Package 'QregBB'

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Type Package

Title Block Bootstrap Methods for Quantile Regression in Time Series

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Author Karl Gregory

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Description Implements moving-blocks bootstrap and extended tapered-blocks bootstrap, as well as smooth versions of each, for quantile regression in time series. This package accompanies the paper: Gregory, K. B., Lahiri, S. N., & Nordman, D. J. (2018). A smooth block bootstrap for quantile regression with time series. The Annals of Statistics, 46(3), 1138-1166.

License GPL-3

RoxygenNote 7.2.0

Imports quantreg

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Contents

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The main function is the `QregBB` function, which implements the moving-blocks bootstrap (MBB), the extended tapered-blocks bootstrap (ETBB), and smooth versions of each (SMBB, SETBB). The function `getNPPIblksizesQR` chooses the block size based on the non-parametric plug-in method described in Lahiri (2013). For the smooth methods, the bandwidth is chosen by using the function `bw.SJ` function on the fitted residuals; then the bandwidth matrix is the identity matrix times the value returned by `bw.SJ`.

Author(s)

Karl Gregory

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References

Gregory, K. B., Lahiri, S. N., & Nordman, D. J. (2018). A smooth block bootstrap for quantile regression with time series. *The Annals of Statistics*, 46(3), 1138-1166.

Lahiri, S. N. (2013). Resampling methods for dependent data. Springer Science & Business Media.

Examples

```
n <- 100
X1 <- arima.sim(model=list(ar=c(.7,.1)),n)
X2 <- arima.sim(model=list(ar=c(.2,.1)),n)
e <- arima.sim(model=list(ar=c(.7,.1)),n)
Y <- X1 + e
X <- cbind(rep(1,n),X1,X2)

QregBB.out <- QregBB(Y,X,tau=.5,l=4,B=500,h=NULL,alpha=0.05)
QregBB.out
```

`getNPPIblksizesQR` *Chooses block sizes for MBB, ETBB, SMBB, and SETBB via the NPPI for quantile regression*

Description

Chooses block sizes for MBB, ETBB, SMBB, and SETBB via the NPPI for quantile regression

Usage

```
getNPPIblksizesQR(Y, X, tau, min.in.JAB = 100)
```

Arguments

`Y`	the vector of response values.
`X`	the design matrix (including a column of ones for the intercept).
`tau`	the quantile of interest.
`min.in.JAB`	the minimum number of Monte-Carlos draws desired in each jackknife draw

Details

This function is based on the nonparametric plug-in (NPPI) method discussed in Lahiri (2003), which makes use of the jackknife-after-bootstrap (JAB).

Value

Returns a list of the NPPI-selected block sizes for the MBB, SMBB, ETBB, and SETBB.

References

Gregory, K. B., Lahiri, S. N., & Nordman, D. J. (2018). A smooth block bootstrap for quantile regression with time series. *The Annals of Statistics*, 46(3), 1138-1166.

Lahiri, S. N. (2003). Resampling Methods for Dependent Data. Springer, New York.

Examples

```
# generate some data and use NPPI to choose block sizes for MBB, SMBB, ETBB, and SETBB.
n <- 50
X1 <- arima.sim(model=list(ar=c(.7,.1)),n)
X2 <- arima.sim(model=list(ar=c(.2,.1)),n)
e <- arima.sim(model=list(ar=c(.7,.1)),n)
Y <- X1 + e
X <- cbind(rep(1,n),X1,X2)

blksize.out <- getNPPIblksizesQR(Y,X,tau=.5)
blksize.out
```

QregBB *Implements MBB, ETBB, SMBB, and SETBB for quantile regression*

Description

Implements MBB, ETBB, SMBB, and SETBB for quantile regression

Usage

```
QregBB(Y, X, tau, l, B = 500, h = NULL, alpha = 0.05)
```

Arguments

Y	the vector of response values.
X	the design matrix (including a column of ones for the intercept).
tau	the quantile of interest.
l	block size.
B	the number of Monte Carlo bootstrap samples to draw.
h	a scalar bandwidth (bandwidth matrix is h times identity).
alpha	a significance level to which the returned confidence intervals will correspond.

Value

A list is returned containing for the MBB, SMBB, ETBB, and SETBB the set of Monte Carlo draws of the pivot quantity $\sqrt{n}(\hat{\beta}_n^* - \tilde{\beta}_n)$, confidence intervals for each component of β corresponding to the specified confidence level, and estimates of the asymptotic covariance matrix of the pivot quantity $\sqrt{n}(\hat{\beta}_n - \beta)$.

References

#' @references

Gregory, K. B., Lahiri, S. N., & Nordman, D. J. (2018). A smooth block bootstrap for quantile regression with time series. *The Annals of Statistics*, 46(3), 1138-1166.

See Also

A 'print.QregBB' method exists which prints to the console the bootstrap standard errors for each coefficient estimator from the MBB, SMBB, ETBB, and SETBB methods as well as confidence intervals for each coefficient at the specified level.

Examples

```
# generate some data and perform block-bootstrap methods
n <- 100
X1 <- arima.sim(model=list(ar=c(.7,.1)),n)
X2 <- arima.sim(model=list(ar=c(.2,.1)),n)
e <- arima.sim(model=list(ar=c(.7,.1)),n)
Y <- X1 + e
X <- cbind(rep(1,n),X1,X2)

QregBB.out <- QregBB(Y,X,tau=.5,l=4,B=500,h=NULL,alpha=0.05)
QregBB.out
```

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