Package 'ERPeq'

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Type Package

Title Probabilistic Hazard Assessment

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Description Computes the probability density and cumulative distribution functions of fourteen distributions used for the probabilistic hazard assessment. Estimates the model parameters of the distributions using the maximum likelihood and reports the goodness-of-fit statistics. The recurrence interval estimations of earthquakes are computed for each distribution.

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Imports VGAM, invgamma, pracma, rmutil, methods, graphics

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LazyData true

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R topics documented:

`cdfbsgdp` *Cumulative distribution function of the Birnbaum-Saunders-Generalized Pareto distribution*

Description

Cumulative distribution function of the Birnbaum-Saunders-Generalized Pareto distribution

Usage

```
cdfbsgdp(par, x)
```

Arguments

`par`	parameter vector of the Birnbaum-Saunders-Generalized Pareto distribution. First parameter is the shape, second parameter is the scale parameter. Third parameter is the lower bound parameter.
`x`	vector of observations or single value

Value

return the value of the cdf of the Birnbaum-Saunders-Generalized Pareto distribution

References

Altun, E., Ozel, G. A novel approach to probabilistic hazard assessment: BSGPD model. (Under Review)

Examples

```
cdfbsgdp(c(0.5,2,0.5),3)
```

`cdfeexp` *Cumulative distribution function of the exponentiated exponential distribution*

Description

Cumulative distribution function of the exponentiated exponential distribution

Usage

```
cdfeexp(par, x)
```

Arguments

`par`	parameter vector of the exponentiated exponential distribution. First parameter is the shape, second is the scale parameter.
`x`	vector of observations or single value

Value

return the value of the pdf of the exponentiated exponential distribution

References

Gupta, R. D., & Kundu, D. (1999). Theory & methods: Generalized exponential distributions. Australian & New Zealand Journal of Statistics, 41(2), 173-188.

Examples

```
cdfeexp(c(0.5,0.3),2)
```

`cdfer` *Cumulative distribution function of the exponentiated Rayleigh distribution*

Description

Cumulative distribution function of the exponentiated Rayleigh distribution

Usage

```
cdfer(par, x)
```

Arguments

`par`	parameter vector of the exponentiated Rayleigh distribution. First parameter is the scale, second is the shape parameter.
`x`	vector of observations or single value

Value

return the value of the pdf of the exponentiated Rayleigh distribution

References

Vodă, V. G. (1976). Inferential procedures on a generalized Rayleigh variate. I. Aplikace matematiky, 21(6), 395-412.

Examples

```
cdfer(c(0.5,0.3),2)
```

`cdfew` *Cumulative distribution function of the exponentiated Weibull distribution*

Description

Cumulative distribution function of the exponentiated Weibull distribution

Usage

```
cdfew(par, x)
```

Arguments

`par`	parameter vector of the exponentiated Weibull distribution. First parameter is the shape, second is the scale parameter and third parameter is shape parameter.
`x`	vector of observations or single value

Value

return the value of the pdf of the exponentiated Weibull distribution

References

Mudholkar, G. S., & Srivastava, D. K. (1993). Exponentiated Weibull family for analyzing bathtub failure-rate data. IEEE transactions on reliability, 42(2), 299-302.

Examples

```
cdfew(c(0.5,0.3,0.6),2)
```

`cdfgamma` *Cumulative distribution function of the Gamma distribution*

Description

Cumulative distribution function of the Gamma distribution

Usage

```
cdfgamma(par, x)
```

Arguments

`par`	parameter vector of the gamma distribution. First parameter is the shape and second is the scale parameter
`x`	vector of quantiles

Value

return the value of the cdf of the gamma distribution

References

Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) Continuous Univariate Distributions, volume 1, chapter 21. Wiley, New York.

Examples

```
cdfgamma(c(2,3),5)
```

`cdfggamma` *Cumulative distribution function of the generalized gamma distribution*

Description

Cumulative distribution function of the generalized gamma distribution

Usage

```
cdfggamma(par, x)
```

Arguments

`par`	parameter vector of the generalized gamma distribution. First parameter is the dispersion, second is the location parameter and third is the family parameter.
`x`	vector of observations or single value

Value

return the value of the pdf of the generalized gamma distribution

References

Stacy, E. W. (1962). A generalization of the gamma distribution. The Annals of mathematical statistics, 1187-1192.

Examples

```
pdfggamma(c(2,5,3),3)
```

`cdfgumbel` *Cumulative distribution function of the gumbel distribution*

Description

Cumulative distribution function of the gumbel distribution

Usage

```
cdfgumbel(par, x)
```

Arguments

`par`	parameter vector of the gumbel distribution. First parameter is the location, second is the scale parameter.
`x`	vector of observations or single value

Value

return the value of the pdf of the gumbel distribution

References

Gumbel, E. J. (1941). The return period of flood flows. The annals of mathematical statistics, 12(2), 163-190.

Examples

```
pdfgumbel(c(0.5,0.3),2)
```

`cdfinvgamma` *Cumulative distribution function of the inverse gamma distribution*

Description

Cumulative distribution function of the inverse gamma distribution

Usage

```
cdfinvgamma(par, x)
```

Arguments

`par`	parameter vector of the inverse gamma distribution. First parameter is the shape, second is the rate parameter.
`x`	vector of observations or single value

Value

return the value of the pdf of the inverse gamma distribution

References

Cook, J. D. (2008). Inverse gamma distribution. online: http://www. johndcook. com/inverse gamma. pdf, Tech. Rep.

Examples

```
cdfinvgamma(c(2,5,3),3)
```

`cdfiwweibull` *Cumulative distribution function of the inverse Weibull distribution*

Description

Cumulative distribution function of the inverse Weibull distribution

Usage

```
cdfiwweibull(par, x)
```

Arguments

`par`	parameter vector of the inverse Weibull distribution. First parameter is the shape and second is the scale parameter
`x`	vector of quantiles

Value

return the value of the cdf of the inverse Weibull distribution

References

Mudholkar, G. S., & Kollia, G. D. (1994). Generalized Weibull family: a structural analysis. Communications in statistics-theory and methods, 23(4), 1149-1171.

Examples

```
cdfiwweibull(c(2,3),5)
```

`cdflevy` *Cumulative distribution function of the Levy distribution*

Description

Cumulative distribution function of the Levy distribution

Usage

```
cdflevy(par, x)
```

Arguments

`par`	parameter vector of the Levy distribution. First parameter is the location, second is the scale parameter.
`x`	vector of observations or single value

Value

return the value of the pdf of the Levy distribution

References

Nolan, J. P. (2003). Modeling financial data with stable distributions. In Handbook of heavy tailed distributions in finance (pp. 105-130). North-Holland.

Examples

```
cdflevy(c(0.5,0.3),2)
```

cdflnormal — *Cumulative distribution function of the log-normal distribution*

Description

Cumulative distribution function of the log-normal distribution

Usage

```
cdflnormal(par, x)
```

Arguments

`par`	parameter vector of the log-normal distribution. First parameter is the shape and second is the scale parameter
`x`	vector of quantiles

Value

return the value of the cdf of the log-normal distribution

References

Heyde, C. C. (1963). On a property of the lognormal distribution. Journal of the Royal Statistical Society: Series B (Methodological), 25(2), 392-393.

Examples

```
cdflnormal(c(2,3),5)
```

cdfpareto — *Cumulative distribution function of the Pareto distribution*

Description

Cumulative distribution function of the Pareto distribution

Usage

```
cdfpareto(par, x)
```

Arguments

`par`	parameter vector of the Pareto distribution. First parameter is the shape and second is the scale parameter
`x`	vector of quantiles

Value

return the value of the cdf of the Pareto distribution

References

Arnold, B. C. (1983). Pareto Distributions, International Cooperative Publishing House.

Examples

```
cdfpareto(c(2,5),2)
```

`cdfrayleigh` *Cumulative distribution function of the Rayleigh distribution*

Description

Cumulative distribution function of the Rayleigh distribution

Usage

```
cdfrayleigh(par, x)
```

Arguments

`par`	scale parameter vector of the Rayleigh distribution.
`x`	vector of quantiles

Value

return the value of the cdf of the Rayleigh distribution

References

Siddiqui, M. M. (1964). Statistical inference for Rayleigh distributions. Journal of Research of the National Bureau of Standards, Sec. D, 68(9), 1005-1010.

Examples

```
cdfrayleigh(c(2),5)
```

`cdfweibull` *Cumulative distribution function of the Weibull distribution*

Description

Cumulative distribution function of the Weibull distribution

Usage

```
cdfweibull(par, x)
```

Arguments

`par`	parameter vector of the Weibull distribution. First parameter is the shape and second is the scale parameter
`x`	vector of quantiles

Value

return the value of the cdf of the weibull distribution

References

Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) Continuous Univariate Distributions, volume 1, chapter 21. Wiley, New York.

Examples

```
cdfweibull(c(2,3),5)
```

`data_earthquake_6.5_7` *Earthquake dataset*

Description

The elapsed time (year) between the earthquakes with 6.5 and 7 magnitudes in Turkey occured between the years of 1990-2021

Usage

```
data_earthquake_6.5_7
```

Format

A numeric vector

`data_earthquake_6_6.5` *Earthquake dataset*

Description

The elapsed time (year) between the earthquakes with 6 and 6.5 magnitudes in Turkey occured between the years of 1990-2021

Usage

```
data_earthquake_6_6.5
```

Format

A numeric vector

`data_earthquake_7` *Earthquake dataset*

Description

The elapsed time (year) between the earthquakes having the magnitudes higher than 7 in Turkey occured between the years of 1990-2021

Usage

```
data_earthquake_7
```

Format

A numeric vector

`expexpcp` *Probabilistic estimation of earthquake recurrence interval using exponentiated exponential distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
expexpcp(fit, r, te)
```

Arguments

`fit`	Fit is the fitexpexp object. See ?fitexpexp for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitexpexp(c(1,1),data=data_earthquake_7)
expexpcp(fit,r=2,te=5)
```

---

expraycp — *Probabilistic estimation of earthquake recurrence interval using exponentiated Rayleigh distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
expraycp(fit, r, te)
```

Arguments

`fit`	Fit is the fitexprayleigh object. See ?fitexprayleigh for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitexprayleigh(c(0.5,0.5),data=data_earthquake_7)
expraycp(fit,r=2,te=5)
```

`expweicp` *Probabilistic estimation of earthquake recurrence interval using exponentiated Weibull distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
expweicp(fit, r, te)
```

Arguments

`fit`	Fit is the fitexpweibull object. See ?fitexpweibull for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitexpweibull(c(1,1,1),data=data_earthquake_7)
expweicp(fit,r=2,te=5)
```

fitbsgpd — *Fitting the Birnbaum-Saunders-Generalized Pareto distribution*

Description

Fitting the Birnbaum-Saunders-Generalized Pareto distribution

Usage

```
fitbsgpd(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
library(VGAM)
data=ERPeq::rbsgpd(500,5,0.7,0.2)
fitbsgpd(starts =c(1,1),data=data)
```

fitexpexp — *Fitting the exponentiated exponential distribution*

Description

Fitting the exponentiated exponential distribution

Usage

```
fitexpexp(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
data=rexpexp(500,2,3)
fitexpexp(starts =c(2,2),data=data)
```

---

fitexprayleigh — *Fitting the exponentiated exponentiated Rayleigh distribution*

Description

Fitting the exponentiated exponentiated Rayleigh distribution

Usage

```
fitexprayleigh(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
data=rexprayleigh(500,2,3)
fitexprayleigh(starts =c(2,2),data=data)
```

---

fitexpweibull — *Fitting the exponentiated Weibull distribution*

Description

Fitting the exponentiated Weibull distribution

Usage

```
fitexpweibull(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
data=rexpweibull(500,2,3,5)
fitexpweibull(starts =c(2,2,2),data=data)
```

`fitgamma` *Fitting the gamma distribution*

Description

Fitting the gamma distribution

Usage

```
fitgamma(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
datagamma=rgamma(500,2,2)
fitgamma(starts =c(2,2),data=datagamma)
```

`fitggamma` *Fitting the generalized gamma distribution*

Description

Fitting the generalized gamma distribution

Usage

```
fitggamma(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
library(rmutil)
data=rggamma(500,2,2,2)
fitggamma(starts =c(1,1,1),data=data)
```

`fitgumbel` *Fitting the Gumbel distribution*

Description

Fitting the Gumbel distribution

Usage

```
fitgumbel(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
library(VGAM)
data=rgumbel(500,2,0.5)
fitgumbel(starts =c(2,2),data=data)
```

fitinvgamma — *Fitting the inverse gamma distribution*

Description

Fitting the inverse gamma distribution

Usage

```
fitinvgamma(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
library(invgamma)
data=rinvgamma(500,2,0.5)
fitinvgamma(starts =c(2,2),data=data)
```

fitiweibull — *Fitting the gamma distribution*

Description

Fitting the gamma distribution

Usage

```
fitiweibull(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
set.seed(7)
data=rgamma(500,shape=1,scale=1)
fitiweibull(starts =c(0.5,0.5),data=data)
```

---

fitlevy — *Fitting the Levy distribution*

Description

Fitting the Levy distribution

Usage

```
fitlevy(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
library(VGAM)
data=ERPeq::rlevy(100,2,0.1)
fitlevy(starts =c(0.1),data=data)
```

---

fitlnormal — *Fitting the log-normal distribution*

Description

Fitting the log-normal distribution

Usage

```
fitlnormal(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
data=rlnorm(500,2,0.5)
fitlnormal(starts =c(2,2),data=data)
```

`fitpareto` *Fitting the Pareto distribution*

Description

Fitting the Pareto distribution

Usage

```
fitpareto(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
library(VGAM)
data=VGAM::rpareto(500,5,2)
fitpareto(starts =c(2),data=data)
```

`fitrayleigh` *Fitting the Rayleigh distribution*

Description

Fitting the Rayleigh distribution

Usage

```
fitrayleigh(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
library(VGAM)
data=rrayleigh(500,2)
fitrayleigh(starts =c(2),data=data)
```

`fitweibull` *Fitting the Weibull distribution*

Description

Fitting the Weibull distribution

Usage

```
fitweibull(starts, data)
```

Arguments

`starts`	A vector defining the starting values for the Nelder-Mead algorithm.
`data`	A vector containing the observations

Value

List the estimated parameters of the distribution with standard errors and goodness-of-fit statistics.

Examples

```
dataweibull=rweibull(500,2,2)
fitweibull(starts =c(2,2),data=dataweibull)
```

gammacp	*Probabilistic estimation of earthquake recurrence interval using gamma distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
gammacp(fit, r, te)
```

Arguments

`fit`	Fit is the fitgamma object. See ?fitgamma for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitgamma(c(1,1),data=data_earthquake_6_6.5)
gammacp(fit,r=2,te=5)
```

ggammacp	*Probabilistic estimation of earthquake recurrence interval using generalized gamma distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
ggammacp(fit, r, te)
```

Arguments

`fit`	Fit is the fitggamma object. See ?fitggamma for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitggamma(c(1,1,1),data=data_earthquake_6_6.5)
ggammacp(fit,r=2,te=5)
```

`gumbelcp` *Probabilistic estimation of earthquake recurrence interval using Gumbel distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
gumbelcp(fit, r, te)
```

Arguments

`fit`	Fit is the fitgumbel object. See ?fitgumbel for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitgumbel(c(1,1),data=data_earthquake_7)
gumbelcp(fit,r=2,te=5)
```

---

invgammacp — *Probabilistic estimation of earthquake recurrence interval using inverse gamma distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
invgammacp(fit, r, te)
```

Arguments

`fit`	Fit is the fitinvgamma object. See ?fitinvgamma for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitinvgamma(c(1,1),data=data_earthquake_7)
invgammacp(fit,r=2,te=5)
```

`iweibullcp` *Probabilistic estimation of earthquake recurrence interval using inverse Weibull distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
iweibullcp(fit, r, te)
```

Arguments

`fit`	Fit is the fitiwebull object. See ?fitiwebull for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitiweibull(c(1,1),data=data_earthquake_6.5_7)
iweibullcp(fit,r=2,te=5)
```

`levycp` *Probabilistic estimation of earthquake recurrence interval using Levy distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
levycp(fit, r, te)
```

Arguments

`fit`	Fit is the fitlevy object. See ?fitlevy for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitlevy(c(1),data=data_earthquake_7)
levycp(fit,r=2,te=5)
```

`lnormalcp` *Probabilistic estimation of earthquake recurrence interval using log-normal distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
lnormalcp(fit, r, te)
```

Arguments

`fit`	Fit is the fitlnormal object. See ?fitlnormal for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitlnormal(c(1,1),data=data_earthquake_6.5_7)
lnormalcp(fit,r=2,te=5)
```

`paretocp` *Probabilistic estimation of earthquake recurrence interval using Pareto distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
paretocp(fit, r, te)
```

Arguments

`fit`	Fit is the fitpareto object. See ?fitpareto for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
library(VGAM)
data=VGAM::rpareto(200,2,5)
fit=fitpareto(c(0.5),data=data)
paretocp(fit,r=2,te=5)
```

pdfbsgdp *Probability density function of the Birnbaum-Saunders-Generalized Pareto distribution*

Description

Probability density function of the Birnbaum-Saunders-Generalized Pareto distribution

Usage

```
pdfbsgdp(par, x)
```

Arguments

par	parameter vector of the Birnbaum-Saunders-Generalized Pareto distribution. First parameter is the shape, second parameter is the scale parameter. Third parameter is the lower bound parameter.
x	vector of observations or single value

Value

return the value of the pdf of the Birnbaum-Saunders-Generalized Pareto distribution.

References

Altun, E., Ozel, G. A novel approach to probabilistic hazard assessment: BSGPD model. (Under Review)

Examples

```
pdfbsgdp(c(2,0.5,0.5),1)
```

pdfeexp *Probability density function of the exponentiated exponential distribution*

Description

Probability density function of the exponentiated exponential distribution

Usage

```
pdfeexp(par, x)
```

Arguments

`par`	parameter vector of the exponentiated exponential distribution. First parameter is the shape, second is the scale parameter.
`x`	vector of observations or single value

Value

return the value of the pdf of the exponentiated exponential distribution

References

Gupta, R. D., & Kundu, D. (1999). Theory & methods: Generalized exponential distributions. Australian & New Zealand Journal of Statistics, 41(2), 173-188. Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) Continuous Univariate Distributions, volume 1, chapter 21. Wiley, New York.

Examples

```
pdfeexp(c(0.5,0.3),2)
```

`pdfer` *Probability density function of the exponentiated Rayleigh distribution*

Description

Probability density function of the exponentiated Rayleigh distribution

Usage

```
pdfer(par, x)
```

Arguments

`par`	parameter vector of the exponentiated Rayleigh distribution. First parameter is the scale, second is the shape parameter.
`x`	vector of observations or single value

Value

return the value of the pdf of the exponentiated Rayleigh distribution

References

Vodă, V. G. (1976). Inferential procedures on a generalized Rayleigh variate. I. Aplikace matematiky, 21(6), 395-412.

Examples

```
pdfer(c(0.5,0.3),2)
```

`pdfew` *Probability density function of the exponentiated Weibull distribution*

Description

Probability density function of the exponentiated Weibull distribution

Usage

```
pdfew(par, x)
```

Arguments

`par`	parameter vector of the exponentiated Weibull distribution. First parameter is the shape, second is the scale parameter and third parameter is shape parameter.
`x`	vector of observations or single value

Value

return the value of the pdf of the exponentiated Weibull distribution

References

Mudholkar, G. S., & Srivastava, D. K. (1993). Exponentiated Weibull family for analyzing bathtub failure-rate data. IEEE transactions on reliability, 42(2), 299-302.

Examples

```
pdfew(c(0.5,0.3,0.6),2)
```

`pdfgamma` *Probability density function of the Gamma distribution*

Description

Probability density function of the Gamma distribution

Usage

```
pdfgamma(par, x)
```

Arguments

`par`	parameter vector of the gamma distribution. First parameter is the shape and second is the scale parameter
`x`	vector of observations or single value

Value

return the value of the pdf of the gamma distribution

References

Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) Continuous Univariate Distributions, volume 1, chapter 21. Wiley, New York.

Examples

```
pdfgamma(c(2,3),5)
```

`pdfggamma` *Probability density function of the generalized gamma distribution*

Description

Probability density function of the generalized gamma distribution

Usage

```
pdfggamma(par, x)
```

Arguments

`par`	parameter vector of the generalized gamma distribution. First parameter is the dispersion, second is the location parameter and third is the family parameter.
`x`	vector of observations or single value

Value

return the value of the pdf of the generalized gamma distribution

References

Stacy, E. W. (1962). A generalization of the gamma distribution. The Annals of mathematical statistics, 1187-1192.

Examples

```
pdfggamma(c(2,5,3),3)
```

pdfgumbel *Probability density function of the gumbel distribution*

Description

Probability density function of the gumbel distribution

Usage

```
pdfgumbel(par, x)
```

Arguments

par	parameter vector of the gumbel distribution. First parameter is the location, second is the scale parameter.
x	vector of observations or single value

Value

return the value of the pdf of the gumbel distribution

References

Gumbel, E. J. (1941). The return period of flood flows. The annals of mathematical statistics, 12(2), 163-190.

Examples

```
pdfgumbel(c(0.5,0.3),2)
```

pdfinvgamma *Probability density function of the inverse gamma distribution*

Description

Probability density function of the inverse gamma distribution

Usage

```
pdfinvgamma(par, x)
```

Arguments

par	parameter vector of the inverse gamma distribution. First parameter is the shape, second is the rate parameter.
x	vector of observations or single value

Value

return the value of the pdf of the inverse gamma distribution

References

Cook, J. D. (2008). Inverse gamma distribution. online: http://www. johndcook. com/inverse gamma. pdf, Tech. Rep.

Examples

```
pdfinvgamma(c(2,5,3),3)
```

`pdfiweibull` *Probability density function of the inverse Weibull distribution*

Description

Probability density function of the inverse Weibull distribution

Usage

```
pdfiweibull(par, x)
```

Arguments

`par`	parameter vector of the inverse Weibull distribution. First parameter is the shape and second is the scale parameter
`x`	vector of observations or single value

Value

return the value of the pdf of the inverse Weibull distribution

References

Mudholkar, G. S., & Kollia, G. D. (1994). Generalized Weibull family: a structural analysis. Communications in statistics-theory and methods, 23(4), 1149-1171.

Examples

```
pdfiweibull(c(2,3),5)
```

pdflevy	*Probability density function of the Levy distribution*

Description

Probability density function of the Levy distribution

Usage

```
pdflevy(par, x)
```

Arguments

par	parameter vector of the Levy distribution. First parameter is the location, second is the scale parameter.
x	vector of observations or single value

Value

return the value of the pdf of the Levy distribution

References

Nolan, J. P. (2003). Modeling financial data with stable distributions. In Handbook of heavy tailed distributions in finance (pp. 105-130). North-Holland.

Examples

```
pdflevy(c(0.5,0.3),2)
```

pdflnormal	*Probability density function of the log-normal distribution*

Description

Probability density function of the log-normal distribution

Usage

```
pdflnormal(par, x)
```

Arguments

par	parameter vector of the log-normal distribution. First parameter is the shape and second is the scale parameter
x	vector of observations or single value

Value

return the value of the pdf of the log-normal distribution

References

Heyde, C. C. (1963). On a property of the lognormal distribution. Journal of the Royal Statistical Society: Series B (Methodological), 25(2), 392-393.

Examples

```
pdflnormal(c(2,3),5)
```

---

pdfpareto *Probability density function of the Pareto distribution*

Description

Probability density function of the Pareto distribution

Usage

```
pdfpareto(par, x)
```

Arguments

`par`	parameter vector of the Pareto distribution. First parameter is the scale and second is the shape parameter
`x`	vector of observations or single value

Value

return the value of the pdf of the Pareto distribution

References

Arnold, B. C. (1983). Pareto Distributions, International Cooperative Publishing House.

Examples

```
pdfpareto(c(2,5),3)
```

pdfrayleigh *Probability density function of the Rayleigh distribution*

Description

Probability density function of the Rayleigh distribution

Usage

```
pdfrayleigh(par, x)
```

Arguments

par	scale parameter vector of the Rayleigh distribution.
x	vector of observations or single value

Value

return the value of the pdf of the Rayleigh distribution

References

Siddiqui, M. M. (1964). Statistical inference for Rayleigh distributions. Journal of Research of the National Bureau of Standards, Sec. D, 68(9), 1005-1010.

Examples

```
pdfrayleigh(c(2),5)
```

pdfweibull *Probability density function of the Weibull distribution*

Description

Probability density function of the Weibull distribution

Usage

```
pdfweibull(par, x)
```

Arguments

par	parameter vector of the weibull distribution. First parameter is the shape and second is the scale parameter
x	vector of observations or single value

Value

return the value of the pdf of the weibull distribution

References

Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) Continuous Univariate Distributions, volume 1, chapter 21. Wiley, New York.

Examples

```
pdfweibull(c(2,3),5)
```

---

rayleighcp — *Probabilistic estimation of earthquake recurrence interval using Rayleigh distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
rayleighcp(fit, r, te)
```

Arguments

`fit`	Fit is the fitrayleigh object. See ?fitrayleigh for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitrayleigh(c(1),data=data_earthquake_7)
rayleighcp(fit,r=2,te=5)
```

rbsgpd *Generate random observations from Birnbaum-Saunders-Generalized Pareto distribution*

Description

Generate random observations from Birnbaum-Saunders-Generalized Pareto distribution

Usage

```
rbsgpd(n, beta, alpha, gamma)
```

Arguments

`n`	number of observations to be generated from the Birnbaum-Saunders-Generalized Pareto
`beta`	lower bound parameter of the
`alpha`	scale parameter of the Birnbaum-Saunders-Generalized Pareto distribution
`gamma`	shape parameter of the Birnbaum-Saunders-Generalized Pareto distribution

Value

return the random sample generated from scale parameter of the Birnbaum-Saunders-Generalized Pareto distribution distribution

References

Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) Continuous Univariate Distributions, volume 1, chapter 21. Wiley, New York.

Examples

```
rbsgpd(100,2,3,5)
```

rexpexp *Generate random observations from exponentiated exponential distribution*

Description

Generate random observations from exponentiated exponential distribution

Usage

```
rexpexp(n, alpha, lambda)
```

Arguments

n	number of observations to be generated
alpha	shape parameter of the exponentiated exponential distribution
lambda	scale parameter of the exponentiated exponential distribution

Value

return the random sample generated from exponentiated exponential distribution

References

Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) Continuous Univariate Distributions, volume 1, chapter 21. Wiley, New York.

Examples

```
rexpexp(100,2,3)
```

---

rexprayleigh — *Generate random observations from exponentiated Rayleigh distribution*

Description

Generate random observations from exponentiated Rayleigh distribution

Usage

```
rexprayleigh(n, alpha, beta)
```

Arguments

n	number of observations to be generated
alpha	shape parameter of the exponentiated Rayleigh distribution
beta	scale parameter of the exponentiated Rayleigh distribution

Value

return the random sample generated from exponentiated exponential distribution

References

Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) Continuous Univariate Distributions, volume 1, chapter 21. Wiley, New York.

Examples

```
rexprayleigh(100,2,3)
```

rexpweibull *Generate random observations from exponentiated Weibull distribution*

Description

Generate random observations from exponentiated Weibull distribution

Usage

```
rexpweibull(n, alpha, beta, theta)
```

Arguments

`n`	number of observations to be generated
`alpha`	shape parameter of the exponentiated Weibull distribution
`beta`	scale parameter of the exponentiated Weibull distribution
`theta`	shape parameter of the exponentiated Weibull distribution

Value

return the random sample generated from exponentiated Weibull distribution

References

Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) Continuous Univariate Distributions, volume 1, chapter 21. Wiley, New York.

Examples

```
rexpweibull(100,2,3,2)
```

rlevy *Generate random observations from Levy distribution*

Description

Generate random observations from Levy distribution

Usage

```
rlevy(n, mu, c)
```

Arguments

`n`	number of observations to be generated
`mu`	location parameter of the Levy distribution
`c`	scale parameter of the Levy distribution

Value

return the random sample generated from Levy distribution

References

Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) Continuous Univariate Distributions, volume 1, chapter 21. Wiley, New York.

Examples

```
rlevy(500,2,3)
```

`weibullcp` *Probabilistic estimation of earthquake recurrence interval using Weibull distribution*

Description

Computes the probability of an earthquake within a specified time "r" and elapsed time "te".

Usage

```
weibullcp(fit, r, te)
```

Arguments

`fit`	Fit is the fitweibull object. See ?fitweibull for details.
`r`	The specified time in which the probability of an earthquake is desired to be calculated.
`te`	Elapsed time since the last earthquake

Value

A numeric value

References

Pasari, S. and Dikshit, O. (2014). Impact of three-parameter Weibull models in probabilistic assessment of earthquake hazards. Pure and Applied Geophysics, 171, 1251-1281.

Examples

```
fit=fitweibull(c(1,1),data=data_earthquake_6_6.5)
weibullcp(fit,r=2,te=5)
```

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