Package 'gamlssbssn'

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Type Package

Title Bimodal Skew Symmetric Normal Distribution

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Description Density, distribution function, quantile function and random generation for the bimodal skew symmetric normal distribution of Hassan and El-Bassiouni (2016) <doi:10.1080/03610926.2014.882950>.

License GPL-2

Encoding UTF-8

LazyData true

RoxygenNote 6.0.1

Imports MASS,gamlss

Depends R (>= 3.3.0), gamlss.dist (>= 4.3.1)

NeedsCompilation no

Repository CRAN

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BSSN *Bimodal Skew Symmetric Normal Distribution*

Description

These functions define the Bimodal Skew Symmetric Normal Distribution. This is a four parameter distribution and can be used to fit a GAMLSS model.The functions dBSSN, pBSSN, qBSSN and rBSSN define the probability distribution function, the cumulative distribution function, the inverse cumulative distribution functions and the random generation for the Bimodal Skew Symmetric Normal Distribution; respectively.

Usage

```
BSSN(mu.link = "identity", sigma.link = "log", nu.link = "identity",
  tau.link = "log")

dBSSN(x, mu = 0, sigma = 1, nu = 1, tau = 0.5, log = FALSE)

pBSSN(q, mu = 0, sigma = 1, nu = 1, tau = 0.5, lower.tail = TRUE,
  log.p = FALSE, log = T)

qBSSN(p, mu = 0, sigma = 1, nu = 1, tau = 0.5, lower.tail = TRUE,
  log.p = FALSE)

rBSSN(n, mu = 0, sigma = 1, nu = 1, tau = 0.5)
```

Arguments

mu.link	Defines the mu.link, with identity link as the default for the mu parameter
sigma.link	Defines the sigma.link, with log link as the deafult for the sigma parameter
nu.link	Defines the nu.link, with identity link as the default for the nu parameter
tau.link	Defines the tau.link, with log link as the default for the tau parameter
x, q	Vector of quantiles
mu	Vector of location parameter values
sigma	Vector of scale parameter values
nu	Vector of nu parameter values
tau	Vector of bimodality parameter values
log, log.p	logical; if TRUE, probabilities p are given as log(p)
lower.tail	logical; if TRUE (default), probabilities are P[X <= x], otherwise, P[X > x]
p	Vector of probabilities
n	number of observations; if length(n) > 1, the length is taken to be the number required

Details

The probability density function of the BSSN distribution is given by

$$f_Y(y|\mu,\sigma,\nu,\tau) = c[\tau + (y-\nu)^(2)]e^{-\sigma(y-\mu)^(2)}$$

for $-\infty < y < \infty$, where $c = 2\sigma^(3/2)/\gamma\sqrt{\pi}$, $\gamma = 1+2\sigma\theta$, $\theta = \tau+\delta^2$, $\delta = \nu-\mu$. $-\infty < \mu < \infty$ and $-\infty < \nu < \infty$ are location parameters and $\sigma > 0$ and $\tau \geq 0$ denote the scale and bimodality parameters respectively.

References

Hassan, M. Y. and El-Bassiouni M. Y. (2015). Bimodal skew-symmetric normal distribution,*Communications in Statistics-Theory and Methods*, **45**, part 5, pp 1527–1541.

Hossain, A.Rigby, R. A. Stasinopoulos D. M. and Enea, M. A flexible approach for modelling proportion response variable:LGD, *31st International workshop for Statistical Modelling Society*,**1**, pp 127–132.

Rigby, R. A. and Stasinopoulos D. M. (2005). Generalized additive models for location, scale and shape,(with discussion), *Appl. Statist.*, **54**, part 3, pp 507-554.

Examples

```
op<-par(mfrow=c(3,3))
curve(dBSSN(x,  mu=1, sigma=0.1, nu=1, tau=1),-12, 12, ylab="f(x)", main="BSSN")
curve(dBSSN(x,  mu=1, sigma=0.1, nu=1, tau=5),-12, 12,ylab="f(x)", main="BSSN")
curve(dBSSN(x,  mu=1, sigma=0.1, nu=1, tau=10),-12, 12, ylab="f(x)", main="BSSN")
curve(dBSSN(x,  mu=1, sigma=0.1, nu=1, tau=20),-12, 12, ylab="f(x)", main="BSSN")
curve(dBSSN(x,  mu=1, sigma=0.1, nu=0, tau=4),-12, 12, ylab="f(x)", main="BSSN")
curve(dBSSN(x,  mu=-1, sigma=0.1, nu=0, tau=3),-12, 12, ylab="f(x)", main="BSSN")
curve(dBSSN(x,  mu=1, sigma=0.1, nu=2, tau=0),-12, 12, ylab="f(x)", main="BSSN")
curve(dBSSN(x,  mu=-1, sigma=0.1, nu=-2, tau=0),-12, 12, ylab="f(x)", main="BSSN")
curve(dBSSN(x,  mu=-1, sigma=0.1, nu=-3, tau=0.8),-12, 12, ylab="f(x)", main="BSSN")
par(op)
```

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