Package 'twopiece'

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Type Package

Title The family of two piece distributions

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Description Density, distribution function, quantile function and random generation for the 3 and 4 parameter two piece distribution with 3 parameterizations.

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R topics documented:

`dtp3` *The 3-Parameter Two Piece Distribution*

Description

Density, distribution function, quantile function and random generation for the 3-parameter two piece distribution with 3 parameterizations: two-piece (tp), epsilon-skew (eps), and inverse scale factors (isf).

Usage

```
dtp3(x, mu, par1, par2, FUN, param = "tp", log = FALSE)
ptp3(x, mu, par1, par2, FUN, param = "tp", log.p = FALSE)
qtp3(p, mu, par1, par2, FUN, param = "tp")
rtp3(n, mu, par1, par2, FUN, param = "tp")
```

Arguments

x	vector of quantiles.
p	vector of probabilities.
n	number of observations. If `length(n) > 1`, the length is taken to be the number required.
mu	location parameter, μ.
par1	scale parameter 1, σ_1.
par2	scale parameter 2, σ_2.
FUN	a symmetric density `f`.
param	parameterizations used.
log, log.p	logical; if TRUE, probabilities p are given as log(p).

Details

The 3-parameter two piece distribution with parameters μ, σ_1, and σ_2 has the following density:

$$s(x) = \frac{2}{\sigma_1 + \sigma_2} f((x-\mu)/\sigma_1) \quad for \quad x < \mu$$

and

$$s(x) = \frac{2}{\sigma_1 + \sigma_2} f((x-\mu)/\sigma_2) \quad for \quad x \geq \mu$$

where `f(x)` is a symmetric density about zero.

More details

If param is not specified, it assumes the default value of "tp". Information about the "eps" and "isf" parameterizations can be found in the References.

Value

`dtp3` gives the density, `ptp3` gives the distribution function, `qtp3` gives the quantile function and `rtp3` generates random deviates.

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References

Arellano-Valle, R. B Gómez, H. W. and Quintana, F. A. (2005). Statistical inference for general class of asymmetric distributions. *Journal of Statistical Planning and Inference*, **128**: 427-443.

Fernández, C. and Steel, M. F. J. (1998). On Bayesian modeling of fat tails and skewness. *Journal of the American Statistical Asociation*, **93**, 359-371.

Mudholkar, G. S. and Hutson, A. D. (2000). The epsilon-skew-normal distribution for analyzing near-normal data. *Journal of Statistical Planning and Inference*, **83**: 291-309.

Rubio, F. J. and Steel, M. F. J. (2014). Inference in Two-Piece Location-Scale models with Jeffreys Priors, with discussion. *Bayesian Analysis*, **9**: 1-22.

See Also

dnorm for the normal distribution and dt for the Student t distribution.

dtp4 for the 4-parameter two piece distribution.

Examples

```
## 3-parameter two piece normal density with parameterization "tp"
tempf = function(x) dtp3(x,0,3,1,dnorm,param="tp")
curve(tempf,-10,5)

## 3-parameter two piece normal distribution with parameterization "tp"
tempf = function(x) ptp3(x,0,1,3,pnorm,param="tp")
curve(tempf,-10,10)

## random number generation for 3-parameter two piece normal distribution
## with parameterization "tp"
sim <- rtp3(1000,0,1,1,rnorm)
hist(sim,probability=TRUE)

## quantile function for the 3-parameter two piece normal distribution
## with parameterization "tp"
qtp3(0.5, 0, 1, 1, qnorm ,param = "tp")
```

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dtp4 *The 4-Parameter Two Piece Distribution*

Description

Density, distribution function, quantile function and random generation for the 4-parameter two piece distribution with 4 parameterizations: two-piece (tp), epsilon-skew (eps), and inverse scale factors (isf).

Usage

```
dtp4(x, mu, par1, par2, delta, FUN, param = "tp", log = FALSE)
ptp4(x, mu, par1, par2, delta, FUN, param = "tp", log.p = FALSE)
qtp4(p, mu, par1, par2, delta, FUN, param = "tp")
rtp4(n, mu, par1, par2, delta, FUN, param = "tp")
```

Arguments

x	vector of quantiles.
p	vector of probabilities.
n	number of observations. If `length(n) > 1`, the length is taken to be the number required.
mu	location parameter, μ.
par1	scale parameter 1, σ_1.
par2	scale parameter 2, σ_2.
delta	shape parameter, δ.

FUN	a symmetric density f.
param	parameterizations used.
log, log.p	logical; if TRUE, probabilities p are given as log(p).

Details

The 4-parameter two piece distribution with parameters μ, σ_1, σ_2 and δ has the following density:

$$s(x) = \frac{2}{\sigma_1 + \sigma_2} f((x-\mu)/\sigma_1, \delta) \quad for \quad x < \mu$$

and

$$s(x) = \frac{2}{\sigma_1 + \sigma_2} f((x-\mu)/\sigma_2, \delta) \quad for \quad x \geq \mu$$

where f(x,delta) is a symmetric density about zero.

More details

If param is not specified, it assumes the default value of "tp". Information about the "eps" and "isf" parameterizations can be found in the References.

Value

dtp4 gives the density, ptp4 gives the distribution function, qtp4 gives the quantile function and rtp4 generates random deviates.

Author(s)

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References

Arellano-Valle, R. B Gómez, H. W. and Quintana, F. A. (2005). Statistical inference for general class of asymmetric distributions. *Journal of Statistical Planning and Inference*, **128**: 427-443.

Fernández, C. and Steel, M. F. J. (1998). On Bayesian modeling of fat tails and skewness. *Journal of the American Statistical Asociation*, **93**, 359-371.

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Rubio, F. J. and Steel, M. F. J. (2014). Inference in Two-Piece Location-Scale models with Jeffreys Priors, with discussion. *Bayesian Analysis*, **9**: 1-22.

See Also

dnorm for the normal distribution and dt for the Student t distribution.

dtp3 for the 3-parameter two piece distribution.

Examples

```
## 4-parameter two piece Student-t density with parameterization tp
tempf = function(x) dtp4(x,0,3,1,4,dt,param="tp")
curve(tempf,-10,5)

## 4-parameter two piece Student-t distribution with parameterization tp
```

```
tempf = function(x) ptp4(x,0,3,1,4,pt,param="tp")
curve(tempf,-10,5)

## random number generation for 4-parameter two piece Student-t distribution
## with parameterization tp
sim <- rtp4(1000,0,1,1,10,rt)
hist(sim, probability=TRUE, xlim=c(-10,10),ylim=c(0,dt(0,4)))

## quantile function for the 4-parameter two piece Student-t distribution
## with parameterization tp
qtp4(0.5, 0, 1, 1, 4, qt ,param = "tp")
```

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