Package ‘TSMCP’

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Type Package
Title Fast Two Stage Multiple Change Point Detection
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Suggests MASS
Description A novel and fast two stage method for simultaneous multiple change point detection and variable selection for piecewise stationary autoregressive (PSAR) processes and linear regression model. It also simultaneously performs variable selection for each autoregressive model and hence the order selection.
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Description

This function provides a novel and fast methodology for simultaneous multiple structural break estimation and variable selection for nonstationary time series models by using ASCAD or AMCP to estimate the chang points proposed by Jin, Shi and Wu (2011).

Usage

cpvnts(Y, method = c("mcp", "scad"), p, lam.d)

Arguments

Y an autoregressive time series.
method the method to be used by mcp or scad. See plus in R packages plus for details.
p an upper bound of autoregressive orders.
lam.d an parameter of the refining procedure. Suggest lam.d=0.05 if the length of Y is smaller than 5000 and lam.d=0.01 otherwise.

Value

pluscpv returns an object of class "cpvnts". An object of class "cpvnts" is a list containing the following components:

variable.selection a matrix of variable selection. Element of the matrix is 1 if the variable is selected and 0 otherwise.
change.points estimators of change points.

References


See Also

plus
Examples

### Example 1: No change point with sample size 1000###

```r
n <- 1000
Y <- rnorm(n)
cp1 <- c(3, 1000)
a0 <- c(0.7)
a1 <- c(1.3)
a2 <- c(-0.8)
for (j in 2:2) {
  for (i in (cp1[j-1] + 1):cp1[j]) {
  }
}
ts.plot(Y)
```

```r
# Y(t)=0.7+1.3Y(t-1)-0.8Y(t-2)+e(t)
```

```r
mcp.cp <- cpvnts(Y, "mcp", 4, 0.05)
mcp.cp  # result of AMCP
```

```r
scad.cp <- cpvnts(Y, "scad", 4, 0.05)
scad.cp  # result of ASCAD
```

### Example 2(Davis et al (2006)): Two change points with sample size 1024###

```r
n <- 1024
Y <- rnorm(n)
cp1 <- c(3, 512, 769, 1024)
a1 <- c(0.9, 1.69, 1.32)
a2 <- c(0, -0.81, -0.81)
for (j in 2:4) {
  for (i in (cp1[j-1] + 1):cp1[j]) {
  }
}
ts.plot(Y)
```

```r
# Y(t)=0.9Y(t-1)+e(t), if t<512 Y(t)=1.69Y(t-1)-0.81Y(t-2)+e(t), if 512<t<769 Y(t)=1.32Y(t-1)-0.81Y(t-2)+e(t), if 769<t<1024
```

```r
mcp.cp <- cpvnts(Y, "mcp", 4, 0.05)
mcp.cp  # result of AMCP
```
### Example 3: Six change points with sample size 10000###

```r
n <- 10000
Y <- rnorm(n)
cp1 <- c(3, 1427, 3084, 4394, 5913, 7422, 8804, 10000)
a1 <- c(1.58, 1.12, 1.61, 1.24, 1.53, 1.32, 1.69)
a2 <- c(-0.79, -0.68, -0.75, -0.66, -0.64, -0.81, -0.81)
for (j in 2:length(cp1)) {
  for (i in (cp1[j - 1] + 1):cp1[j]) {
  }
}
tsp.plot(Y)
```

```r
mcp.cp <- cpvnts(Y, "mcp", 4, 0.01)
mcp.cp # result of AMCP
```

```r
scad.cp <- cpvnts(Y, "scad", 4, 0.01)
scad.cp # result of ASCAD
```
tsmcplm

X  the n-by-p design matrix.
method the method to be used by lasso, adaptive lasso, mcp or scad. See plus in R packages plus for details.
c  ceiling(c*sqrt(length(Y))) is the length of each segments in splitting stage.

Value

tsmcplm returns an object of class "tsmcplm". An object of class "tsmcplm" is a list containing the following components:

change.points estimators of change points.

References


See Also

plus lars

Examples

## example 1: mean shift model
## true change point location:
## 100, 130, 150, 230, 250, 400, 440, 650, 760, 780, 810
Y <- rnorm(1000, 0, 0.5) +
c(rep(0,100), rep(4,30), rep(-1,20), rep(2,80), rep(-2,20),
   rep(3,150), rep(-1, 40), rep(1,210), rep(5,110), rep(2,20),
   rep(7,30), rep(3,190))
ts.plot(Y)

## estimate change points
tsmcplm(Y = Y, X = NULL, method = "adapt", c = 0.3)

## example 2: linear model:
## a periodic auto correlation series with period 122 and
## order of auto correlation 1

###
## true change point location:
## 200, 350, 450, 550, 700, and 850

n <- 1000
y <- rnorm(n)
for (t in 2:n) {
y[t] <- cos(t*pi/61) + 3*sin(t*pi/61) + 0.5*y[t-1] + (2*sin(t*pi/61) + 0.1 * y[t-1])*(200 < t) + (2* cos(t*pi/61) - 4 *sin(t*pi/61) - 0.6* y[t-1])*(350 < t) + (2* sin(t*pi/61) + 0.7* y[t-1])*(450 < t) + (-3* sin(t*pi/61) -
0.3 * y[t-1] *(550 < t) + (-3 * cos(t*pi/61) + 5 * sin(t*pi/61))* (700 < t) + (3 * cos(t*pi/61) - 5 * sin(t*pi/61) - 0.4*y[t-1] )* (850 < t) + rnorm(1)
}

ts.plot(y)
x <- sapply(2:n, function(t){cbind(cos(t*pi/61), sin(t*pi/61), y[t-1])}, simplify = FALSE)
x <- do.call(rbind, x)

tsmcplm(Y = y[-1], X = x, method = "adapt", c = 2)
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