Package ‘Bayesiangammareg’

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Type Package

Title Bayesian Gamma Regression: Joint Mean and Shape Modeling

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Author Arturo Camargo Lozano [aut, cre],
Edilberto Cepeda Cuervo [aut]

Maintainer Arturo Camargo Lozano <bacamargol@unal.edu.co>

Description Adjust the Gamma regression models from a Bayesian perspective described by Cepeda and Urdinola (2012) <doi:10.1080/03610918.2011.600500>, modeling the parameters of mean and shape and using different link functions for the parameter associated to the mean. And calculates different adjustment statistics such as the Akaike information criterion and Bayesian information criterion.

Depends R (>= 3.1.1), mvtnorm

License GPL (>= 2)

NeedsCompilation no

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Bayesiangammareg — *Bayesian Gamma Regression: Joint Mean and Shape Modeling*

Description

Function to do Bayesian Gamma Regression: Joint Mean and Shape Modeling

Usage

```
Bayesiangammareg(Y, X, Z, nsim, bpri, Bpri, gpri, Gpri, burn, jump,
graph1, graph2, meanlink = "log")
```

Arguments

`Y`	object of class matrix, with the dependent variable.
`X`	object of class matrix, with the variables for modeling the mean.
`Z`	object of class matrix, with the variables for modeling the shape.
`nsim`	a number that indicate the number of iterations.
`bpri`	a vector with the initial values of beta.
`Bpri`	a matrix with the initial values of the variance of beta.
`gpri`	a vector with the initial values of gamma.
`Gpri`	a matrix with the initial 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.
`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.
`meanlink`	represent the link function, logarithm or identity.

Details

The Bayesian Gamma regression allows the joint modeling of the mean and the shape of a gamma distributed variable, using a Bayesian estimation algorithm proposed by Cepeda-Cuervo (2001).

Value

object of class bayesiangammareg 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.

`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.

`call` Call.

Author(s)

Arturo Camargo Lozano <bacamargol@unal.edu.co>, Edilberto Cepeda-Cuervo <ecepedac@unal.edu.co>

References

1. Cepeda-Cuervo E. (2001) Modelagem da variabilidade em modelos lineares generalizados. Ph.D. tesis. Instituto de Matematicas. Universidade Federal do Rio do Janeiro. 2. Cepeda-Cuervo E. and Gamerman D. (2005). Bayesian Methodology for modeling parameters in the two-parameter exponential family. Estadistica 57, 93 105.

Examples

```
X1 <- rep(1,50)
X2 <- runif(50,0,30)
X3 <- runif(50,0,20)
X4 <- runif(50,10,20)
mui <- 15 + 3*X2 + 2*X3
alphai <- exp(3 + 0.15*X2 + 0.15*X4)
Y <- rgamma(50,shape=alphai,scale=mui/alphai)
X <- cbind(X1,X2,X3)
Z <- cbind(X1,X2,X4)
bpri <- c(1,1,1)
Bpri <- diag(10^(3),nrow=ncol(X),ncol=ncol(X))
gpri <- c(0,0,0)
Gpri <- diag(10^(3),nrow=ncol(Z),ncol=ncol(Z))
burn <- 0
jump <- 1
nsim <- 300
graph1=FALSE
graph2=FALSE
Bayesiangammareg(Y,X,Z,nsim,bpri,Bpri,gpri,Gpri,burn,jump,graph1,graph2,"ide")
```

`criteria` *Criteria for Comparison the Bayesian Gamma Regression.*

Description

Performs the comparison criterias for the Bayesian Gamma regression

Usage

```
criteria(X, gammaresiduals)
```

Arguments

`X`	object of class matrix, with the independent variable for the mean.
`gammaresiduals`	object of class bayesiangammareg, with the residuals of the Bayesian Gamma regression, that can be calculated by the function gammaresiduals

Details

This function calculate the residuals of a Bayesian Gamma regression.

Value

`deviance`	the deviance criteria
`AIC`	the AIC criteria
`BIC`	the BIC criteria

Author(s)

Arturo Camargo Lozano <bacamargol@unal.edu.co>, Edilberto Cepeda-Cuervo <ecepedac@unal.edu.co>

References

1. Cepeda-Cuervo E. (2001) Modelagem da variabilidade em modelos lineares generalizados. Ph.D. tesis. Instituto de Matematicas. Universidade Federal do Rio do Janeiro. 2. Cepeda-Cuervo E. and Gamerman D. (2005). Bayesian Methodology for modeling parameters in the two-parameter exponential family. Estadistica 57, 93 105. 3. Espinheira, P. L., Ferrari, S. L., and Cribari-Neto, F. On beta regression residuals. Journal of Applied Statistics 4. Cepeda-Cuervo E., Corrales, M., Cifuentes, M. V., and Zarate, H. (2016). On Gamma Regression Residuals.

GammaIdentity — *Bayesian Gamma Regression with link Identity for the Model of Mean.*

Description

Function to do Bayesian Gamma Regression link Identity: Joint Mean and Shape modeling with Identity link for Mean.

Usage

```
GammaIdentity(Y, X, Z, nsim, bpri, Bpri, gpri, Gpri, burn, jump, graph1, graph2)
```

Arguments

Y	Object of class matrix, with the dependent variable.
X	Object of class matrix, with the variables for modeling the mean.
Z	Object of class matrix, with the variables for modeling the shape.
nsim	a number that indicate the number of iterations.
bpri	a vector with the initial values of beta.
Bpri	a matrix with the initial values of the variance of beta.
gpri	a vector with the initial values of gamma.
Gpri	a matrix with the initial 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.
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.

Value

object of class `bayesiangammareg` 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 precision
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
G	object of class matrix with the G values
yestimado	object of class matrix with the fitted values of y
residuals	object of class matrix with the residuals of the regression
phi	object of class matrix with the precision terms of the regression
variance	object of class matrix with the variance terms 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

Author(s)

Arturo Camargo Lozano <bacamargol@unal.edu.co>, Edilberto Cepeda-Cuervo <ecepedac@unal.edu.co>

References

1. Cepeda-Cuervo E. (2001) Modelagem da variabilidade em modelos lineares generalizados. Ph.D. tesis. Instituto de Matematicas. Universidade Federal do Rio do Janeiro. 2. Cepeda-Cuervo E. and Gamerman D. (2005). Bayesian Methodology for modeling parameters in the two-parameter exponential family. Estadistica 57, 93 105. 3. Cepeda Cuervo E. and Gamerman D. (2001). Bayesian Modeling of Variance Heterogeneity in Normal Regression Models. Brazilian Journal of Probability and Statistics. 14, 207-221.

Examples

```
X1 <- rep(1,50)
X2 <- runif(50,0,30)
X3 <- runif(50,0,20)
X4 <- runif(50,10,20)
mui <- 15 + 3*X2 + 2*X3
alphai <- exp(3 + 0.15*X2 + 0.15*X4)
Y <- rgamma(50,shape=alphai,scale=mui/alphai)
X <- cbind(X1,X2,X3)
Z <- cbind(X1,X2,X4)
bpri <- c(1,1,1)
Bpri <- diag(10^(3),nrow=ncol(X),ncol=ncol(X))
gpri <- c(0,0,0)
Gpri <- diag(10^(3),nrow=ncol(Z),ncol=ncol(Z))
burn <- 0
jump <- 1
nsim <- 300
graph1=FALSE
graph2=FALSE
Bayesiangammareg(Y,X,Z,nsim,bpri,Bpri,gpri,Gpri,burn,jump,graph1,graph2,"ide")
```

GammaLog — *Bayesian Gamma Regression with logarithm link for Model of Mean.*

Description

Function to do Bayesian Gamma Regression: Joint Mean and Shape modeling with Log link for Mean.

Usage

```
GammaLog(Y, X, Z, nsim, bpri, Bpri, gpri, Gpri, burn, jump,
graph1, graph2)
```

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 shape.

nsim	a number that indicate the number of iterations.
bpri	a vector with the initial values of beta.
Bpri	a matrix with the initial values of the variance of beta.
gpri	a vector with the initial values of gamma.
Gpri	a matrix with the initial 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.
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.

Value

object of class bayesiangammareg 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 precision
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
G	object of class matrix with the G values
yestimado	object of class matrix with the fitted values of y
residuals	object of class matrix with the residuals of the regression
phi	object of class matrix with the precision terms of the regression
variance	object of class matrix with the variance terms 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

Author(s)

Arturo Camargo Lozano <bacamargol@unal.edu.co>, Edilberto Cepeda-Cuervo <ecepedac@unal.edu.co>

References

1. Cepeda-Cuervo E. (2001) Modelagem da variabilidade em modelos lineares generalizados. Ph.D. tesis. Instituto de Matematicas. Universidade Federal do Rio do Janeiro. 2. Cepeda Cuervo E. and Gamerman D. (2005). Bayesian Methodology for modeling parameters in the two parameter exponential family. Estadistica 57, 93 105. 3. Cepeda Cuervo E. and Gamerman D. (2001). Bayesian Modeling of Variance Heterogeneity in Normal Regression Models. Brazilian Journal of Probability and Statistics. 14, 207-221.

Examples

```
X1 <- rep(1,50)
X2 <- runif(50,0,30)
X3 <- runif(50,0,20)
X4 <- runif(50,10,20)
mui<-exp(1 + 0.14*X2 + 0.05*X3)
alphai<-exp(0.1 + 0.01*X2 + 0.03*X4)
Y <- rgamma(50,shape=alphai,scale=mui/alphai)
X <- cbind(X1,X2,X3)
Z <- cbind(X1,X2,X4)
bpri <- c(1,1,1)
Bpri <- diag(10^(3),nrow=ncol(X),ncol=ncol(X))
gpri <- c(0,0,0)
Gpri <- diag(10^(3),nrow=ncol(Z),ncol=ncol(Z))
burn <- 0
jump <- 1
nsim <- 300
graph1=FALSE
graph2=FALSE
Bayesiangammareg(Y,X,Z,nsim,bpri,Bpri,gpri,Gpri,burn,jump,graph1,graph2,"log")
```

---

gammaresiduals *Residuals of the Gamma Regression*

Description

This function calculates the Gamma regression residuals

Usage

```
gammaresiduals(Y, X, model)
```

Arguments

Y	object of class matrix, with the dependent variable.
X	object of class matrix, with the independent variable.
model	object of class Bayesiangammareg.

Value

rabs	Pearson absolute residuals
rp	Pearson residuals
rd	deviance residuals
rast	Asteric residuals

Author(s)

Arturo Camargo Lozano <bacamargol@unal.edu.co>, Edilberto Cepeda Cuervo <ecepedac@unal.edu.co>

References

1. Cepeda-Cuervo E. (2001) Modelagem da variabilidade em modelos lineares generalizados. Ph.D. tesis. Instituto de Matematicas. Universidade Federal do Rio do Janeiro. 2. Cepeda-Cuervo E. and Gamerman D. (2005). Bayesian Methodology for modeling parameters in the two-parameter exponential family. Estadistica 57, 93 105. 3. Cepeda Cuervo E., Corrales, M., Cifuentes, M. V., and Zarate, H. (2016). On Gamma Regression Residuals.

---

print.Bayesiangammareg *Print the Bayesian Gamma Regression*

Description

Print the Bayesian Gamma Regression for Joint modeling of Mean and Shape

Usage

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

Arguments

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

Value

print the Bayesian Gamma regression

Author(s)

Arturo Camargo Lozano <bacamargol@unal.edu.co>, Edilberto Cepeda Cuervo <ecepedac@unal.edu.co>

References

1. Cepeda-Cuervo E. (2001) Modelagem da variabilidade em modelos lineares generalizados. Ph.D. tesis. Instituto de Matematicas. Universidade Federal do Rio do Janeiro.

print.summary.Bayesiangammareg

Print the Summary of the Bayesian Gamma Regression

Description

Print the summary Bayesian Gamma regression for Joint modeling of Mean and Shape parameters

Usage

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

Arguments

x	object of class Bayesiangammareg
...	not used.

Value

Print the summary Bayesian Gamma Regression for Joint modeling of Mean and Shape parameters

Author(s)

Arturo Camargo <bacamargol@unal.edu.co>, Edilberto Cepeda-Cuervo <ecepedac@unal.edu.co>

References

1. Cepeda-Cuervo E. (2001) Modelagem da variabilidade em modelos lineares generalizados. Ph.D. tesis. Instituto de Matematicas. Universidade Federal do Rio do Janeiro.

summary.Bayesiangammareg

Print the Bayesian Gamma Regression

Description

Summarized the Bayesian Gamma Regression for joint modeling of mean and variance

Usage

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

Arguments

object	an object of class Bayesiangammareg
...	not used.

Value

call	Call
coefficients	Coefficients
deviance	deviance
AIC	AIC
BIC	BIC

Author(s)

Brayan Arturo Camargo <bacamargol@unal.edu.co>, Edilberto Cepeda Cuervo <ecepedac@unal.edu.co>

References

1. Cepeda-Cuervo E. (2001) Modelagem da variabilidade em modelos lineares generalizados. Ph.D. tesis. Instituto de Matematicas. Universidade Federal do Rio do Janeiro. 2. Cepeda-Cuervo E. and Gamerman D. (2005). Bayesian Methodology for modeling parameters in the two-parameter exponential family. Estadistica 57, 93 105. 3. Cepeda Cuervo E. and Gamerman D. (2001). Bayesian Modeling of Variance Heterogeneity in Normal Regression Models. Brazilian Journal of Probability and Statistics. 14, 207-221.

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