Package 'NegBinBetaBinreg'

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Type Package

Title Negative Binomial and Beta Binomial Bayesian Regression Models

License GPL (>= 2)

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Depends R (>= 3.1.1), mvtnorm, Matrix, boot

Description The Negative Binomial regression with mean and shape modeling and mean and variance modeling and Beta Binomial regression with mean and dispersion modeling.

NeedsCompilation no

Repository CRAN

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Contents

NegBinBetaBinreg-package
NegBinBetaBinreg

Description

Function to estimate a Negative Binomial regression models with mean and shape (or variance) regression structures, and Beta Binomial regression with mean and dispersion regression structures.

Details

Package:	NegBinBetaBinreg
Type:	Package
Version:	1.0
Date:	2016-10-8
License:	GPL-2
LazyLoad:	yes

Author(s)

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criteria *criteria for comparison the Bayesian Negative Binomial regression models with mean and shape (or variance) regression structures, and Beta Binomial regression with mean and dispersion regression structures.*

Description

Performs the comparison criterias for the Bayesian Negative Binomial regression models with mean and shape (or variance) regression structures, and Beta Binomial regression with mean and dispersion regression structures.

Usage

```
criteria(objeto)
```

Arguments

objeto	object of class NegBinBetaBinreg

Details

This function calculate the information criteria for a Bayesian Negative Binomial regression with mean and shape modeling and mean and variance modeling and Beta Binomial regression with mean and dispersion modeling.

Value

AIC	the AiC criteria
BIC	the BIC criteria

Author(s)

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dpostb *Posterior value of beta*

Description

Propose a value for posterior distribution of the beta parameter

Usage

```
dpostb(y,x,z,betas,gammas,bpri,Bpri,model,m)
```

Arguments

y	object of class matrix, with the dependent variable
x	object of class matrix, with the variables for modelling the mean
z	object of class matrix, with the variables for modelling the variance
betas	a vector with the previous proposal beta parameters
gammas	a vector with the previous proposal gamma parameters
bpri	a vector with the initial values of beta
Bpri	a matrix with the initial values of the variance of beta
model	it indicates the model that will be used. By default, is the Beta Binomial model (BB), but it could also be the Negative Binomial with mean and shape (NB1) or the Negative Binomial with mean and variance (NB2).
m	It is positive integer that In the Beta Binomial model indicates the number of trials. By default, is the number of data

Details

Generate a proposal for the beta parameter according to the model proposed by Cepeda and Gamerman(2005).

Value

value	a matrix with the proposal for beta

Author(s)

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References

1. Cepeda C. E. (2001). Modelagem da variabilidade em modelos lineares generalizados. Unpublished Ph.D. tesis. Instituto de Matematicas. Universidade Federal do Rio do Janeiro. //http://www.docentes.unal.edu.co/ecep http://www.bdigital.unal.edu.co/9394/. 2.Cepeda, E. C. and Gamerman D. (2005). Bayesian Methodology for modeling parameters in the two-parameter exponential family. Estadistica 57, 93 105. // 3.Cepeda, E. and Garrido, L. (2011). Bayesian beta regression models: joint mean and precision modeling. Universidad Nacional // 4.Cepeda, E. and Migon, H. and Garrido, L. and Achcar, J. (2012) Generalized Linear models with random effects in the two parameter exponential family. Journal of Statistical Computation and Simulation. 1, 1 13. // 5.Cepeda-Cuervo, E. and Cifuentes-Amado, V. (2016) Double generalized beta-binomial and negative binomial regression. To appear.

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dpostg *Posterior value of gamma*

Description

Propose a value for posterior distribution of the gamma parameter

Usage

```
dpostg(y,x,z,betas,gammas,gpri,Gpri,model,m)
```

Arguments

y	object of class matrix, with the dependent variable
x	object of class matrix, with the variables for modelling the mean
z	object of class matrix, with the variables for modelling the variance
betas	a vector with the previous proposal beta parameters
gammas	a vector with the previous proposal gamma parameters
gpri	a vector with the initial values of gamma
Gpri	a matrix with the initial values of the variance of gamma
model	it indicates the model that will be used. By default, is the Beta Binomial model (BB), but it could also be the Negative Binomial with mean and shape (NB1) or the Negative Binomial with mean and variance (NB2).
m	It is positive integer that In the Beta Binomial model indicates the number of trials. By default, is the number of data

Details

Generate a proposal for the beta parameter according to the model proposed by Cepeda(2001) and Cepeda and Gamerman(2005).

Value

value	a integer with the value of the posterior density for gamma

Author(s)

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`gammakernel` *the probability of a gamma parameter from the probability density funcion defined by old parameters*

Description

evaluate the probability of a gamma parameter from the probability density function defined by old parameters

Usage

```
gammakernel(y, x, z,betas.ini,gammas.now,gammas.old,gpri,Gpri,model,m,ni)
```

Arguments

y	object of class matrix, with the dependent variable
x	object of class matrix, with the variables for modelling the mean
z	object of class matrix, with the variables for modelling the variance
betas.ini	a vector with the beta that define the old p.d.f
gammas.now	a vector with the gamma parameter - new parameters - to evaluate in the old p.d.f

gammas.old	a vector with the gamma that define the old p.d.f
gpri	a vector with the initial values of gamma
Gpri	a matrix with the initial values of the variance of gamma
model	it indicates the model that will be used. By default, is the Beta Binomial model (BB), but it could also be the Negative Binomial with mean and shape (NB1) or the Negative Binomial with mean and variance (NB2).
m	It is positive integer that In the Beta Binomial model indicates the number of trials. By default, is the number of data
ni	It is a vector of positive integer that In the Beta Binomial model indicates the number of trials to each individual. By default, is a vector of m

Details

Evaluate the probability of a gamma parameter from the probability density function defined by old parameters, according with the model proposed by Cepeda(2001) and Cepeda and Gamerman(2005).

Value

value	a vector with the probability for the gamma parameter from the probability density function defined by old parameters

Author(s)

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gammaproposal *A proposal for gamma parameter*

Description

Propose a value for the gamma parameter

Usage

```
gammaproposal(y, x, z, betas.ini,gammas.ini,gpri,Gpri,model,m,ni)
```

Arguments

y	object of class matrix, with the dependent variable
x	object of class matrix, with the variables for modelling the mean
z	object of class matrix, with the variables for modelling the variance
betas.ini	a vector with the previous proposal beta parameters
gammas.ini	a vector with the previous proposal gamma parameters
gpri	a vector with the initial values of gamma
Gpri	a matrix with the initial values of the variance of gamma
model	it indicates the model that will be used. By default, is the Beta Binomial model (BB), but it could also be the Negative Binomial with mean and shape (NB1) or the Negative Binomial with mean and variance (NB2).
m	It is positive integer that In the Beta Binomial model indicates the number of trials. By default, is the number of data
ni	It is a vector of positive integer that In the Beta Binomial model indicates the number of trials to each individual. By default, is a vector of m

Details

Generate a proposal for the gamma parameter according to the model proposed by Cepeda(2001) and Cepeda and Gamerman(2005).

Value

value	a number with the proposal for the gamma parameter

Author(s)

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mukernel *the probability of a beta parameter from the probability density function defined by old parameters*

Description

evaluate the probability of a beta parameter from the probability density function defined by old parameters

Usage

```
mukernel(y, x, z, betas.now,betas.old,gammas.ini,bpri,Bpri,model,m,ni)
```

Arguments

y	object of class matrix or vector, with the dependent variable.
x	object of class matrix, with the variables for modelling the mean.
z	object of class matrix, with the variables for modelling the shape, variance or dispersion.
betas.now	a vector with the beta parameter, new parameter, to evaluate in the old p.d.f
betas.old	a vector with the beta that define the old p.d.f
gammas.ini	a vector with the gamma that define the old p.d.f
bpri	a vector with the prior values of beta.
Bpri	a matrix with the prior values of the variance of beta.
model	it indicates the model that will be used. By default, is the Beta Binomial model (BB), but it could also be the Negative Binomial with mean and shape (NB1) or the Negative Binomial with mean and variance (NB2).
m	It is positive integer that In the Beta Binomial model indicates the number of trials. By default, is the number of data
ni	It is a vector of positive integer that In the Beta Binomial model indicates the number of trials to each individual. By default, is a vector of m

Details

Evaluate the probability of a beta parameter from the probability density function defined by old parameters, according with the model proposed by Cepeda(2001) and Cepeda and Gamerman(2005).

Value

value	a matrix with the probability for the beta parameter from the probability density function defined by old parameters

Author(s)

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`muproposal` *A proposal for beta parameter*

Description

Propose a value for the beta parameter

Usage

```
muproposal(y, x, z, betas.ini,gammas.ini,bpri,Bpri,model,m,ni)
```

Arguments

`y`	object of class matrix or vector, with the dependent variable.
`x`	object of class matrix, with the variables for modelling the mean.
`z`	object of class matrix, with the variables for modelling the shape, variance or dispersion.
`betas.ini`	a vector with the beta that define the old p.d.f
`gammas.ini`	a vector with the gamma that define the old p.d.f
`bpri`	a vector with the prior values of beta.
`Bpri`	a matrix with the prior values of the variance of beta.
`model`	it indicates the model that will be used. By default, is the Beta Binomial model (BB), but it could also be the Negative Binomial with mean and shape (NB1) or the Negative Binomial with mean and variance (NB2).
`m`	It is positive integer that In the Beta Binomial model indicates the number of trials. By default, is the number of data
`ni`	It is a vector of positive integer that In the Beta Binomial model indicates the number of trials to each individual. By default, is a vector of m

Details

Generate a proposal for the beta parameter according to the model proposed by Cepeda(2001) and Cepeda and Gamerman(2005).

Value

value a matrix with the proposal for beta

Author(s)

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NegBinBetaBinreg *NegBinBetaBinreg*

Description

Function to estimate a Negative Binomial regression models with mean and shape (or variance) regression structures, and Beta Binomial regression with mean and dispersion regression structures.

Usage

```
NegBinBetaBinreg(y,x,z,nsim,bpri,Bpri,
gpri,Gpri,burn,jump,bini,gini,model,m,ni,graph1,graph2)
```

Arguments

y	object of class matrix or vector, with the dependent variable.
x	object of class matrix, with the variables for modelling the mean.
z	object of class matrix, with the variables for modelling the shape, variance or dispersion.
nsim	a number that indicate the number of iterations.
bpri	a vector with the prior values of beta.
Bpri	a matrix with the prior values of the variance of beta.
gpri	a vector with the prior values of gamma.
Gpri	a matrix with the prior values of the variance of gamma.

burn	a proportion that indicate the number of iterations to be burn at the beginning of the chain.
jump	a number that indicate the distance between samples of the autocorrelated the chain, to be excluded from the final chain.
bini	a vector with the initial values of beta.
gini	a vector with the initial values of gamma.
model	it indicates the model that will be used. By default, is the Beta Binomial model (BB), but it could also be the Negative Binomial with mean and shape (NB1) or the Negative Binomial with mean and variance (NB2).
m	Is positive integer that In the Beta Binomial model indicates the number of trials. By default, is the number of data
ni	Is a vector of positive integer that In the Beta Binomial model indicates the number of trials to each individual. By default, is a vector of m
graph1	if it is TRUE present the graph of the chains without jump and burn.
graph2	if it is TRUE present the graph of the chains with jump and burn.

Details

The Bayesian Negative Binomial regression allow the joint modelling of mean and shape or variance of a negative binomial distributed variable, as is proposed in Cepeda (2001), with exponential link for the mean and the shape or variance. The Bayesian Beta Binomial regression allow the joint modelling of mean and precision of a beta binomial distributed variable, as is proposed in Cepeda (2001), with logit link for the mean and exponential link for the precision.

Value

object of class NegBinBetaBinreg with:

coefficients	object of class matrix with the estimated coefficients of beta and gamma.
desv	object of class matrix with the estimated desviations of beta and gamma.
interv	object of class matrix with the estimated confidence intervals of beta and gamma.
fitted.values	object of class matrix with the fitted values of y.
residuals	object of class matrix with the residuals of the regression.
estresiduals	object of class matrix with the standardized residuals of the regression.
beta.mcmc	object of class matrix with the complete chains for beta.
gamma.mcmc	object of class matrix with the complete chains for gamma.
beta.mcmc.short	object of class matrix with the chains for beta after the burned process.
gamma.mcmc.short	object of class matrix with the chains for gamma after the burned process.
aceptbeta	object of class integer with the acceptance rate for the beta values.
aceptgamma	object of class integer with the acceptance rate for the gamma values.
call	Call.

Author(s)

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References

1. Cepeda C. E. (2001). Modelagem da variabilidade em modelos lineares generalizados. Unpublished Ph.D. tesis. Instituto de Matematicas. Universidade Federal do Rio do Janeiro. //http://www.docentes.unal.edu.co/ecep http://www.bdigital.unal.edu.co/9394/. 2.Cepeda, E. C. and Gamerman D. (2005). Bayesian Methodology for modeling parameters in the two-parameter exponential family. Estadistica 57, 93 105. // 3.Cepeda, E. and Garrido, L. (2011). Bayesian beta regression models: joint mean and precision modeling. Universidad Nacional // 4.Cepeda, E. and Migon, H. and Garrido, L. and Achcar, J. (2012) Generalized Linear models with random effects in the two parameter exponential family. Journal of Statistical Computation and Simulation. 1, 1 13. // 5.Cepeda-Cuervo, E. and Cifuentes-Amado, V. (2016) Double generalized beta-binomial and negative binomial regression. To appear.

Examples

```
rm(list=ls(all=TRUE))

Y<-c(6,6,9,13,23,25,32,53,54,5,5,11,17,19,2,8,13,14,20,47,
     48,60,81,6,17,67,0,0,2,7,11,12,0,0,5,5,5,11,17,3,4,22,
     30,36,0,1,5,7,8,16,27,25,10,11,20,33,0,1,5,5,5,5,5,7,7,11,15,5,6,6,7,14
)
y <- Y <- Y[1:68]

x0<-rep(1,times=68)
x2<-c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,
      1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,
      1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1
)
x3<-c(0,0,0,0,0,0,0,0,0,1,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,
      0,1,1,1,1,1,1,1,0,0,0,0,0,0,0,1,1,1,0,0,0,1,1,1,1,1,1,1,
      0,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,1
)
x<-cbind(x0,x2,x3)
z0<-rep(1,times=68)
z<-cbind(z0,x2)

Bpri=diag(rep(1,3))
bpri=rep(0,3)
Gpri=diag(rep(1,2))
gpri=rep(0,2)

Bini=diag(rep(1,3))
bini=c(3,-1,-0.5)
Gini=diag(rep(1,2))
gini=c(3,-1)

nsim = 300
burn <- 0.1
```

```
jump <- 5
model <- "NB1"
m <- 360
ni <- NULL
re<- NegBinBetaBinregEst (y,x,z,nsim,bpri,
Bpri,gpri,Gpri,burn,jump,bini,gini,
model,m,ni,graph1=FALSE,graph2=FALSE)
summary(re)
```

NegBinBetaBinregEst *Negative Binomial and Beta Binomial regression*

Description

Function to estimate a Negative Binomial regression models with mean and shape (or variance) regression structures, and Beta Binomial regression with mean and dispersion regression structures.

Usage

```
NegBinBetaBinregEst(y,x,z,nsim,bpri,Bpri,
gpri,Gpri,burn,jump,bini,gini,model,m,ni,graph1,graph2)
```

Arguments

y	object of class matrix or vector, with the dependent variable.
x	object of class matrix, with the variables for modelling the mean.
z	object of class matrix, with the variables for modelling the shape, variance or dispersion.
nsim	a number that indicate the number of iterations.
bpri	a vector with the prior values of beta.
Bpri	a matrix with the prior values of the variance of beta.
gpri	a vector with the prior values of gamma.
Gpri	a matrix with the prior values of the variance of gamma.
burn	a proportion that indicate the number of iterations to be burn at the beginning of the chain.
jump	a number that indicate the distance between samples of the autocorrelated the chain, to be excluded from the final chain.
bini	a vector with the initial values of beta.
gini	a vector with the initial values of gamma.
model	it indicates the model that will be used. By default, is the Beta Binomial model (BB), but it could also be the Negative Binomial with mean and shape (NB1) or the Negative Binomial with mean and variance (NB2).
m	Is positive integer that In the Beta Binomial model indicates the number of trials. By default, is the number of data

ni	Is a vector of positive integer that In the Beta Binomial model indicates the number of trials to each individual. By default, is a vector of m
graph1	if it is TRUE present the graph of the chains without jump and burn.
graph2	if it is TRUE present the graph of the chains with jump and burn.

Details

The Bayesian Negative Binomial regression allow the joint modelling of mean and shape or variance of a negative binomial distributed variable, as is proposed in Cepeda (2001), with exponential link for the mean and the shape or variance. The Bayesian Beta Binomial regression allow the joint modelling of mean and precision of a beta binomial distributed variable, as is proposed in Cepeda (2001), with logit link for the mean and exponential link for the precision.

Value

object of class bayesbetareg with the following:

Bestimado	object of class matrix with the estimated coefficients of beta
Gammaest	object of class matrix with the estimated coefficients of gamma
X	object of class matrix, with the variables for modelling the mean
Z	object of class matrix, with the variables for modelling the shape, variance or dispersion.
DesvBeta	object of class matrix with the estimated desviations of beta
DesvGamma	object of class matrix with the estimated desviations of gamma
B	object of class matrix with the B values of the confidence intervals for beta
G	object of class matrix with the G values of the confidence intervals for gamma
yestimado	object of class matrix with the fitted values of y
residuales	object of class matrix with the residuals of the regression
residuales	object of class matrix with the standardized residuals of the regression
beta.mcmc	object of class matrix with the complete chains for beta
gamma.mcmc	object of class matrix with the complete chains for gamma
beta.mcmc.auto	object of class matrix with the chains for beta after the burned process
gamma.mcmc.auto	object of class matrix with the chains for gamma after the burned process
aceptbeta	object of class matrix with the acceptance rate for the betas
aceptgamma	object of class matrix with the acceptance rate for the gammas

Author(s)

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`print.NegBinBetaBinreg` *print.NegBinBetaBinreg*

Description

Print the Negative Binomial regression models with mean and shape (or variance) regression structures, and Beta Binomial regression with mean and dispersion regression structures.

Usage

```
## S3 method for class 'NegBinBetaBinreg'
print(x,...)
```

Arguments

x	object of class NegBinBetaBinreg
...	not used.

Value

print the Negative Binomial regression with mean and shape modeling and mean and variance modeling and Beta Binomial regression with mean and dispersion modeling

Author(s)

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`print.summary.NegBinBetaBinreg` *print the summary of the NegBinBetaBinreg*

Description

Print the summary for a Negative Binomial regression models with mean and shape (or variance) regression structures, and Beta Binomial regression with mean and dispersion regression structures.

Usage

```
## S3 method for class 'summary.NegBinBetaBinreg'
print(x, ...)
```

Arguments

`x`	object of class NegBinBetaBinreg
`...`	not used.

Value

Print the summary for a Negative Binomial regression with mean and shape modeling and mean and variance modeling and Beta Binomial regression with mean and dispersion modeling

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summary.NegBinBetaBinreg *summary.NegBinBetaBinreg*

Description

Print the Negative Binomial regression models with mean and shape (or variance) regression structures, and Beta Binomial regression with mean and dispersion regression structures.

Usage

```
## S3 method for class 'NegBinBetaBinreg'
summary(object, ...)
```

Arguments

object	an object of class NegBinBetaBinreg
...	not used.

Value

call	Call
coefficients	Coefficients
AIC	AIC
BIC	BIC

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veros *Likelihood*

Description

calculate the likelihood value for the Negative Binomial regression models with mean and shape (or variance) regression structures, and Beta Binomial regression with mean and dispersion regression structures.

Usage

```
veros(y,x,z,betas,gammas,model,m)
```

Arguments

y	object of class matrix, with the dependent variable
x	object of class matrix, with the variables for modelling the mean
z	object of class matrix, with the variables for modelling the variance
betas	a vector with the previous proposal beta parameters
gammas	a vector with the previous proposal gamma parameters
model	it indicates the model that will be used. By default, is the Beta Binomial model (BB), but it could also be the Negative Binomial with mean and shape (NB1) or the Negative Binomial with mean and variance (NB2).
m	It is positive integer that In the Beta Binomial model indicates the number of trials. By default, is the number of data

Details

calculate the likelihood value for the Negative Binomial regression with mean and shape modeling and mean and variance modeling and Beta Binomial regression with mean and dispersion modeling.

Value

value	a integer with the likelihood

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