Package 'rBeta2009'

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Type Package

Title The Beta Random Number and Dirichlet Random Vector Generating Functions

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Description Contains functions to generate random numbers from the beta distribution and random vectors from the Dirichlet distribution.

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rbeta *The Beta Random Number Generating Function*

Description

Random generation for the beta distribution with parameters shape1 and shape2.

Usage

```
rbeta(n, shape1, shape2)
```

Arguments

n	Number of beta random numbers to generate. If length(n) > 1, the length is taken to be the number required.
shape1, shape2	Positive shape parameters.

Details

The beta distribution with parameters shape1$= a$ and shape2$= b$ has density

$$\frac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)}x^{a-1}(1-x)^{b-1}$$

for $a > 0, b > 0$ and $0 \leq x \leq 1$.

The mean is $\frac{a}{a+b}$ and the variance is $\frac{ab}{(a+b)^2(a+b+1)}$.

rbeta basically utilizes the following guideline primarily proposed by Hung *et al.* (2009) for generating beta random numbers.

- When max(shape1,shape2) < 1, the B00 algorithm (Sakasegawa, 1983) is used;
- When shape1$< 1 <$shape2 or shape1$> 1 >$shape2, the B01 algorithm (Sakasegawa, 1983) is used;
- When min(shape1,shape1) > 1, the B4PE algorithm (Schmeiser and Babu, 1980) is used if one papameter is close to 1 and the other is large (say > 4); otherwise, the BPRS algorithm (Zechner and Stadlober, 1993) is used.

Value

rbeta generates beta random numbers.

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Source

`rbeta` uses a C translation of

Y. C. Hung and N. Balakrishnan and Y. T. Lin (2009), Evaluation of beta generation algorithms, *Communications in Statistics - Simulation and Computation*, **38**:750–770.

References

Y. C. Hung and N. Balakrishnan and Y. T. Lin (2009), Evaluation of beta generation algorithms, *Communications in Statistics - Simulation and Computation*, **38**, 750–770.

H. Sakasegawa (1983), Stratified rejection and squeeze method for generating beta random numbers, *Annals of the Institute Statistical Mathematics*, **35**, 291–302.

B.W. Schmeiser and A.J.G. Babu (1980), Beta variate generation via exponential majorizing functions, *Operations Research*, **28**, 917–926.

H. Zechner and E. Stadlober (1993), Generating beta variates via patchwork rejection, *Computing*, **50**, 1–18.

See Also

`rbeta` in package **stats**.

Examples

```
library(rBeta2009)
rbeta(10, 0.7, 1.5)
```

`rdirichlet` *The Dirichlet Random Vector Generating Function*

Description

The function to generate random vectors from the Dirichlet distribution.

Usage

```
rdirichlet(n, shape)
```

Arguments

`n`	Number of Dirichlet random vectors to generate. If `length(n) > 1`, the length is taken to be the number required.
`shape`	Vector with `length(shape) >= 2` containing positive shape parameters of the Dirichlet distribution. If `length(shape) = 2`, it reduces to the beta generating function.

Details

The Dirichlet distribution is the multidimensional generalization of the beta distribution.

A k-variate Dirichlet random vector $(x_1, \ldots, x_k)$ has the joint probability density function

$$\frac{\Gamma(\alpha_1 + \cdots + \alpha_{k+1})}{\Gamma(\alpha_1) \ldots \Gamma(\alpha_{k+1})} x_1^{\alpha_1 - 1} \ldots x_k^{\alpha_k - 1} \left(1 - \sum_{i=1}^{k} x_i\right)^{\alpha_{k+1} - 1},$$

where $x_i \geq 0$ for all $i = 1, \ldots, k$, $\sum_{i=1}^{k} x_i \leq 1$, and $\alpha_1, \ldots, \alpha_{k+1}$ are positive shape parameters.

`rdirichlet` generates the Dirichlet random vector by utilizing the transformation method based on beta variates and three guidelines introduced by Hung *et al.* (2011). The three guidelines include: how to choose the fastest beta generation algorithm, how to best re-order the shape parameters, and how to reduce the amount of arithmetic operations.

Value

`rdirichlet()` returns a matrix with `n` rows, each containing a single Dirichlet random vector.

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Source

`rdirichlet` uses a C translation of

Y. C. Hung and N. Balakrishnan and C. W. Cheng (2011), Evaluation of algorithms for generating Dirichlet random vectors, *Journal of Statistical Computation and Simulation*, **81**, 445–459.

References

Y. C. Hung and N. Balakrishnan and C. W. Cheng (2011), Evaluation of algorithms for generating Dirichlet random vectors, *Journal of Statistical Computation and Simulation*, **81**, 445–459.

See Also

`rdirichlet` in package **MCMCpack**.
`rdirichlet` in package **gtools**.

Examples

```
library(rBeta2009)
rdirichlet(10, c(1.5, 0.7, 5.2, 3.4))
```

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