Package 'LRQMM'

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Type Package

Title Fitting Linear Quantile Regression Mixed Models with Relationship Matrix

Version 1.2.3

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Description Fit a quantile regression mixed model involved Relationship Matrix using a sparse implementation of the
Frisch-Newton interior-point algorithm as described in
Portnoy and Koenker (1977, Statistical Science) <https://www.jstor.org/stable/2246216>.

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LazyData true

Depends R (>= 3.5.0)

Imports GeneticsPed, SparseM, quantreg, Matrix, kinship2, MCMCglmm, rsvd, R.matlab, sparsesvd

Suggests MASS

NeedsCompilation no

Repository CRAN

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R topics documented:

Cow *Herd life Data of Iranian Holstein Cows*

Description

Cow data include 100 cows with id records, father's record, mother' record, number of HYS, age of first calving and Herd life.

Usage

```
data("Cow")
```

Format

A data frame with 100 observations on the following 6 variables.

`REGNO` The number form animal record as vector or column matrix

`FREG` The number form father's animal record as vector or column matrix

`MREG` The number form mother's animal record as vector or column matrix

`HYS` a numeric vector levels of Herd, Year, Season

`AGECAL` a numeric vector of age of first calving

`HL` a numeric vector of Herd Life

Examples

```
data(Cow)
```

`lrqmm` *Fitting Linear Quantile Regression Mixed Models With Relationship Matrix*

Description

Fit a quantile regression mixed model involved Relationship Matrix using a sparse implementation of the Frisch-Newton interior-point algorithm.

Usage

```
lrqmm(id, sire, dam, X, Y,cova=NULL , alpha = 0 , tau = 0.5)
```

Arguments

`id`	The number form animal record as column matrix
`sire`	The number form father's animal record as column matrix
`dam`	The number form mother's animal record as column matrix
`X`	fixed effect(s) as column matrix that will change to factor variable in this function
`Y`	a response column matrix
`cova`	covariate effect(s) column matrix
`alpha`	a parameter for raite error's varince to variance of random effects dependent on statistical model (Animal model, Sire model, etc.)
`tau`	desired quantile

Details

The function computes an estimate on the tau-th quantile effects of the linear mixed model. This is a sparse implementation of the Frisch-Newton algorithm for quantile regression described in Portnoy and Koenker (1997).

We used "GeneticsPed", "Matrix", "kinship2", "MCMCglmm", "rsvd", "SparseM" and "quantreg" packages in this function. befor using "lrqmm" function be sure from installation this packages.

"GeneticsPed" available in

<https://bioconductor.org/packages/release/bioc/src/contrib/GeneticsPed_1.46.0.tar.gz> or orders in <http://bioconductor.org/packages/release/bioc/html/GeneticsPed.html>.

other packages are available in CRAN.

Value

`Fixed effects`	estimate for fixed effect(s) from linear quantile regression mixed model with its standard error
`cova effects`	estimate for covariate effect(s) from linear quantile regression mixed model with its standard error

Random effects	estimate for random effect(s) from linear quantile regression mixed model with its standard error
residuals	estimate for model residuals from linear quantile regression mixed model
Time_between_start_to_end	execution time of linear quantile regression mixed model
MAE	mean absolute error for fitted model
summary	reporting quantile for effects estimation, variance of response variable, variance of pedigree's random.effect, variance of record's random.effect, number of observations, pedigree's length, fix effect lavels and random effect lavels

Author(s)

Sayyed Reza Alavian

References

[1]Alavian, S. R. (2019). Creating LRQMM package for predicting the breeding value of animals by corrected mixed quantile regression (Unpublished master's thesis). Ferdowsi University Of Mashhad. Mashhad. Iran.[Persian].

[2]Koenker, R. and S. Portnoy (1997). The Gaussian Hare and the Laplacean Tortoise: Computability of Squared-error vs Absolute Error Estimators, (with discussion). Statistical Science, 12, 279-300. <https://www.jstor.org/stable/2246216>

[3]Koenker, R. W. (2005). Quantile Regression, Cambridge U. Press. ISBN: 0521608279.

[4]Mrode, R. A. (2005). Linear Models for the Prediction of Animal Breeding Values. 3rd edition. CABI International. ISBN: 9781780643915.

Examples

```
#Start(not run)


data(Cow)
with(lrqmm(id=REGNO,sire=FREG,dam=MREG,X=HYS,Y=HL,cova=AGECAL,alpha=1,tau=0.5)
,data=Cow)


#End(not run)
```

---

lrqmm_m *Fitting Linear Quantile Regression Mixed Models With Relationship Matrix With MATLAB*

Description

Fit a quantile regression mixed model involved Relationship Matrix using a sparse implementation of the Frisch-Newton interior-point algorithm.

Usage

```
lrqmm_m(id, sire, dam, X, Y,cova=NULL , alpha = 0 , tau = 0.5 , maxTries = 3000
        , interval = 30)
```

Arguments

id	The number form animal record as column matrix
sire	The number form father's animal record as column matrix
dam	The number form mother's animal record as column matrix
X	fixed effect(s) as column matrix that will change to factor variable in this function
Y	a response column matrix
cova	covariate effect(s) column matrix
alpha	a parameter for raite error's varince to variance of random effects, dependent on statistical model (Animal model, Sire model, etc.)
tau	desired quantile
maxTries	The maximum number of times the connection is check for an answer from the MATLAB server before giving up. Default values is 3000 times.
interval	The interval in seconds between each poll for an answer. Default interval is 30 (second).

Details

The function computes an estimate on the tau-th quantile effects of the linear mixed model. This is a sparse implementation of the Frisch-Newton algorithm for quantile regression described in Portnoy and Koenker (1997).

We used "GeneticsPed", "Matrix", "kinship2", "MCMCglmm", "R.matlab", "SparseM" and "quantreg" packages in this function. befor using "lrqmm" function be sure from installation this packages.

"GeneticsPed" available in

<https://bioconductor.org/packages/release/bioc/src/contrib/GeneticsPed_1.46.0.tar.gz> or orders in <http://bioconductor.org/packages/release/bioc/html/GeneticsPed.html>.

other packages are available in CRAN.

Value

Fixed effects	estimate for fixed effect(s) from linear quantile regression mixed model with its standard error
cova effects	estimate for covariate effect(s) from linear quantile regression mixed model with its standard error
Random effects	estimate for random effect(s) from linear quantile regression mixed model with its standard error
residuals	estimate for model residuals from linear quantile regression mixed model
Time_between_start_to_end	execution time of linear quantile regression mixed model

MAE	mean absolute error for fitted model
summary	reporting quantile for effects estimation, variance of response variable, variance of pedigree's random.effect, variance of record's random.effect, number of observations, pedigree's length, fix effect lavels and random effect lavels

Note

When this function stops abnormally (due an error or warning in MATLAB), you should close the MATLAB software window and disconnect the software. By performing this function again, the connection will be established. When more times need to the connection check for an answer from the MATLAB server before giving up, "maxTries" can be increase. When more times need to increase seconds between each poll for an answer, "interval" can be increase.

Author(s)

Sayyed Reza Alavian and Hani Rezaee[ctb]

References

[1]Alavian, S. R. (2019). Creating LRQMM package for predicting the breeding value of animals by corrected mixed quantile regression (Unpublished master's thesis). Ferdowsi University Of Mashhad. Mashhad. Iran.[Persian].

[2]Koenker, R. and S. Portnoy (1997). The Gaussian Hare and the Laplacean Tortoise: Computability of Squared-error vs Absolute Error Estimators, (with discussion). Statistical Science, 12, 279-300. <https://www.jstor.org/stable/2246216>

[3]Koenker, R. W. (2005). Quantile Regression, Cambridge U. Press. ISBN: 0521608279.

[4]Mrode, R. A. (2005). Linear Models for the Prediction of Animal Breeding Values. 3rd edition. CABI International. ISBN: 9781780643915.

Examples

```
#Start(not run)
#before running this code, be sure for Matlab installation in your system.
#
# >data(Cow)
# >with(lrqmm_m(id=REGNO,sire=FREG,dam=MREG,X=HYS,Y=HL,cova=AGECAL,alpha=1,tau=0.5)
#  ,data=Cow)
#
#
#End(not run)
```

PINVmat *Generalized Inverse of A Big Matrix Whit MATLAB*

Description

Calucated invesre of the generilzed big matrix with MATLAB

Usage

```
PINVmat(x, maxTriess = 3000, intervall = 30)
```

Arguments

x	a numeric matrix
maxTriess	The maximum number of times the connection is check for an answer from the MATLAB server before giving up. Default values is 3000 times.
intervall	The interval in seconds between each poll for an answer. Default interval is 30 (second).

Details

see pinv function in MATLAB.

Value

a inverse generalized matrix

Author(s)

Sayyed Reza Alavian

References

[1]Alavian, S. R. (2019). Creating LRQMM package for predicting the breeding value of animals by corrected mixed quantile regression (Unpublished master's thesis). Ferdowsi University Of Mashhad. Mashhad. Iran.[Persian].

Examples

```
M <- rbind(
  c(20, 10, 15,  0,  2),
  c(10,  5,  8,  1,  0),
  c( 0,  1,  2,  6,  3))
#before running this code, be sure for Matlab installation in your system.
# >PINVmat(M)
```

spginv *Generalized Inverse of a Sparse Matrix*

Description

Calucated invesre of the generilzed sparse matrix with sparsesvd function in sparcesvd package and ginv function in MASS package.

Usage

```
spginv(x)
```

Arguments

x	a sparse real matrix in Matrix package format

Details

see sparsesvd function in sparcesvd package and ginv function in MASS package.

Value

a inverse generalized sparse matrix

Author(s)

Sayyed Reza Alavian

References

[1]Alavian, S. R. (2019). Creating LRQMM package for predicting the breeding value of animals by corrected mixed quantile regression (Unpublished master's thesis). Ferdowsi University Of Mashhad. Mashhad. Iran.[Persian].

Examples

```
M <- rbind(
  c(20, 10, 15,  0,  2),
  c(10,  5,  8,  1,  0),
  c( 0,  1,  2,  6,  3))
M <- Matrix::Matrix(M, sparse=TRUE)
spginv (M)
```

STDE *SE for lrqmm*

Description

This function writed in "summary.rq" in "quantreg" package but in below used and changed for lrqmm function.

Details

This function runs in "lrqmm_m" function.

Author(s)

Sayyed Reza Alavian

References

[1]Alavian, S. R. (2019). Creating LRQMM package for predicting the breeding value of animals by corrected mixed quantile regression (Unpublished master's thesis). Ferdowsi University Of Mashhad. Mashhad. Iran.[Persian].

SVDmat *Calculates SVD of Matrix in MATLAB*

Description

This function Calculates SVD of Matrix in MATLAB and produces the "economy size" decomposition.

Usage

```
SVDmat(E,maxTriess = 3000,intervall = 30)
```

Arguments

E	a numeric matrix
maxTriess	The maximum number of times the connection is check for an answer from the MATLAB server before giving up. Default values is 3000 times.
intervall	The interval in seconds between each poll for an answer. Default interval is 30 (second).

Details

This function use R working directory to biulte and read files. So there should be enough space. All function's files remove after finishing calucation. This function is commonly used in big data.

Value

d	a vector containing the positive singular values
u	a matrix with the corresponding left singular vectors
v	a matrix with the corresponding right singular vectors

Note

When this function stops abnormally (due an error or warning in MATLAB), you should close the MATLAB software window and disconnect the software. By performing this function again, the connection will be established. When more times need to the connection check for an answer from the MATLAB server before giving up, "maxTries" can be increase. When more times need to increase seconds between each poll for an answer, "interval" can be increase.

Author(s)

Sayyed Reza Alavian

References

[1]Alavian, S. R. (2019). Creating LRQMM package for predicting the breeding value of animals by corrected mixed quantile regression (Unpublished master's thesis). Ferdowsi University Of Mashhad. Mashhad. Iran.[Persian].

Examples

```
M <- rbind(
  c(20, 10, 15,  0,  2),
  c(10,  5,  8,  1,  0),
  c( 0,  1,  2,  6,  3))
#before running this code, be sure for Matlab installation in your system.
# >SVDmat(M)
```

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