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 FAdist-package

Distributions that are sometimes used in hydrology

Description

This package contains several distributions that are sometimes useful in hydrology

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 GAMMA3

Three-Parameter Gamma Distribution (also known as Pearson type III distribution)

Description

Density, distribution function, quantile function and random generation for the 3-parameter gamma distribution with shape, scale, and threshold (or shift) parameters equal to shape, scale, and thres, respectively.

Usage

```

dgamma3(x, shape=1, scale=1, thres=0, log=FALSE)
pgamma3(q, shape=1, scale=1, thres=0, lower.tail=TRUE, log.p=FALSE)
qgamma3(p, shape=1, scale=1, thres=0, lower.tail=TRUE, log.p=FALSE)
rgamma3(n, shape=1, scale=1, thres=0)

```

Arguments

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

Details

If Y is a random variable distributed according to a gamma distribution (with shape and scale parameters), then $X = Y+m$ has a 3-parameter gamma distribution with the same shape and scale parameters, and with threshold (or shift) parameter m .

Value

`dgamma3` gives the density, `pgamma3` gives the distribution function, `qgamma3` gives the quantile function, and `rgamma3` generates random deviates.

References

BOBEE, B. and F. ASHKAR (1991). The Gamma Family and Derived Distributions Applied in Hydrology. Water Resources Publications, Littleton, Colo., 217 p.

See Also

[dgamma](#), [pgamma](#), [qgamma](#), [rgamma](#)

Examples

```
thres <- 10
x <- rgamma3(n=10, shape=2, scale=11, thres=thres)
dgamma3(x, 2, 11, thres)
dgamma(x-thres, 2, 1/11)
```

GenPARETO

Generalized Pareto Distribution

Description

Density, distribution function, quantile function and random generation for the generalized Pareto distribution with shape and scale parameters equal to shape and scale, respectively.

Usage

```
dgp(x, shape=1, scale=1, log=FALSE)
pgp(q, shape=1, scale=1, lower.tail=TRUE, log.p=FALSE)
qgp(p, shape=1, scale=1, lower.tail=TRUE, log.p=FALSE)
rgp(n, shape=1, scale=1)
```

Arguments

<code>x, q</code>	vector of quantiles.
<code>p</code>	vector of probabilities.
<code>n</code>	number of observations.
<code>shape</code>	shape parameter.

scale	scale parameter.
log, log.p	logical; if TRUE, probabilities p are given as log(p).
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$.

Details

If X is a random variable distributed according to a generalized Pareto distribution, it has density $f(x) = 1/\text{scale} * (1 - \text{shape} * x / \text{scale})^{(1 - \text{shape}) / \text{shape}}$

Value

dgp gives the density, pgp gives the distribution function, qgp gives the quantile function, and rgp generates random deviates.

References

Coles, S. (2001) An introduction to statistical modeling of extreme values. Springer

Examples

```
x <- rgp(1000, -.2, 10)
hist(x, freq=FALSE, col='gray', border='white')
curve(dgp(x, -.2, 10), add=TRUE, col='red4', lwd=2)
```

GEV

Generalized Extreme Value Distribution (for maxima)

Description

Density, distribution function, quantile function and random generation for the generalized extreme value distribution (for maxima) with shape, scale, and location parameters equal to shape, scale, and location, respectively.

Usage

```
dgev(x, shape=1, scale=1, location=0, log=FALSE)
pgev(q, shape=1, scale=1, location=0, lower.tail=TRUE, log.p=FALSE)
qgev(p, shape=1, scale=1, location=0, lower.tail=TRUE, log.p=FALSE)
rgev(n, shape=1, scale=1, location=0)
```

Arguments

x, q	vector of quantiles.
p	vector of probabilities.
n	number of observations.
shape	shape parameter.

scale	scale parameter.
location	location parameter.
log, log.p	logical; if TRUE, probabilities p are given as log(p).
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$.

Details

If X is a random variable distributed according to a generalized extreme value distribution, it has density

$$f(x) = 1/\text{scale} * (1 + \text{shape} * ((x - \text{location})/\text{scale}))^{-1/\text{shape} - 1} * \exp(- (1 + \text{shape} * ((x - \text{location})/\text{scale}))^{-1/\text{shape}})$$

Value

dgev gives the density, pgev gives the distribution function, qgev gives the quantile function, and rgev generates random deviates.

References

Coles, S. (2001) An introduction to statistical modeling of extreme values. Springer

Examples

```
x <- rgev(1000, -.1, 3, 100)
hist(x, freq=FALSE, col='gray', border='white')
curve(dgev(x, -.1, 3, 100), add=TRUE, col='red4', lwd=2)
```

GUMBEL

Gumbel Distribution (for maxima)

Description

Density, distribution function, quantile function and random generation for the Gumbel distribution (for maxima) with scale and location parameters equal to scale and location, respectively.

Usage

```
dgumbel(x, scale=1, location=0, log=FALSE)
pgumbel(q, scale=1, location=0, lower.tail=TRUE, log.p=FALSE)
qgumbel(p, scale=1, location=0, lower.tail=TRUE, log.p=FALSE)
rgumbel(n, scale=1, location=0)
```

Arguments

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

Details

If X is a random variable distributed according to a Gumbel distribution, it has density $f(x) = 1/\text{scale} * \exp(-(x-\text{location})/\text{scale} - \exp(-(x-\text{location})/\text{scale}))$

Value

`dgumbel` gives the density, `pgumbel` gives the distribution function, `qgumbel` gives the quantile function, and `rgumbel` generates random deviates.

References

Coles, S. (2001) An introduction to statistical modeling of extreme values. Springer

Examples

```
x <- rgumbel(1000,3,100)
hist(x,freq=FALSE,col='gray',border='white')
curve(dgumbel(x,3,100),add=TRUE,col='red4',lwd=2)
```

KAPPA

Kappa Distribution

Description

Density, distribution function, quantile function and random generation for the kappa distribution with shape and scale parameters equal to shape and scale, respectively.

Usage

```
dkappa(x, shape=1, scale=1, log=FALSE)
pkappa(q, shape=1, scale=1, lower.tail=TRUE, log.p=FALSE)
qkappa(p, shape=1, scale=1, lower.tail=TRUE, log.p=FALSE)
rkappa(n, shape=1, scale=1)
```

Arguments

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

Details

If X is a random variable distributed according to a kappa distribution, it has density

$$f(x) = \text{shape}/\text{scale} * (\text{shape} + (x/\text{scale})^{\text{shape}})^{-(\text{shape}+1)/\text{shape}}$$
Value

`dkappa` gives the density, `pkappa` gives the distribution function, `qkappa` gives the quantile function, and `rkappa` generates random deviates.

Examples

```
x <- rkappa(1000, 12, 10)
hist(x, freq=FALSE, col='gray', border='white')
curve(dkappa(x, 12, 10), add=TRUE, col='red4', lwd=2)
```

KAPPA4

Four-Parameter Kappa Distribution

Description

Density, distribution function, quantile function and random generation for the four-parameter kappa distribution with `shape1`, `shape2`, `scale`, and `location` parameters equal to `shape1`, `shape2`, `scale`, and `location`, respectively.

Usage

```
dkappa4(x, shape1, shape2, scale=1, location=0, log=FALSE)
pkappa4(q, shape1, shape2, scale=1, location=0, lower.tail=TRUE, log.p=FALSE)
qkappa4(p, shape1, shape2, scale=1, location=0, lower.tail=TRUE, log.p=FALSE)
rkappa4(n, shape1, shape2, scale=1, location=0)
```

Arguments

<code>x, q</code>	vector of quantiles.
<code>p</code>	vector of probabilities.
<code>n</code>	number of observations.
<code>shape1</code>	shape parameter.
<code>shape2</code>	shape parameter.
<code>scale</code>	scale parameter.
<code>location</code>	location parameter.
<code>log, log.p</code>	logical; if TRUE, probabilities <code>p</code> are given as $\log(p)$.
<code>lower.tail</code>	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$.

Details

See References

Value

`dkappa4` gives the density, `pkappa4` gives the distribution function, `qkappa4` gives the quantile function, and `rkappa4` generates random deviates.

References

Hosking, J.R.M. (1994). The four-parameter kappa distribution. IBM Journal of Research and Development, 38(3), 251-258.

Examples

```
x <- rkappa4(1000, .1, .2, 12, 110)
hist(x, freq=FALSE, col='gray', border='white')
curve(dkappa4(x, .1, .2, 12, 110), add=TRUE, col='red4', lwd=2)
```

 LGAMMA3

Log-Pearson Type III Distribution

Description

Density, distribution function, quantile function and random generation for the log-Pearson type III distribution with `shape1`, `shape2`, and `scale` parameters equal to `shape`, `scale`, and `thres`, respectively.

Usage

```
dlgamma3(x, shape=1, scale=1, thres=1, log=FALSE)
plgamma3(q, shape=1, scale=1, thres=1, lower.tail=TRUE, log.p=FALSE)
qlgamma3(p, shape=1, scale=1, thres=1, lower.tail=TRUE, log.p=FALSE)
rlgamma3(n, shape=1, scale=1, thres=1)
```

Arguments

<code>x, q</code>	vector of quantiles.
<code>p</code>	vector of probabilities.
<code>n</code>	number of observations.
<code>shape</code>	shape1 parameter.
<code>scale</code>	shape2 parameter.
<code>thres</code>	scale parameter.
<code>log, log.p</code>	logical; if TRUE, probabilities p are given as log(p).
<code>lower.tail</code>	logical; if TRUE (default), probabilities are $P[X \leq x]$; otherwise, $P[X > x]$.

Details

If Y is a random variable distributed according to a gamma distribution (with shape and scale parameters), then $X = \exp(Y+m)$ has a log-Pearson type III distribution with shape1 and shape2 parameters corresponding to the shape and $1/\text{scale}$ parameters of Y , and with scale parameter m .

Value

`dlgamma3` gives the density, `plgamma3` gives the distribution function, `qlgamma3` gives the quantile function, and `rlgamma3` generates random deviates.

References

BOBEE, B. and F. ASHKAR (1991). The Gamma Family and Derived Distributions Applied in Hydrology. Water Resources Publications, Littleton, Colo., 217 p.

See Also

[dgamma](#), [pgamma](#), [qgamma](#), [rgamma](#), [dgamma3](#), [pgamma3](#), [qgamma3](#), [rgamma3](#)

Examples

```
thres <- 10
x <- rlgamma3(n=10, shape=2, scale=11, thres=thres)
dlgamma3(x, 2, 11, thres)
dgamma3(log(x), 2, 1/11, thres)/x
dgamma(log(x)-thres, 2, 11)/x
```

LLOGIS

*Log-Logistic Distribution***Description**

Density, distribution function, quantile function and random generation for the log-logistic distribution with shape and scale parameters equal to shape and scale, respectively.

Usage

```
dllog(x, shape=1, scale=1, log=FALSE)
pllog(q, shape=1, scale=1, lower.tail=TRUE, log.p=FALSE)
qllog(p, shape=1, scale=1, lower.tail=TRUE, log.p=FALSE)
rllog(n, shape=1, scale=1)
```

Arguments

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

Details

If Y is a random variable distributed according to a logistic distribution (with location and scale parameters), then $X = \exp(Y)$ has a log-logistic distribution with shape and scale parameters corresponding to the scale and location parameters of Y , respectively.

Value

dllog gives the density, pllog gives the distribution function, qllog gives the quantile function, and rllog generates random deviates.

See Also

[dlogis](#), [plogis](#), [qlogis](#), [rlogis](#)

Examples

```
x <- rllog(10, 1, 0)
dllog(x, 1, 0)
dlogis(log(x), 0, 1)/x
```

LLOGIS3

*Three-Parameter Log-Logistic Distribution***Description**

Density, distribution function, quantile function and random generation for the 3-parameter log-logistic distribution with shape, scale, and threshold (or shift) parameters equal to shape, scale, and thres, respectively.

Usage

```
dllog3(x, shape=1, scale=1, thres=0, log=FALSE)
pllog3(q, shape=1, scale=1, thres=0, lower.tail=TRUE, log.p=FALSE)
qllog3(p, shape=1, scale=1, thres=0, lower.tail=TRUE, log.p=FALSE)
rllog3(n, shape=1, scale=1, thres=0)
```

Arguments

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

Details

If Y is a random variable distributed according to a logistic distribution (with location and scale parameters), then $X = \exp(Y) + m$ has a 3-parameter log-logistic distribution with shape and scale parameters corresponding to the scale and location parameters of Y , respectively; and threshold parameter m .

Value

dllog3 gives the density, pllog3 gives the distribution function, qllog3 gives the quantile function, and rllog3 generates random deviates.

See Also

[dlogis](#), [plogis](#), [qlogis](#), [rlogis](#), [dllog](#), [pllog](#), [qllog](#), [rllog](#)

Examples

```

m <- 100
x <- rlllog3(10,1,0,m)
dllog3(x,1,0,m)
dllog(x-m,1,0)
dlogis(log(x-m),0,1)/(x-m)

```

LNORM3

*Three-Parameter Lognormal Distribution***Description**

Density, distribution function, quantile function and random generation for the 3-parameter lognormal distribution with shape, scale, and threshold (or shift) parameters equal to shape, scale, and thres, respectively.

Usage

```

dlnorm3(x, shape=1, scale=1, thres=0, log=FALSE)
plnorm3(q, shape=1, scale=1, thres=0, lower.tail=TRUE, log.p=FALSE)
qlnorm3(p, shape=1, scale=1, thres=0, lower.tail=TRUE, log.p=FALSE)
rlnorm3(n, shape=1, scale=1, thres=0)

```

Arguments

<code>x, q</code>	vector of quantiles.
<code>p</code>	vector of probabilities.
<code>n</code>	number of observations.
<code>shape</code>	shape parameter.
<code>scale</code>	scale parameter.
<code>thres</code>	threshold (or shift) parameter.
<code>log, log.p</code>	logical; if TRUE, probabilities <code>p</code> are given as $\log(p)$.
<code>lower.tail</code>	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$.

Details

If Y is a random variable distributed according to a normal distribution (with location(mean) and scale(standard deviation) parameters), then $X = \exp(Y)+m$ has a 3-parameter lognormal distribution with shape and scale parameters corresponding to the scale and location parameteres of Y , respectively; and threshold parameter m .

Value

`dlnorm3` gives the density, `plnorm3` gives the distribution function, `qlnorm3` gives the quantile function, and `rlnorm3` generates random deviates.

See Also

[dnorm](#), [pnorm](#), [qnorm](#), [rnorm](#), [dlnorm](#), [plnorm](#), [qlnorm](#), [rlnorm](#)

Examples

```
m <- 100
x <- rlnorm3(10, 1, 0, m)
dlnorm3(x, 1, 0, m)
dlnorm(x-m, 0, 1)
dnorm(log(x-m), 0, 1)/(x-m)
```

WEIBULL3

*Three-Parameter Weibull Distribution***Description**

Density, distribution function, quantile function and random generation for the 3-parameter Weibull distribution with shape, scale, and threshold (or shift) parameters equal to shape, scale, and thres, respectively.

Usage

```
dweibull3(x, shape, scale=1, thres=0, log=FALSE)
pweibull3(q, shape, scale=1, thres=0, lower.tail=TRUE, log.p=FALSE)
qweibull3(p, shape, scale=1, thres=0, lower.tail=TRUE, log.p=FALSE)
rweibull3(n, shape, scale=1, thres=0)
```

Arguments

<code>x, q</code>	vector of quantiles.
<code>p</code>	vector of probabilities.
<code>n</code>	number of observations.
<code>shape</code>	shape parameter.
<code>scale</code>	scale parameter.
<code>thres</code>	threshold (or shift) parameter.
<code>log, log.p</code>	logical; if TRUE, probabilities p are given as log(p).
<code>lower.tail</code>	logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$.

Details

If Y is a random variable distributed according to a Weibull distribution (with shape and scale parameters), then $X = Y+m$ has a 3-parameter Weibull distribution with shape and scale parameters corresponding to the shape and scale parameters of Y , respectively; and threshold parameter m .

Value

dweibull3 gives the density, pweibull3 gives the distribution function, qweibull3 gives the quantile function, and rweibull3 generates random deviates.

See Also

[dweibull](#), [pweibull](#), [qweibull](#), [rweibull](#)

Examples

```
m <- 100
x <- rweibull3(10,3,1,m)
dweibull3(x,3,1,m)
dweibull(x-m,3,1)
```

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