

# Package: ERPeq (via r-universe)

September 17, 2024

**Type** Package

**Title** Probabilistic Hazard Assessment

**Version** 0.1.0

**Maintainer** Emrah Altun <emrahaltun123@gmail.com>

**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.

**License** GPL-3

**Imports** VGAM, invgamma, pracma, rutil, methods, graphics

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.1.2

**Depends** R (>= 2.10)

**NeedsCompilation** no

**Author** Emrah Altun [aut, cre, cph], Gamze Ozel [ctb]

**Date/Publication** 2023-06-22 19:00:12 UTC

**Repository** <https://emrahaltun.r-universe.dev>

**RemoteUrl** <https://github.com/cran/ERPeq>

**RemoteRef** HEAD

**RemoteSha** 5d05a8fbf1ecc16d786d58566042e99aa5270749

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cdfbsgdp	<i>Cumulative distribution function of the Birnbaum-Saunders- Generalized Pareto distribution</i>
----------	---

---

## 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)
```

---

cdfexp	<i>Cumulative distribution function of the exponentiated exponential distribution</i>
--------	---

---

**Description**

Cumulative distribution function of the exponentiated exponential distribution

**Usage**

```
cdfexp(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**

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

---

cdfexp	<i>Cumulative distribution function of the exponentiated Rayleigh distribution</i>
--------	--

---

**Description**

Cumulative distribution function of the exponentiated Rayleigh distribution

**Usage**

```
cdfexp(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**

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

**Examples**

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

---

cdfew	<i>Cumulative distribution function of the exponentiated Weibull distribution</i>
-------	---

---

**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)
```

---

 cdfgamma

*Cumulative distribution function of the generalized gamma distribution*


---

**Description**

Cumulative distribution function of the generalized gamma distribution

**Usage**

```
cdfgamma(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**

```
pdfgamma(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**

<code>par</code>	parameter vector of the inverse gamma distribution. First parameter is the shape, second is the rate parameter.
<code>x</code>	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](http://www.johndcook.com/inverse_gamma.pdf), Tech. Rep.

**Examples**

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

---

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

---

**Description**

Cumulative distribution function of the inverse Weibull distribution

**Usage**

```
cdfiweibull(par, x)
```

**Arguments**

<code>par</code>	parameter vector of the inverse Weibull distribution. First parameter is the shape and second is the scale parameter
<code>x</code>	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**

```
cdfiweibull(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)
```

---

<code>cdflnormal</code>	<i>Cumulative distribution function of the log-normal distribution</i>
-------------------------	--

---

**Description**

Cumulative distribution function of the log-normal distribution

**Usage**

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

**Arguments**

<code>par</code>	parameter vector of the log-normal distribution. First parameter is the shape and second is the scale parameter
<code>x</code>	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)
```

---

<code>cdfpareto</code>	<i>Cumulative distribution function of the Pareto distribution</i>
------------------------	--

---

**Description**

Cumulative distribution function of the Pareto distribution

**Usage**

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

**Arguments**

<code>par</code>	parameter vector of the Pareto distribution. First parameter is the shape and second is the scale parameter
<code>x</code>	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 occurred 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 occurred 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 occurred 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**

<code>fit</code>	Fit is the <code>fitexpcp</code> object. See <code>?fitexpcp</code> for details.
<code>r</code>	The specified time in which the probability of an earthquake is desired to be calculated.
<code>te</code>	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=fitexpcp(c(1,1),data=data_earthquake_7)
expcp(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**

<code>fit</code>	Fit is the <code>fitexprayleigh</code> object. See <code>?fitexprayleigh</code> for details.
<code>r</code>	The specified time in which the probability of an earthquake is desired to be calculated.
<code>te</code>	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	<i>Probabilistic estimation of earthquake recurrence interval using exponentiated Weibull distribution</i>
----------	--

---

**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**

<code>starts</code>	A vector defining the starting values for the Nelder-Mead algorithm.
<code>data</code>	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**

<code>starts</code>	A vector defining the starting values for the Nelder-Mead algorithm.
<code>data</code>	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	<i>Fitting the exponentiated Rayleigh distribution</i>
----------------	--

---

**Description**

Fitting the 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	<i>Fitting the exponentiated Weibull distribution</i>
---------------	---

---

**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	<i>Fitting the gamma distribution</i>
----------	---------------------------------------

---

**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)
```

---

fitgamma	<i>Fitting the generalized gamma distribution</i>
----------	---

---

**Description**

Fitting the generalized 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**

```
library(rmutil)
data=rggamma(500,2,2,2)
fitgamma(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	<i>Fitting the inverse gamma distribution</i>
-------------	---

---

**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	<i>Fitting the gamma distribution</i>
-------------	---------------------------------------

---

**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)
fittiweibull(starts =c(0.5,0.5),data=data)
```

---

fitlevy	<i>Fitting the Levy distribution</i>
---------	--------------------------------------

---

**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	<i>Fitting the log-normal distribution</i>
------------	--

---

**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	<i>Fitting the Pareto distribution</i>
-----------	--

---

**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	<i>Fitting the Rayleigh distribution</i>
-------------	--

---

**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=rrrayleigh(500,2)
fitrrayleigh(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	<i>Probabilistic estimation of earthquake recurrence interval using gamma distribution</i>
---------	--

---

**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)
```

---

ggammap	<i>Probabilistic estimation of earthquake recurrence interval using generalized gamma distribution</i>
---------	--

---

**Description**

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

**Usage**

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

---

gumbelcp	<i>Probabilistic estimation of earthquake recurrence interval using Gumbel distribution</i>
----------	---

---

**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	<i>Probabilistic estimation of earthquake recurrence interval using inverse gamma distribution</i>
------------	--

---

**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	<i>Probabilistic estimation of earthquake recurrence interval using inverse Weibull distribution</i>
------------	--

---

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

---

levycp	<i>Probabilistic estimation of earthquake recurrence interval using Levy distribution</i>
--------	---

---

**Description**

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

**Usage**

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

**Arguments**

<code>fit</code>	Fit is the <code>fitlevy</code> object. See <code>?fitlevy</code> for details.
<code>r</code>	The specified time in which the probability of an earthquake is desired to be calculated.
<code>te</code>	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**

<code>fit</code>	Fit is the <code>fitlnormal</code> object. See <code>?fitlnormal</code> for details.
<code>r</code>	The specified time in which the probability of an earthquake is desired to be calculated.
<code>te</code>	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	<i>Probabilistic estimation of earthquake recurrence interval using Pareto distribution</i>
----------	---

---

**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	<i>Probability density function of the Birnbaum-Saunders-Generalized Pareto distribution</i>
----------	--

---

**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)
```

---

pdfexp	<i>Probability density function of the exponentiated exponential distribution</i>
--------	---

---

**Description**

Probability density function of the exponentiated exponential distribution

**Usage**

```
pdfexp(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**

```
pdfexp(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)
```

---

pdfgamma

*Probability density function of the generalized gamma distribution*

---

**Description**

Probability density function of the generalized gamma distribution

**Usage**

```
pdfgamma(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**

```
pdfgamma(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**

<code>par</code>	parameter vector of the gumbel distribution. First parameter is the location, second is the scale parameter.
<code>x</code>	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**

<code>par</code>	parameter vector of the inverse gamma distribution. First parameter is the shape, second is the rate parameter.
<code>x</code>	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](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)
```



**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	<i>Probabilistic estimation of earthquake recurrence interval using Rayleigh distribution</i>
------------	---

---

**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	<i>Generate random observations from Birnbaum-Saunders-Generalized Pareto distribution</i>
--------	--

---

**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	<i>Generate random observations from exponentiated exponential distribution</i>
---------	---

---

**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	<i>Generate random observations from exponentiated Rayleigh distribution</i>
--------------	--

---

**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	<i>Generate random observations from exponentiated Weibull distribution</i>
-------------	---

---

**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	<i>Generate random observations from Levy distribution</i>
-------	--

---

**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	<i>Probabilistic estimation of earthquake recurrence interval using Weibull distribution</i>
-----------	--

---

**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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