Package 'covreg'

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Type Package

Title A simultaneous regression model for the mean and covariance

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Description This package fits a simultaneous regression model for the mean vectors and covariance matrices of multivariate response variables, as described in Hoff and Niu (2012). The explanatory variables can be continuous or discrete. The current version of the package provides the Bayesian estimates.

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covreg-package   *A simultaneous regression model for the mean and covariance*

Description

This package fits a simultaneous regression model for the mean vectors and covariance matrices of multivariate response variables, as described in Hoff and Niu (2012). The explanatory variables can be continuous or discrete. The current version of the package provides the Bayesian estimates.

Details

This package fits a simultaneous regression model for the mean vectors and covariance matrices of multivariate response variables, as described in Hoff and Niu (2012). The explanatory variables can be continuous or discrete. The current version of the package provides the Bayesian estimates.

Author(s)

Xiaoyue Niu and Peter Hoff

References

P.D. Hoff and X. Niu. A Covariance Regression Model. Statistica Sinica, 22:729-753, 2012

Examples

```
## load FEV data ##
data(fev)
## specify mean and cov models ##
library(splines)
fmean=as.formula(cbind(fev,height)~bs(age,knots=11))
fcov=as.formula(cbind(fev,height)~sqrt(age)+age)
## fit model ##
fit<-covreg.mcmc(fmean,fcov,data=fev,R=2,niter=100,nthin=1)
## summarize MCMC samples ##
M.psamp=m.psamp(fit)
S.psamp=cov.psamp(fit)
```

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cov.psamp   *Posterior samples of the covariance matrices from the covariance re-
                                gression model*

Description

Calculates the posterior samples of the covariance matrices based on the posterior samples of the parameters and the explanatory variables in the covariance regression model.

Usage

```
cov.psamp(fit)
```

Arguments

fit	the returned object from covreg.mcmc

Value

MCMC samples of the covariance matrices given the explanatory variables specified in the model.

Author(s)

Xiaoyue Niu and Peter Hoff

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covreg.mcmc	*Bayesian estimation of the covariance regressioin model*

Description

covreg.mcmc is used to estimate the parameters in the covariance regression model providing Bayesian estimates.

Usage

```
covreg.mcmc(fmean, fcov, data = NULL, R = 1, niter = 10000,
nthin = 10, nsave = niter/nthin, verb = T)
```

Arguments

fmean	an object of class "formula", model for the mean regression.
fcov	an object of class "formula", model for the covariance regression. Can be different from the mean model.
data	data frame containing variables in the model.
R	a positive integer, rank of the model.
niter	number of MCMC iterations.
nthin	number of thinning.
nsave	number of output iterations, calu=alted as niter/nthin.
verb	print progress of MCMC(TRUE/FALSE).

Value

B1.psamp	an array containing the MCMC samples of the mean regression coefficients
B2.psamp	an array containing the MCMC samples of the covariance regression coefficients
A.psamp	an array containing the MCMC samples of the baseline covariance matrix
matrix.mean	the design matrix of the mean regression
matrix.cov	the design matrix of the covariance regression

Author(s)

Xiaoyue Niu and Peter Hoff

Examples

```
## load FEV data ##
data(fev)
## specify mean and cov models ##
library(splines)
fmean=as.formula(cbind(fev,height)~bs(age,knots=11))
fcov=as.formula(cbind(fev,height)~sqrt(age)+age)
## fit model ##
fit<-covreg.mcmc(fmean,fcov,data=fev,R=2,niter=100,nthin=1)
## summarize MCMC samples ##
M.psamp=m.psamp(fit)
S.psamp=cov.psamp(fit)
```

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fev   *Modified Rosner's FEV data*

Description

Modified children's FEV data. FEV was replaced by log(FEV). Age 3 was grouped to age 4 and Age 19+ was grouped to age 18.

Usage

```
data(fev)
```

Format

A data frame with 654 observations on the following 5 variables.

age a numeric vector

fev a numeric vector

height a numeric vector

male a numeric vector

smoke a numeric vector

References

Rosner, B. (1999), Fundamentals of Biostatistics, 5th ed., Pacific Grove, CA: Duxbury.

m.psamp	*Posterior samples of the mean vectors from the covariance regression model*

Description

Calculates the posterior samples of the mean vectors based on the posterior samples of the parameters and the explanatory variables in the covariance regression model.

Usage

```
m.psamp(fit)
```

Arguments

fit   the returned object from covreg.mcmc

Value

MCMC samples of the mean vectors given the explanatory variables specified in the model.

Author(s)

Xiaoyue Niu and Peter Hoff

rmn	*Sample from matrix normal distribution*

Description

Generate a random sample from the matrix normal distribution

Usage

```
rmn(M = 0, Srow, Scol)
```

Arguments

M   a matrix, mean of the matrix normal distribution.

Srow   a positive definite matrix, row covariance matrix of the matrix normal distribution.

Scol   a positive definite matrix, column covariance matrix of the matrix normal distribution

Value

Return a matrix that comes from a matrix normal distribution with mean M, row covariance Srow, and column covariance Scol.

Author(s)

Xiaoyue Niu and Peter Hoff

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rwish   *Sample from the Wishart distribution*

Description

Generate a random sample from the Wishart distribution

Usage

```
rwish(S0, nu)
```

Arguments

S0   a positive definite matrix

nu   a positive integer

Details

Return a ramdom sample from the Wishart distribution with mean nu*S0.

Value

a positive definite matrix

Author(s)

Xiaoyue Niu and Peter Hoff

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