Package 'AdjBQR'

October 30, 2016

Type Package

Title Adjusted Bayesian Quantile Regression Inference

Version 1.0

Date 2016-10-25

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Description Adjusted inference for Bayesian quantile regression based on asymmetric Laplace working likelihood, for details see Yang, Y., Wang, H. and He, X. (2015), Posterior inference in Bayesian quantile regression with asymmetric Laplace likelihood, International Statistical Review, 2015 <doi:10.1111/insr.12114>.

Depends quantreg, MHadaptive, coda, survival

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RoxygenNote 5.0.1

NeedsCompilation no

Repository CRAN

Date/Publication 2016-10-30 16:58:03

R topics documented:

BCQR *Adjusted Bayesian Censored Quantile Regression*

Description

Bayesian quantile regression based on asymmetric-Laplace-type likelihood with posterior variance adjustment

Usage

```
BCQR(y, x, tau, niter = 20000, burn_in = 4000, prop_cov = NULL,
  level = 0.9)
```

Arguments

y	the observed response vector that is left censored at zero
x	the design matrix. If the first column of x is not all ones, a column of ones will be added.
tau	the quantile level of interest
niter	integer: number of iterations to run the chain for. Default 20000.
burn_in	integer: discard the first burn_in values. Default 100.
prop_cov	covariance matrix giving the covariance of the proposal distribution. This matrix need not be positive definite. If the covariance structure of the target distribution is known (approximately), it can be given here. If not given, the diagonal will be estimated via the Fisher information matrix.
level	nominal confidence level for the credible interval

Details

The function returns the unadjusted and adjusted posterior standard deviation, and unadjusted and adjusted credible intervals for Bayesian censored quantile regression based on asymmetric-Laplace-type working likelihood. The asymmetric-Laplace-type likelihood is based on the objective function of the Powell's estimator in Powell (1986).

Value

A list of the following commponents is returned

estpar: posterior mean of the regression coefficient vector

PSD: posterior standard deviation without adjustment

PSD.adj: posterior standard deviation with adjustment

CI.BAL: credible interval without adjustment

CI.BAL.adj: credible interval with adjustment

sig: estimated scale parameter

MCMCsize: effective size of the chain

References

Powell, J. L. (1986). Censored regression quantiles. Journal of Econometrics, 32, 143-155.

Yang, Y., Wang, H. and He, X. (2015). Posterior inference in Bayesian quantile regression with asymmetric Laplace likelihood. International Statistical Review, 2015. doi: 10.1111/insr.12114.

Examples

```
#A simulation example
library(AdjBQR)
n=200
set.seed(12368819)
x1=rnorm(n)
x2=rnorm(n)
ystar=3/4+2*x1+3*x2+rt(n,df=3)
y=ystar*(ystar>0)
delta=1*(ystar>0)
x = cbind(x1, x2)
## Bayesian censored quantile regression based on asymmetric-Laplace-type likelihood
BCQR(y, x, tau=0.5, level=0.9)
```

BQR *Adjusted Bayesian Quantile Regression*

Description

Bayesian quantile regression based on asymmetric Laplace likelihood with posterior variance adjustment

Usage

```
BQR(y, x, tau, niter = 20000, burn_in = 4000, prop_cov = NULL,
  level = 0.9)
```

Arguments

y	the response vector
x	the design matrix. If the first column of x is not all ones, a column of ones will be added.
tau	the quantile level of interest
niter	integer: number of iterations to run the chain for. Default 20000.
burn_in	integer: discard the first burn_in values. Default 100.
prop_cov	covariance matrix giving the covariance of the proposal distribution. This matrix need not be positive definite. If the covariance structure of the target distribution is known (approximately), it can be given here. If not given, the diagonal will be estimated via the Fisher information matrix.
level	nominal confidence level for the credible interval

Details

The function returns the unadjusted and adjusted posterior standard deviation, and unadjusted and adjusted credible intervals for Bayesian quantile regression based on asymmetric Laplace working likelihood.

Value

A list of the following commponents is returned

estpar: posterior mean of the regression coefficient vector

PSD: posterior standard deviation without adjustment

PSD.adj: posterior standard deviation with adjustment

CI.BAL: credible interval without adjustment

CI.BAL.adj: credible interval with adjustment

sig: estimated scale parameter

MCMCsize: effective size of the chain

References

Yang, Y., Wang, H. and He, X. (2015). Posterior inference in Bayesian quantile regression with asymmetric Laplace likelihood. International Statistical Review, 2015. doi: 10.1111/insr.12114.

Examples

```
#A simulation example
library(AdjBQR)
n=200
set.seed(12368819)
x1 = rnorm(n)
x2 = rnorm(n)
y=2*x1+2*x2+rt(n,df=3)
x = cbind(1, x1, x2)
## Bayesian quantile regression based on asymmetric Laplace likelihood
BQR(y, x, tau=0.5, level=0.9)
```

---

li_powell *Asymmetric-Laplace-type Working Likelihood For Cenaored Quantile Regression*

Description

Asymmetric-Laplace-type working likelihood for linear quantile regression with responses subject to left censoring at zero

Usage

```
li_powell(pars, y, x, tau, sig)
```

Arguments

pars	regression coefficient vector
y	the response vector
x	the design matrix with one in the first column corresponding to the intercept
tau	the quantile level
sig	scale parameter sigma

Details

The asymmetric-Laplace-type working likelihood is proportional to exponential of the negative Powell objective function for censored quantile regression

Value

the working log (asymmetric Laplace-type) likelihood function (the part involving the regression coefficients)

References

Powell, J. L. (1986). Censored regression quantiles. Journal of Econometrics, 32, 143-155.

Yang, Y., Wang, H. and He, X. (2015). Posterior inference in Bayesian quantile regression with asymmetric Laplace likelihood. International Statistical Review, 2015. doi: 10.1111/insr.12114.

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li_reg *Asymmetric Laplace Working Likelihood For Linear Quantile Regression*

Description

Asymmetric Laplace Working Likelihood For Linear Quantile Regression

Usage

```
li_reg(pars, y, x, tau, sig)
```

Arguments

pars	regression coefficient vector
y	the response vector
x	the design matrix with one in the first column corresponding to the intercept
tau	the quantile level
sig	scale parameter sigma

Details

The asymmetric Laplace working likelihood is proportional to exponential of the negative quantile objective function for linear quantile regression

Value

the working log (asymmetric Laplace) likelihood function (the part involving the regression coefficients)

References

Yang, Y., Wang, H. and He, X. (2015). Posterior inference in Bayesian quantile regression with asymmetric Laplace likelihood. International Statistical Review, 2015. doi: 10.1111/insr.12114.

`sigma_est` *Estimation of the Scale Parameter for Quantile Regression*

Description

Estimation of the Scale Parameter for Quantile Regression

Usage

```
sigma_est(y, x)
```

Arguments

y	the response vector
x	the design matrix with one in the first column corresponding to the intercept

Value

the estimated scale parameter sigma

`sigma_est_powell` *Estimation of the Scale Parameter for Censored Quantile Regression*

Description

Estimation of the Scale Parameter for Censored Quantile Regression

Usage

```
sigma_est_powell(y, x)
```

Arguments

`y`	the response vector
`x`	the design matrix with one in the first column corresponding to the intercept

Value

the estimated scale parameter sigma

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