Package 'PowerNormal'

July 25, 2017

Type Package

Title Power Normal Distribution

Version 1.2.0

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Description Miscellaneous functions for a descriptive analysis and initial Bayesian and classical inference for the power parameter of the the Power Normal (PN) distribution. This miscellaneous will be extend for more distributions into the power family and the three-parameter model.

Imports stats

License GPL-2

NeedsCompilation no

Repository CRAN

Date/Publication 2017-07-25 15:57:25 UTC

R topics documented:

dpn *The PN distribution*

Description

Density, distribution function, quantile function and random generation for the PN distribution with power equal to alpha.

Usage

```
dpn(x, alpha)
ppn(q, alpha)
qpn(p, alpha)
rpn(n, alpha)
```

Arguments

x, q	vector of observations or quantiles.
p	vector of probabilities.
n	number of observations.
alpha	power parameter.

Details

The alpha parameter must be greater than 0 (`alpha > 0`).

References

Lehmann, EL. (1953). The power of rank tests. *The Annals of Mathematical Statistics*, **24**, 23–43.

Durrans, SR. (1992). Distributions of fractional order statistics in hydrology. *Water Resources Research*, **28**, 1649–1655.

Agamez-Montavo, G. (2017). Modelos de mistura finita usando a classe de distribuicoes alpha potencia. *Thesis (Doctoral)*, University of Sao Paulo.

Examples

```
# Density

dpn(2,1)
dnorm(2)

# Distribution function

ppn(2,1)
pnorm(2)

# Quantile function
```

```
qpn(0.5,1)
qnorm(0.5)


# Random generation

alpha <- 0.5
n <- 10
rpn(n, alpha)
```

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pn.bayes *Fit univariate PN distribution (Bayesian)*

Description

Return the posterior mean, median and variance of power parameter for PN distribution

Usage

```
pn.bayes(x,prior= "Jeffreys", shape_0 = NULL, rate_0 = NULL)
```

Arguments

x	the response vector
prior	the prior distribution of power parameter: "Jeffreys" (default), "Uniform" and "Gamma"
shape_0, rate_0	shape and rate hyperparameters of the gamma distribution.

References

Agamez-Montavo, G. (2017). Modelos de mistura finita usando a classe de distribuicoes alpha potencia. *Thesis (Doctoral)*, University of Sao Paulo.

Examples

```
x <- rpn(100, 25)

pn.bayes(x)

pn.bayes(x, prior = 'Uniform')

pn.bayes(x, prior = 'Gamma', 1/100, 1/100)
```

pn.bias *Unbiased estimator for alpha (PN distribution)*

Description

Unbiased estimator for `alpha` of PN distribution

Usage

```
pn.bias(x)
```

Arguments

`x`	the response vector

References

Gupta RD, Gupta RC. (1998). Analyzing skewed data by power normal model. *Test*, **17**, 197–210.

pn.dens *Estimated densities (PN distribution)*

Description

Plot the estimated density or log-density (PN)

Usage

```
pn.dens(x, model, log=FALSE, ylab=NULL, xlab = NULL, main = NULL, ...)
```

Arguments

`x`	the response vector
`model`	a variable returned by `pn.mle`
`log`	Logical, plot log-density if TRUE (default = FALSE)
`ylab`	Title of the ylab, if NULL default is selected
`xlab`	Title of the xlab, if NULL default is selected
`main`	Main Title, if NULL default is selected
`...`	further arguments to *plot*

pn.hist — *Histrogram and estimated densities plots (PN distribution)*

Description

Plot the histogram along with the estimated density (PN)

Usage

```
pn.hist(x, model, breaks, main,..., col.lines, lwd, lty  )
```

Arguments

x	the response vector
model	a variable returned by pn.mle
breaks	the same option in *histogram*
main	the main title (have useful default values)
...	further arguments to *histogram*
col.lines	line color
lwd	line width
lty	line type

pn.IC — *Confidence interval for alpha (PN distribution)*

Description

Confidence interval for the power parameter of PN distribution

Usage

```
pn.IC(x,p)
```

Arguments

x	the response vector
p	confidence level

References

Gupta RD, Gupta RC. (1998). Analyzing skewed data by power normal model. *Test*, **17**, 197–210.

pn.ICred *Credibility interval for alpha (PN distribution)*

Description

Credibility interval for the power parameter of PN distribution

Usage

```
pn.ICred(x, p, prior="Jeffreys", shape_0=NULL, rate_0 = NULL)
```

Arguments

x	the response vector
p	credibility level
prior	the prior distribution of power parameter: "Jeffreys" (default), "Uniform" and "Gamma"
shape_0, rate_0	shape and rate hyperparameters of the gamma distribution.

References

Agamez-Montavo, G. (2017). Modelos de mistura finita usando a classe de distribuicoes alpha potencia. *Thesis (Doctoral)*, University of Sao Paulo.

Examples

```
x <- rpn(100, 25)

pn.ICred(x, 0.95)

pn.ICred(x, 0.95, prior = 'Uniform')

pn.ICred(x, 0.95, prior = 'Gamma', 1/100, 1/100)
```

pn.lines *Plot lines of PN densities*

Description

Add lines of PN estimated denisty or log-density in pn.dens or pn.hist plots.

Usage

```
pn.lines(x, model, log=FALSE, ...)
```

Arguments

x	the response vector
model	a variable returned by pn.mle
log	Logical, plot log-density if TRUE (default = FALSE)
...	further arguments to lines

pn.mle *Fit univariate PN distribution (Classic)*

Description

Return the estimative of power parameter for PN distribution

Usage

```
pn.mle(x)
```

Arguments

x	the response vector

References

Gupta RD, Gupta RC. (1998). Analyzing skewed data by power normal model. *Test*, **17**, 197–210.

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