Package 'gnorm'

January 30, 2018

Version 1.0.0

Date 2018-01-29

Title Generalized Normal/Exponential Power Distribution

Author Maryclare Griffin

Maintainer Maryclare Griffin <maryclaregriffin@gmail.com>

Suggests knitr, rmarkdown

Description

Functions for obtaining generalized normal/exponential power distribution probabilities, quantiles, densities and random deviates. The generalized normal/exponential power distribution was introduced by Subbotin (1923) and rediscovered by Nadarajah (2005). The parametrization given by Nadarajah (2005) <doi:10.1080/02664760500079464> is used.

License GPL (>= 2)

Encoding UTF-8

LazyData true

RoxygenNote 6.0.1

VignetteBuilder knitr

Type Package

URL http://github.com/maryclare/gnorm

NeedsCompilation no

Repository CRAN

Date/Publication 2018-01-30 10:46:25 UTC

R topics documented:

gnorm *The generalized normal distribution*

Description

Density, distribution function and random generation for the generalized normal/exponential power distribution.

A generalized normal random variable x with parameters μ, $\alpha > 0$ and $\beta > 0$ has density:

$$p(x) = \beta exp - (|x - \mu|/\alpha)^{\beta}/(2\alpha\Gamma(1/\beta)).$$

The mean and variance of x are μ and $\alpha^2\Gamma(3/\beta)/\Gamma(1/\beta)$, respectively.

Usage

```
dgnorm(x, mu = 0, alpha = 1, beta = 1, log = FALSE)
pgnorm(q, mu = 0, alpha = 1, beta = 1, lower.tail = TRUE, log.p = FALSE)
qgnorm(p, mu = 0, alpha = 1, beta = 1, lower.tail = TRUE, log.p = FALSE)
rgnorm(n, mu = 0, alpha = 1, beta = 1)
```

Arguments

x, q	vector of quantiles
mu	location parameter
alpha	scale parameter
beta	shape parameter
log, log.p	logical; if TRUE, probabilities p are given as log(p)
p	vector of probabilities
n	number of observations
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise $P[X > x]$

Source

dgnorm, pgnorm, qgnorm andrgnorm are all parametrized as in Version 1 of the Generalized Normal Distribution Wikipedia page, which uses the parametrization given by in Nadarajah (2005). The same distribution was described much earlier by Subbotin (1923) and named the exponential power distribution by Box and Tiao (1973).

Box, G. E. P. and G. C. Tiao. "Bayesian inference in Statistical Analysis." Addison-Wesley Pub. Co., Reading, Mass (1973).
Nadarajah, Saralees. "A generalized normal distribution." Journal of Applied Statistics 32.7 (2005): 685-694.
Subbotin, M. T. "On the Law of Frequency of Error." Matematicheskii Sbornik 31.2 (1923): 206-301.

Examples

```
# Plot generalized normal/exponential power density
# that corresponds to the standard normal density
xs <- seq(-1, 1, length.out = 100)
plot(xs, dgnorm(xs, mu = 0, alpha = sqrt(2), beta = 2), type = "l",
     xlab = "x", ylab = expression(p(x)))

# Plot the generalized normal/exponential power CDF
# that corresponds to the standard normal CDF
s <- seq(-1, 1, length.out = 100)
plot(xs, pgnorm(xs, 0, sqrt(2), 2), type = "l", xlab = "q",
     ylab = expression(paste("Pr(", x<=q, ")", sep = "")))

# Plot the generalized normal/exponential power inverse CDF
# that corresponds to the standard normal inverse CDF
xs <- seq(0, 1, length.out = 100)
plot(xs, qgnorm(xs, 0, sqrt(2), 2), type = "l", xlab = "p",
     ylab = expression(paste("q: p = Pr(", x<=q, ")", sep = "")))

# Make a histogram of draws from the generalized normal/exponential
# power distribution that corresponds to a standard normal distribution
xs <- rgnorm(100, 0, sqrt(2), 2)
```

Index