Package ‘rBeta2009’

February 20, 2015

Type Package
Title The Beta Random Number and Dirichlet Random Vector Generating Functions
Version 1.0
Date 2012-02-25
Author Ching-Wei Cheng, Ying-Chao Hung, Narayanaswamy Balakrishnan
Maintainer Ching-Wei Cheng <aks43725@gmail.com>
Description The package contains functions to generate random numbers from the beta distribution and random vectors from the Dirichlet distribution.
License GPL-2
LazyLoad yes
Repository CRAN
Date/Publication 2012-03-01 09:33:12
NeedsCompilation yes

R topics documented:

rbeta .................................................. 1
rdirichlet .......................................... 3

Index

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 \( \text{shape1} = a \) and \( \text{shape2} = b \) 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 \( \max(\text{shape1}, \text{shape2}) < 1 \), the B00 algorithm (Sakasegawa, 1983) is used;
- When \( \text{shape1} < 1 < \text{shape2} \) or \( \text{shape1} > 1 > \text{shape2} \), the B01 algorithm (Sakasegawa, 1983) is used;
- When \( \min(\text{shape1}, \text{shape2}) > 1 \), the B4PE algorithm (Schmeiser and Babu, 1980) is used if one parameter 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.

Author(s)

Ching-Wei Cheng <aks43725@gmail.com>,
Ying-Chao Hung <hungy@nccu.edu.tw>,
Narayanaswamy Balakrishnan <bala@univmail.cis.mcmaster.ca>

Source

rbeta uses a C translation of

rdirichlet

References


See Also

*rbeta* in package *stats*.

Examples

```r
dl <-(5, 0.7, 1.5)
rdl(n, 0.7, 1.5)
```

rdirichlet

The Dirichlet Random Vector Generating Function

Description

The function to generate random vectors from the Dirichlet distribution.

Usage

```r
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

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

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.

Author(s)

Ching-Wei Cheng <aks43725@gmail.com>,
Ying-Chao Hung <hungy@nccu.edu.tw>,
Narayanaswamy Balakrishnan <bala@univmail.cis.mcmaster.ca>

Source

rdirichlet uses a C translation of


References


See Also

rdirichlet in package MCMCpack.
rdirichlet in package gtools.

Examples

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

*Topic Dirichlet
   rdirichlet, 3
*Topic beta
   rbeta, 1

rbeta, 1, 3
rdirichlet, 3, 4