

Package ‘ALDqr’

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Title Quantile Regression Using Asymmetric Laplace Distribution

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Depends R (>= 2.15.0)

Imports HyperbolicDist, sn

Description EM algorithm for estimation of parameters and other methods in a quantile regression.

License GPL (>= 3.0)

NeedsCompilation no

Repository CRAN

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ais *Australian institute of sport data*

Description

Data on 102 male and 100 female athletes collected at the Australian Institute of Sport.

Format

This data frame contains the following columns:

Sex (0 = male or 1 = female)

Ht height (cm)

Wt weight (kg)

LBM lean body mass

RCC red cell count

WCC white cell count

Hc Hematocrit

Hg Hemoglobin

Ferr plasma ferritin concentration

BMI body mass index, $\text{weight}/(\text{height})^{**2}$

SSF sum of skin folds

Bfat Percent body fat

Label Case Labels

Sport Sport

References

S. Weisberg (2005). *Applied Linear Regression*, 3rd edition. New York: Wiley, Section 6.4

diag.qr

Diagnostics for Quantile Regression Using Asymmetric Laplace Distribution

Description

Return case-deletion estimating the parameters in a quantile regression

Usage

`diag.qr(y, x, tau, theta)`

Arguments

`y` vector of responses

`x` the design matrix

`tau` the quantile to be estimated, this is generally a number strictly between 0 and 1.

`theta` parameter estimated

Value

Hessian and gradient matrix. Also the generalized cook distance (GDi), approximation of the likelihood distance (QDi)

Author(s)

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References

[1] Koenker, R. W. (2005). Quantile Regression, Cambridge U. Press. [2] Yu, K. & Moyeed, R. (2001). Bayesian quantile regression. *Statistics & Probability Letters*, 54 (4), 437 to 447. [3] Kotz, S., Kozubowski, T. & Podgorski, K. (2001). The laplace distribution and generalizations: A revisit with applications to communications, economics, engineering, and finance. Number 183. Birkhauser.

Examples

```
## Not run:

#####
### Graphic of the generalized Cook distance for data(AIS) ###
#####
#Datos
data(ais, package="sn")
attach(ais)
sexInd <- (sex=="female") + 0
x      <- cbind(1,LBM,sexInd)
y      <- BMI

#Percentile
perc   <- 0.5

res    <- EM.qr(y,x,perc)
diag   <- diag.qr(y,x,perc,res$theta)
HessianMatrix <- diag$MatrizQ
Gradiente    <- diag$mdelta
GDI          <- c()
for (i in 1:202) {
  GDI[i] <- t(Gradiente[,i])
}

#Seccion de los graficos
par(mfrow = c(1,1))
plot(seq(1:202),GDI,xlab='Index',ylab=expression(paste(GD[i])),main='p=0.1')
abline(h=2*(4+1)/202,lty=2)
identify(GDI,n=1)
```

```

plot(seq(1:202),GDI,xlab='Index',ylab=expression(paste(GD[i])),main='p=0.5')
abline(h=2*(4+1)/202, lty=2)
identify(GDI,n=1)

plot(seq(1:202),GDI,xlab='Index',ylab=expression(paste(GD[i])),main='p=0.9')
abline(h=2*(4+1)/202, lty=2)
identify(GDI,n=4)

#####
### Graphic of the likelihood displacemente for data(AIS) ###
#####
#Dados
data(ais, package="sn"); attach(ais); sexInd<-(sex=="female")+0; x=cbind(1,LBM,sexInd); y=BMI

#Percentile
perc      <- 0.9
n         <- nrow(x)

res       <- EM.qr(y,x,perc)

thetaest  <- res$theta
sigmaest  <- thetaest[4]
betaest   <- matrix(thetaest[1:3],3,1)

taup2     <- (2/(perc*(1-perc)))
thep      <- (1-2*peGraphic of the generalized Cook distance for data(AIS)rc)/(perc*(1-perc))

diag      <- diag.qr(y,x,perc,thetaest)

HessianMatrix <- diag$MatrixQ
Gradiente    <- diag$mdelta

sigma        <- sigmaest
beta         <- betaest

muc          <- (y-x
delta2       <- (y-x
gamma2       <- (2+thep^2/taup2)/sigma

vchpN       <- besselK(sqrt(delta2*gamma2), 0.5-1)
             / (besselK(sqrt(delta2*gamma2), 0.5))*(sqrt(delta2/gamma2))^-1)
vchp1       <- besselK(sqrt(delta2*gamma2), 0.5+1)
             / (besselK(sqrt(delta2*gamma2), 0.5))*(sqrt(delta2/gamma2))

Q           <- -0.5*n*log(sigmaest)-0.5*(sigmaest*taup2)^{-1}*
             (sum(vchpN*muc^2 - 2*muc*thep + vchp1*(thep^2+2*taup2)))
#####
theta_i     <- thetaest
sigmaest    <- theta_i[4,]
betaest     <- theta_i[1:3,]
sigma       <- sigmaest
beta        <- betaest

```

```

muc          <- (y-x

delta2       <- (y-x
gamma2       <- (2+thep^2/taup2)/sigma

vchpN       <- besselK(sqrt(delta2*gamma2), 0.5-1)
              /(besselK(sqrt(delta2*gamma2), 0.5))*(sqrt(delta2/gamma2))^-1)
vchp1       <- besselK(sqrt(delta2*gamma2), 0.5+1)
              /(besselK(sqrt(delta2*gamma2), 0.5))*(sqrt(delta2/gamma2))

Q1 <- c()
for (i in 1:202)
{
  Q1[i] <- -0.5*n*log(sigmaest[i])-sum(vchpN[,i]*muc[,i]^2 - 2*muc[,i]*thep
    + vchp1[,i]*(thep^2+2*taup2))/(2*(sigmaest[i]*taup2))
}

#####
QDi <- 2*(-Q+Q1)

#Depois de escolger perc guardamos os valores de QDi
QDi0.1 <- QDi
QDi0.5 <- QDi
QDi0.9 <- QDi

#Seccion de los graficos
par(mfrow = c(1,1))
plot(seq(1:202),QDi0.1,xlab='Index',ylab=expression(paste(QD[i])),main='p=0.1')
abline(h=mean(QDi0.1)+3.5*sd(QDi0.1),lty=2)
identify(QDi0.1,n=3)

plot(seq(1:202),QDi0.5,xlab='Index',ylab=expression(paste(QD[i])),main='p=0.5')
abline(h=mean(QDi0.5)+3.5*sd(QDi0.5),lty=2)
identify(QDi0.5,n=3)

plot(seq(1:202),QDi0.9,xlab='Index',ylab=expression(paste(QD[i])),main='p=0.9')
abline(h=mean(QDi0.9)+3.5*sd(QDi0.9),lty=2)
identify(QDi0.9,n=4)

## End(Not run)

```

EM.qr

*Quantile Regression Using Asymmetric Laplace Distribution***Description**

Return estimating the parameters in a quantile regression

Usage

EM.qr(y, x = NULL, tau = NULL, error = 0.000001, iter = 2000, envelope=FALSE)

Arguments

y	vector of responses
x	the design matrix
tau	the quantile to be estimated, this is generally a number strictly between 0 and 1.
error	the coverage maximum error
iter	maximum iterations of the EM algorithm.
envelope	confidence envelopes for a curve based on bootstrap replicates

Value

Estimated parameter for a quantile regression fit, standard error, log-likelihood.

Author(s)

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References

- [1] Koenker, R. W. (2005). Quantile Regression, Cambridge U. Press.
- [2] Yu, K. & Moyeed, R. (2001). Bayesian quantile regression. *Statistics & Probability Letters*, 54 (4), 437 to 447.
- [3] Kotz, S., Kozubowski, T. & Podgorski, K. (2001). The laplace distribution and generalizations: A revisit with applications to communications, economics, engineering, and finance. Number 183. Birkhauser.

Examples

```
data(ais, package="sn")
attach(ais)
sexInd <- (sex=="female") + 0
x      <- cbind(1,LBM,sexInd)
y      <- BMI
tau    <- 0.5

## EM.qr
EM.qr(y,x,tau)
```

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