Package: tmvnsim (via r-universe)

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Title Truncated Multivariate Normal Simulation

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Description Importance sampling from the truncated multivariate normal using the GHK (Geweke-Hajivassiliou-Keane) simulator. Unlike Gibbs sampling which can get stuck in one truncation sub-region depending on initial values, this package allows truncation based on disjoint regions that are created by truncation of absolute values. The GHK algorithm uses simple Cholesky transformation followed by recursive simulation of univariate truncated normals hence there are also no convergence issues. Importance sample is returned along with sampling weights, based on which, one can calculate integrals over truncated regions for multivariate normals.

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Repository CRAN

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NeedsCompilation yes

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Description

This function simulates an importance sample from the truncated multivariate normal distribution with mean equal to `mean` and covariance matrix `sigma`, lower and upper truncation points `lower` and `upper`.

Usage

```
tmvnsim(nsamp, k, lower=rep(-Inf,k), upper=rep(Inf,k), imod=rep(FALSE, k)
   , means=rep(0, k), sigma=diag(1, k))
```

Arguments

nsamp	Number of samples to generate
k	Dimension
lower	Vector of lower truncation points, default is `rep(-Inf, length = k)`.
upper	Vector of upper truncation points, default is `rep( Inf, length = k)`.
imod	Logical vector indicating whether truncation bounds of a particular dimension should be applied on the modulus (absolute value) of that component. Defaults to FALSE for all components
means	Mean vector, default is 0 for all components
sigma	Covariance matrix, default is identity matrix

Details

The simulation of truncated multivariate normal is done using importance sampling (GHK simulator) that uses a Cholesky decomposition of the covariance matrix to convert the problem of covering the truncation region to a recursive sampling from certain univariate truncated normals. Importance sampling weights are simultaneously returned. The original GHK algorithm has been slightly modified to allow truncation of some or all components using absolute value (modulus).

Value

A list with the following two components:

samp	A matrix of nsamp rows and k columns containing the simulated samples
wts	A vector of length nsamp containing the importance sampling weights

Author(s)

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References

Geweke, J. 1989. Bayesian inference in econometric models using Monte Carlo integration. Econometrica 57: 1317-1339.

Hajivassiliou, V., and D. McFadden. 1998. The method of simulated scores for the estimation of LDV models. Econometrica 66: 863-896.

Keane, M. P. 1994. A computationally practical simulation estimator for panel data. Econometrica 62: 95-116

Examples

```
low <- rep(1, 5)
high <- rep(2, 5)
sig <- matrix(0.1, 5, 5)
diag(sig) <- 1
res <- tmvnsim(nsamp=1000, k=5, lower=low, upper=high, imod=rep(TRUE, 5)
  , means=rep(0, 5), sigma=sig)
head(res$samp)
head(res$wts)
cat("Probability of the region:\n")
mean(res$wts)
cat("Mean of Z-bar conditonal on truncation region:\n")
sum(rowMeans(res$samp) * res$wts)/sum(res$wts)
```

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