. It generalizes the simple code of Dr. Hansen (http://www.ssc.wisc.edu/~bhansen/), allowing multiple (more-than-one) regime-dependent (ind1) variables. We generalize the original code to better fit general need of threshold modeling in panel data.
bootn and trimn are vector of 3 by 1, indicating numbers of three corresponding regimes.
This version corrects a slight error incurred by argument max_lag, which is used by Hansen to arrange investment data via lags. In this package, users manipulate data to fit personal research to ptm(), hence this argument is omitted lest should degree of freedom will suffer a loss of N.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

References

Hansen B. E. (1999) Threshold effects in non-dynamic panels: Estimation, testing and inference. Journal of Econometrics,93, 345-368.

Examples

```
# library(pdR)
#data(invest)
#dat<-invest[1:1500,]    # subsetting the first 1500 obs., #for simplicity
#t <- 15            #Length of time period
#nt <- nrow(dat)
#n <- nt/t           # number of cross-section units

#dep<- as.matrix(dat[,1])       # investment/assets
#th1<- as.matrix(dat[,2])  #Tobin's Q
#th2<- as.matrix(dat[,3])  # cash-flow/assets
#ind1<- cbind(th1,th2)  #regime-dep covariates
#d <- as.matrix(dat[,4])      # Threshold variable
#ind2 <- cbind((th1^2),(th1^3),(th1*d)) # regime-indep covariates:
#bootn<-c(100,200,300)  # bootstrapping replications for each  threshold esitmation
#trimn<-c(0.05,0.05,0.05)   #trimmed percentage for each threshold  esitmation

#qn<-400
#conf_lev<-0.95

#Output=ptm(dep,ind1,ind2,d,bootn,trimn,qn,conf_lev,t,n)
#Output[[1]] #Formatted output of 1st threshold, 2 regimes
#Output[[2]] #Formatted output of 2nd threshold, 3 regimes
#Output[[3]] #Formatted output of 3rd threshold, 4 regimes

# In the output, the Regime-dependent Coefficients matrix
# is, from top to bottom, regime-wise.
```

---

r_est *A subroutine for model()*

Description

This function is a subroutine for model(), estimation procedure.

Usage

```
r_est(y, r, trim, tt, qq1, qn1, qn, n, cf, xt, ct, thresh)
```

Arguments

y	vector of dependent variable.
r	numer of regime.
trim	value of trimmed percentage.
tt	length of time period.
qq1	parameter defined by as.matrix(unique(thresh)[floor(sq*nrow(as.matrix(sort(unique(thresh)))))]).
qn1	as defined by nrow(qq1).

`qn`	number of quantiles to examine.
`n`	parameter of cross-section units.
`cf`	special declaration, e.g. lag().
`xt`	regime independent variables.
`ct`	trace of regime dependent variables.
`thresh`	threshold variable.

References

Hanse B. E. (1999) Threshold effects in non-dynamic panels: Estimation, testing and inference. Journal of Econometrics,93, 345-368.

Original code from Dr. Hansen (http://www.ssc.wisc.edu/~bhansen/).

`ship` *Panel data on the number of ship accidents*

Description

Panel data on the number of ship accidents, McCullagh and Nelder(1989)

Usage

```
data("ship")
```

Format

- `accident` the number of ship accidents
- `ship` Ship iD
- `service` the number of months in service
- `op_75_79` the operating period between 1975 and 1979
- `co_65_69` consecutive construction periods of 5 years
- `co_70_74` consecutive construction periods of 5 years
- `co_75_79` consecutive construction periods of 5 years
- `yr_con` years of construction
- `yr_op` years of operation

References

McCullagh, P., and J. A. Nelder (1989) Generalized Linear Models. 2nd ed. London: Chapman and Hall/CRC.

Examples

```
data(ship)
```

SMPLSplit_est *Estimation of sub-sampled data*

Description

A function for estimating the subsampled data.

Usage

```
SMPLSplit_est(data,dep,indep,th,plot,h=1,nonpar=2)
```

Arguments

`data`	the data in either data.frame or matrix.
`dep`	the name of dependent variable.
`indep`	the name(s) of independent variable(s).
`th`	the name of threshold variable.
`plot`	=1, plot; =0, do not plot.
`h`	h=1, heteroskedasticity-consistent covariance; h=0, homoskedastic case.
`nonpar`	Indicator for non-parametric method used to estimate nuisance scale in the presence of heteroskedasticity (only relevant if h=1).Set nonpar=1 to estimate regressions using a quadratic.Set nonpar=2 to estimate regressions using an Epanechnikov kernel with automatic bandwidth.

Details

This code estimates the parameters of sub-sampled data. It generalizes the simple code of Dr. Hansen, allowing White Corrected Heteroskedastic Errors.

Value

`threshold`	values of threshold estimates.
`est0`	coefficient estimates of global data.
`est.low`	coefficient estimates of low regime.
`est.high`	coefficient estimates of high regime.
`est0.info`	additional information of global data.
`est.joint.info`	additional information of joint threshods.
`est.low.info`	additional information of est.low.
`est.high.info`	additional information of est.high.

Note

Original code offered by Dr. B. E.Hansen (http://www.ssc.wisc.edu/~bhansen/).

References

Hanse B. E. (2000) Sample Splitting and Threshold Estimation. Econometrica, 68, 575-603.

Examples

```
## Not run, becasue of bootstrap replicaiton takes time. Users may unmark # and run.
data("dur_john")
rep <- 500
trim_per <- 0.15
dep <- "gdpGrowth"
indep <- colnames(dur_john)[c(2,3,4,5)]

SMPLSplit_est(data=dur_john,dep,indep,th="GDP60",plot=0,h=1,nonpar=2)
```

SMPLSplit_example *Example code for sample splitting*

Description

A sample code for learning sample splitting.

Usage

```
SMPLSplit_example(data,dep,indep,th1,th2,trim_per,rep,plot)
```

Arguments

`data`	the data in either data.frame or matrix.
`dep`	the name of dependent variable.
`indep`	the name(s) of independent variable(s)
`th1`	the first threshold variable.
`th2`	the second threshold variable.
`trim_per`	trimmed percentage.
`rep`	nNumber of bootstrap repetitions.
`plot`	=1, plot; =0, do not plot.

Details

This code is the learning example for learning Hansen's econometric sample splitting. I detailed the description of each threshold stage.

Note

Original code offered by Dr. B. E.Hansen (http://www.ssc.wisc.edu/~bhansen/).

References

Hanse B. E. (2000) Sample Splitting and Threshold Estimation. Econometrica, 68, 575-603.

Examples

```
## Not run, becasue of bootstrap replicaiton takes time. Users may unmark # and run.
data("dur_john")
#rep <- 500
#trim_per <- 0.15
#dep <- "gdpGrowth"
#indep <- colnames(dur_john)[c(2,3,4,5)]
#th1 <- "GDP60"
#th2 <- "Literacy"
#OUT=SMPLSplit_est(data=dur_john,dep,indep,th=th1,plot=0,h=1,nonpar=2)
#OUT$TEST
#OUT$Hypothesis
#OUT$Threshold
#stat=matrix(as.numeric(OUT$TEST),byrow = TRUE,8,2)
#colnames(stat)=c("F-Stat","P-value")
#rownames(stat)=OUT$Hypothesis
#stat
```

SMPLSplit_het *Testing for sample splitting*

Description

A function for testing sample split given subsampled data.

Usage

```
SMPLSplit_het(data,dep,indep,th,trim_per,rep,plot)
```

Arguments

data	the data in either data.frame or matrix
dep	the name of dependent variable.
indep	the name(s) of independent variable(s).
th	the name of threshold variable.
trim_per	trimmed percentage.
rep	number of bootstrap repetition.
plot	=1, plot; =0, do not plot.

Details

This code tests for the presence of threshold. It generalizes the simple code of Dr. Hansen, allowing Heteroskedastic Errors (White Corrected).

Value

`fstat` LM-test for no threshold.

`pvalue` bootstrap P-Value.

Note

Original code offered by Dr. B. E.Hansen (http://www.ssc.wisc.edu/~bhansen/).

References

Hanse B. E. (2000) Sample Splitting and Threshold Estimation. Econometrica, 68, 575-603.

`sse_calc` *a subroutine of model()*

Description

SSE calculation

Usage

```
sse_calc(y, x)
```

Arguments

This function is a sub-routine for model(), calculating SSE of each regression

`y` vector of dependent variable.

`x` matrix of independent variables.

References

Hanse B. E. (1999) Threshold effects in non-dynamic panels: Estimation, testing and inference. Journal of Econometrics,93, 345-368.

Original code from Dr. Hansen (http://www.ssc.wisc.edu/~bhansen/).

tbar *Compute the resursive mean*

Description

Compute the resursive mean of each series

Usage

```
tbar(x)
```

Arguments

x	A univariate time series data

Details

This function computes the resursive mean

Author(s)

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Examples

```
data(inf19)
y <- inf19[,1]
tbar(y)
```

---

thr_sse *a subroutine calculating SSE*

Description

This function is a sub-routine for model(), calculating SSE of each threshold regression.

Usage

```
thr_sse(y, q, r, cf, xt, ct, thresh, tt, n)
```

Arguments

`y`	parameter.
`q`	qq1 in model().
`r`	parameter.
`cf`	as defined in model().
`xt`	as defined in model().
`ct`	as defined in model().
`thresh`	as defined in model().
`tt`	as defined in model().
`n`	as defined in model().

References

Hanse B. E. (1999) Threshold effects in non-dynamic panels: Estimation, testing and inference. Journal of Econometrics,93, 345-368.

Original code from Dr. Hansen (http://www.ssc.wisc.edu/~bhansen/).

`tr` *A sub-routine calculating trace*

Description

Estimation of trace.

Usage

```
tr(y, tt, n)
```

Arguments

This function is a sub-routine for model(), calculating trace of matrix

`y`	data vector.
`tt`	time period length.
`n`	number of cross-section units.

References

Hanse B. E. (1999) Threshold effects in non-dynamic panels: Estimation, testing and inference. Journal of Econometrics,93, 345-368.

Original code from Dr. Hansen (http://www.ssc.wisc.edu/~bhansen/).

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