Package ‘cslogistic’

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Title Conditionally Specified Logistic Regression

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Description This package contains functions for likelihood and posterior analysis of conditionally specified logistic regression models. All calculus and simulation is done in compiled FORTRAN.

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`BayesCslogistic` *Perform a Bayesian Analysis of a conditionally specified logistic regression model*

Description

This function generates a posterior density sample from a conditionally specified logistic regression model for multivariate binary data using a random walk Metropolis algorithm. The user supplies data and priors, and a sample from the posterior density is returned as a object, which can be subsequently analyzed with functions provided in the coda package.

Usage

```
BayesCslogistic(formula, type = TRUE, intercept = TRUE,
           burnin = 1000, mcmc = 10000, thin=1,
           tune=1.1, beta.start = NA, b0 = 0, B0 = 0, ...)
```

Arguments

`formula`	Model formula.
`type`	logical variable indicating if covariates have the same effect 'TRUE' or different effect 'FALSE' for each variable.
`intercept`	logical variable indicating if only the intercept 'TRUE' or all the covariates have different effect 'FALSE' for each variable. The option 'type' must be 'FALSE'.
`burnin`	The number of burn-in iterations for the sampler.
`mcmc`	The number of Metropolis iterations for the sampler.
`thin`	The thinning interval used in the simulation. The number of mcmc iterations must be divisible by this value.
`tune`	Metropolis tuning parameter. Make sure that the acceptance rate is satisfactory (typically between 0.20 and 0.5) before using the posterior density sample for inference.
`beta.start`	The starting value for the β vector. This can either be a scalar or a column vector with dimension equal to the number of betas. If this takes a scalar value, then that value will serve as the starting value for all of the betas. The default value of NA will use the maximum likelihood estimate of β as the starting value. Those are obtained using the function Cslogistic
`b0`	The prior mean of β. This can either be a scalar or a column vector with dimension equal to the number of betas. If this takes a scalar value, then that value will serve as the prior mean for all of the betas.
`B0`	The prior precision of β. This can either be a scalar or a square matrix with dimensions equal to the number of betas. If this takes a scalar value, then that value times an identity matrix serves as the prior precision of β. Default value of 0 is equivalent to an improper uniform prior for beta.
`...`	further arguments to be passed.

Value

An mcmc object that contains the posterior density sample. This object can be summarized by functions provided by the coda package.

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References

Garcia-Zattera, M. J., Jara, A., Lesaffre, E. and Declerck, D. (2005). On conditional independence for multivariate binary data in caries research. In preparation.

Joe, H. and Liu, Y. (1996). A model for multivariate response with covariates based on compatible conditionally specified logistic regressions. Satistics & Probability Letters 31: 113-120.

See Also

`cslogistic`, `MleCslogistic`.

Examples

```
# simulated data set

library(mvtnorm)

n<-400
mu1<-c(-1.5,-0.5)
Sigma1<-matrix(c(1, -0.175,-0.175,1),ncol=2)
age<-as.vector(sample(seq(5,6,0.1),n,replace=TRUE))
beta1<-0.2

z<-rmvnorm(n,mu1,Sigma1)
zz<-cbind(z[,1]+beta1*age,z[,2]+beta1*age)
datos<-cbind(zz[,1]>0,zz[,2]>0,age)
colnames(datos)<-c("y1","y2","age")
data0<-data.frame(datos)
attach(data0)

# equal effect of age for all the covariates

y<-cbind(y1,y2)

fit0<-BayesCslogistic(y~age)
fit0
summary(fit0)
plot(fit0)

# different effects: only intercept

fit1<-BayesCslogistic(y~age,type=FALSE)
```

```
fit1
summary(fit1)
plot(fit1)

# different effects: all the covariates

fit2<-BayesCslogistic(y~age,type=FALSE,intercept=FALSE)
fit2
summary(fit2)
plot(fit2)
```

`cslogistic` *Perform an Analysis of a conditionally specified logistic regression model*

Description

This package contains functions for likelihood and posterior analysis of conditionally specified logistic regression models.

Details

Assume that for each of n experimental units the values of m binary variables

$$Y_{i1}, \ldots, Y_{im}$$

are recorded. The 'MleCslogistic' and 'BayesCslogistic' functions fit a conditional specified logistic regression model, such that for $i = 1, \ldots, n$ and $j = 1, \ldots, m$,

$$\text{logit} P(Y_{ij} = 1 | Y_{ik} = y_k, k \neq j) = X_{ij}\beta_j + \sum_{k=1, k \neq j}^{m} \alpha_{jk} y_k$$

where, the parameters α_{jk} have interpretation as conditional log-odds ratios and the parameters β_j correspond to the regression coefficients associated to the vector of covariates X_{ij}. For compatibility of conditional distributions it is assumed that $\alpha_{jk} = \alpha_{kj}$, $j \neq k$.

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Joe, H. and Liu, Y. (1996). A model for multivariate response with covariates based on compatible conditionally specified logistic regressions. Satistics & Probability Letters 31: 113-120.

See Also

MleCslogistic, BayesCslogistic.

MleCslogistic *Perform a Maximum Likelihood Analysis of a conditionally specified logistic regression model*

Description

Fit a conditional specified logistic regression model for multivariate binary responses.

Usage

```
MleCslogistic(formula,type = TRUE, intercept = TRUE, method = "BFGS",
              maxiter=1000 , data, ...)
```

Arguments

formula	a symbolic description of the model to be fit.
type	logical variable indicating if covariates have the same effect 'TRUE' or different effect 'FALSE' for each variable.
intercept	logical variable indicating if only the intercept 'TRUE' or all the covariates have different effect 'FALSE' for each variable. The option 'type' must be 'FALSE'.
method	the optimization method to be used; the default method is "BFGS".
maxiter	maximum number of iterations used by the optimization method.
data	an optional data frame containing the variables in the model. If not found in 'data', the variables are taken from 'environment(formula)', typically the environment from which 'cslogistic' is called..
...	further arguments to be passed.

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Joe, H. and Liu, Y. (1996). A model for multivariate response with covariates based on compatible conditionally specified logistic regressions. Satistics & Probability Letters 31: 113-120.

See Also

cslogistic, BayesCslogistic.

Examples

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# simulated data set

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mu1<-c(-1.5,-0.5)
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age<-as.vector(sample(seq(5,6,0.1),n,replace=TRUE))
beta1<-0.2

z<-rmvnorm(n,mu1,Sigma1)
zz<-cbind(z[,1]+beta1*age,z[,2]+beta1*age)
datos<-cbind(zz[,1]>0,zz[,2]>0,age)
colnames(datos)<-c("y1","y2","age")
data0<-data.frame(datos)
attach(data0)

# equal effect of age for all the covariates

y<-cbind(y1,y2)

fit0<-MleCslogistic(y~age)
fit0
summary(fit0)

# different effects: only intercept

fit1<-MleCslogistic(y~age,type=FALSE)
fit1
summary(fit1)

# different effects: all the covariates

fit2<-MleCslogistic(y~age,type=FALSE,intercept=FALSE)
fit2
summary(fit2)
```

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