Package 'BayesCR'

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Type Package

Title Bayesian Analysis of Censored Regression Models Under Scale Mixture of Skew Normal Distributions

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Description Propose a parametric fit for censored linear regression models based on SMSN distributions, from a Bayesian perspective. Also, generates SMSN random variables.

Depends R(>= 3.1.2)

Imports mvtnorm, Rlab, truncdist, mnormt, rootSolve

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NeedsCompilation no

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R topics documented:

Bayes.CR *Bayesian Analysis of Censored Regression Models Under Scale Mixture of Skew Normal Distributions*

Description

Propose a parametric fit for censored linear regression models based on SMSN distributions, from a Bayesian perspective.

Usage

```
Bayes.CR(cc,x,y,cens="left",dist="Normal",criteria="FALSE",influence="FALSE",
spacing=NULL,prior=NULL,hyper=NULL,n.thin=10,burnin=100,n.iter=2000,
n.chains=2,chain="TRUE")
```

Arguments

cc	Vector of censoring indicators. For each observation: 0 if non-censored, 1 if censored.
x	Matrix or vector of covariates.
y	Vector of responses in case of right/left censoring.
cens	"left" for left censoring, "right" for right censoring.
dist	Distribution to be used: "Normal" for Normal model, "T" for Student-t model, "Slash" for slash model, "NormalC" for contaminated Normal model, "SN" for Skew-Normal model, "ST" for Skew-t model and "SSL" for Skew-Slash model.
criteria	"TRUE" or "FALSE". Indicates if model selection criteria (LPML, DIC, EAIC, EBIC and WAIC) should be computed.
influence	"TRUE" or "FALSE". Indicates if the divergence measures (KL divergence, J, L and Chi Distance) should be computed.
spacing	Should only be specified if at least one of "influence" or "criteria" is TRUE. This is the lag between observations of the final chain (after burn-in and thinning) used to compute these measures. If spacing=1, all the chain is used.
prior	Prior distribution to be used for the degrees of freedom under Student-t model: "Exp" for exponential distribution, "Jeffreys" for Jeffreys prior, "Unif" for Uniforme distribution and "Hierar" for Hierarchical prior (exponential with a parameter that follows a uniform distribution). Must be "NULL" for other models.
hyper	Value of hyperparameter for the exponential prior. Must not be provided in case of others prior distributions.
n.thin	Lag for posterior sample.
burnin	Burn-in for posterior sample.
n.iter	The number of iterations to be considered (before burnin and thinning).
n.chains	The number of chains to be considered. It must be less than 5.
chain	If "TRUE", all the posterior chains are stored for posterior analysis.

Details

Specification of the priors distributions is given in reference papers (Garay et. al 2013 and Cancho et. al 2010). See Gelman et. al for the difference between the two versions of WAIC criterion. Calculations under the Skew-slash model may take a while, as it involves numerical integrations - you may want to specify big values to "spacing" under this model. For the Contaminated Normal model, a observation y comes from a normal distribution with mean "x beta" and variance "sigma2/rho" with probabilty "nu" and comes from a normal distribution with mean "x beta" and variance "sigma2" with probability 1-"nu".

Value

`Mean`	Posterior mean for the parameters.
`Sd`	Standard deviations for the parameters.
`HPD`	HPD(95%) interval for the parameters.
`LPML`	Log-marginal pseudo likelihood for model selection.
`DIC`	DIC criterion for model selection.
`EAIC`	EAIC criterion for model selection.
`EBIC`	EBIC criterion for model selection.
`WAIC1`	First version of Watanabe-Akaike information criterion.
`WAIC2`	Second version of Watanabe-Akaike information criterion.

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References

Aldo M. Garay, Victor H. Lachos, Heleno Bolfarine, Celso R. Cabral. 2013. "Bayesian analysis of censored regression models with scale mixture of normal distributions". Vicente G. Cancho, Dipak K. Dey, Victor H. Lachos and Marinho G. Andrade. 2010. "Bayesian nonlinear regression models with scale mixtures of skew-normal distributions: estimation and case influence diagnostics". Andrew Gelman, Jessica Hwang, Aki Vehtari. 2013. "Understanding predictive information criteria for Bayesian models".

Examples

```
##see examples in \code{\link{motorettes}}
```

motorettes *Accelerated Life Tests On Electrical Insulation*

Description

Accelerated life tests on electrical insulation in motorettes with censoring times.

Usage

```
data(motorettes)
```

Format

A data frame with 40 observed times of life tests on electrical insulation in motorettes at four different temperatures (150C, 170c, 190c and 200c). y corresponds to log10 of the failure time (or end of study time, in case of right censored observations), x corresponds to (100/(temperature + 273.2)) and cc is a indicator of censoring (1 if censored, 0 if not).

Source

Tan, M., Tian, G. L. and Ng, K. W. (2009). Bayesian Missing Data Problems: EM, Data Augmentation and Noniterative Computation.

Examples

```
##Load the data
data(motorettes)
attach(motorettes)

##Set design matrix
x <- cbind(1,x)

##Fits a right censored normal model
Normal <- Bayes.CR(cc,x,y,cens="right",dist="Normal",n.thin=10,burnin=200,n.iter=800,
n.chains=1,chain="TRUE")
```

rSMSN *Generate SMSN Random Variables*

Description

Generate random variables with one of the following distributions: Normal, Student-t, Contaminated Normal, Slash, Skew-Normal, Skew-t and Skew-Slash.

Usage

```
rSMSN(n,mu,sigma2,lambda,nu,dist)
```

Arguments

n	Number of observations to be generated.
mu	Location parameter.
sigma2	Scale parameter.
lambda	Shape parameter (control skewness). Only must be provided for Skew-Normal, Skew-t and Skew-Slash distributions.
nu	Degree of freedom. Must not be provided for Normal and Skew-Normal distribution. Must be a vector of length 2 for Contaminated-Normal distribution.
dist	Distribution to be used: "Normal" for Normal model, "T" for Student-t model, "Slash" for slash model, "NormalC" for contaminated Normal model, "SN" for Skew-Normal model, "ST" for Skew-t model and "SSL" for Skew-Slash model.

Details

If Y follows a Contaminated Normal model, than a observation y comes from a normal distribution with mean "mu"" and variance "sigma2/rho" with probabilty "nu" and comes from a normal distribution with mean "mu" and variace "sigma2" with probability "1-nu".

Author(s)

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References

Aldo M. Garay, Victor H. Lachos, Heleno Bolfarine, Celso R. Cabral. 2013. "Bayesian analysis of censored regression models with scale mixture of normal distributions". Vicente G. Cancho, Dipak K. Dey, Victor H. Lachos and Marinho G. Andrade. 2010. "Bayesian nonlinear regression models with scale mixtures of skew-normal distributions: estimation and case influence diagnostics".

Examples

```
# Generate a sample with 100 observations of a symmetric Student-t distribution
sample <- rSMSN(n=100,mu=5,sigma2=2,lambda=0,nu=3,dist="T")
```

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