Package ‘twopexp’

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Type Package

Title The Two Parameter Exponential Distribution

Version 0.1.0

Maintainer Atchanut Rattanalertnusorn <atchanut_r@rmutt.ac.th>

Description Density, distribution function, quantile function,
and random generation function, maximum likelihood estimation (MLE),
penalized maximum likelihood estimation (PMLE), the quartiles method estimation (QM),
and median rank estimation (MEDRANK) for the two-parameter exponential distribution.
MLE and PMLE are based on Mengjie Zheng (2013)<https://scse.d.umn.edu/sites/scse.d.umn.edu/files/mengjie-thesis_masters-1.pdf>.
QM is based on Entisar Elgmati and Nadia Gregni (2016)<doi:10.5539/ijsp.v5n5p12>.
MEDRANK is based on Matthew Reid (2022)<doi:10.5281/ZENODO.3938000>.

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Author Atchanut Rattanalertnusorn [aut, cre]

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R topics documented:

`cdfplot` *Distribution function plot of the two-parameter exponential distribution*

Description

Distribution function plot of the two-parameter exponential distribution with `theta` and `beta`

Usage

```
cdfplot(x, theta, beta)
```

Arguments

`x`	vector of quantile.
`theta`	location parameter, where $\theta > 0$.
`beta`	scale parameter, where $\beta > 0$.

Value

a distribution function plot of the two-parameter exponential distribution

Examples

```
x <- seq(0,20,by=0.01)
theta <- 6
beta <- 2
cdfplot(x,theta,beta)
```

medrank — *Median rank method to estimate parameters of the two-parameter exponential dist.*

Description

Median rank method to estimate parameters of the two-parameter exponential dist.

Usage

```
medrank(x, methods = c("B"))
```

Arguments

`x`	vector of quantile (or a data set).
`methods`	there are some of median rank methods as follows; "B" stand for Benard median rank method (default), "BL" stand for Blom method, "MKM" stand for Hazen (Modified Kaplan Meier) method, "OT" stand for The one-third method, and "C" stand for Cunane method

Value

the estimate three values for the two-parameter exponential dist. as follows: `theta.hat` gives the estimate location parameter, `beta.hat` gives the estimate scale parameter, and `lamda.hat` gives the estimate the rate.

Source

Reid, M. (2022). Reliability – a Python library for reliability engineering (Version 0.8.2) [Computer software]. Zenodo. doi: 10.5281/ZENODO.3938000.

Examples

```
x1 <- c(25,43,53,65,76,86,95,115,132,150) # test a data set
medrank(x1,"B")    # Benard method (default) or medrank(x1)
```

mle_tpexp — *Maximum likelihood estimation for the two-parameter exponential dist.*

Description

To estimate the location (or shift) and scale parameters for the two-parameter exponential distribution based on maximum likelihood method. See detail in `source`

Usage

```
mle_tpexp(x, theta = 0, beta = 1)
```

Arguments

x	vector of quantile (or a data set).
theta	location parameter, where $\theta > 0$.
beta	scale parameter, where $\beta > 0$ and $rate = 1/\beta$.

Value

the estimate three values for the two-parameter exponential dist. as follows: `theta.hat` gives the estimate location parameter, `beta.hat` gives the estimate scale parameter, and `lamda.hat` gives the estimate the rate.

Source

Zheng, M. (2013). *Penalized Maximum Likelihood Estimation of Two-Parameter Exponential Distributions [Master's thesis]*. https://scse.d.umn.edu/sites/scse.d.umn.edu/files/mengjie-thesis_masters-1.pdf

Examples

```
x1 <- c(25,43,53,65,76,86,95,115,132,150) # test a data set
mle_tpexp(x1)
x2 <- c(20,15,10,25,35,30,40,70,50,60,90,100,80,5) # test a data set
mle_tpexp(x2)
```

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pdfplot *Density plot of the two-parameter exponential distribution*

Description

Density plot of the two-parameter exponential distribution with `theta` and `beta`

Usage

```
pdfplot(x, theta, beta)
```

Arguments

x	vector of quantile.
theta	location parameter, where $\theta > 0$.
beta	scale parameter, where $\beta > 0$.

Value

a density plot of the two-parameter exponential distribution

Examples

```
x <- seq(0,20,by=0.01)
theta <- 6
beta <- 2
pdfplot(x,theta,beta)
```

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pmle_tpexp *Penalized maximum likelihood estimation for the two-parameter exponential dist.*

Description

To estimate the location (or shift) and scale parameters for the two-parameter exponential distribution based on penalized maximum likelihood method. See detail in `source`

Usage

```
pmle_tpexp(x, theta = 0, beta = 1)
```

Arguments

`x`	vector of quantile (or a data set).
`theta`	location parameter, where $\theta > 0$.
`beta`	scale parameter, where $\beta > 0$ and $rate = 1/\beta$.

Value

the estimate three values for the two-parameter exponential dist. as follows: `ptheta.hat` gives the estimate location parameter, `pbeta.hat` gives the estimate scale parameter, and `plamda.hat` gives the estimate the rate.

Source

Zheng, M. (2013). *Penalized Maximum Likelihood Estimation of Two-Parameter Exponential Distributions [Master's thesis]*. https://scse.d.umn.edu/sites/scse.d.umn.edu/files/mengjie-thesis_masters-1.pdf

Examples

```
x1 <- c(25,43,53,65,76,86,95,115,132,150) # test a data set
pmle_tpexp(x1)
x2 <- c(20,15,10,25,35,30,40,70,50,60,90,100,80,5) # test a data set
pmle_tpexp(x2)
```

qm_tpexp *Quartile method estimation of the two-parameter exponential distribution*

Description

To estimate the location (or shift) and scale parameters for the two-parameter exponential distribution based on quartile method. See detail in `source`

Usage

```
qm_tpexp(x, methods = c("Q13"))
```

Arguments

`x`	vector of quantile (or a data set).
`methods`	there are two quartile methods as follows; "Q13" stand for the first and the third quartile method (default), and "Q12" stand for the first and the second quartile (median) method.

Value

the estimate three values for the two-parameter exponential dist. as follows: `qmtheta.hat` gives the estimate location parameter, `qmbeta.hat` gives the estimate scale parameter, and `qmlamda.hat` gives the estimate the rate.

Source

Elgmati, E., Gregni, N. (2016). Quartile Method Estimation of Two-Parameter Exponential Distribution Data with Outliers. *International Journal of Statistics and Probability*, *5(5)*, 12-15. doi: 10.5539/ijsp.v5n5p12

Examples

```
x1 <- c(25,43,53,65,76,86,95,115,132,150) # test a data set
qm_tpexp(x1,"Q13")  # or qm_tpexp(x1)
qm_tpexp(x1,"Q12")
```

surplot — *Survival function plot of the two-parameter exponential distribution*

Description

Survival function plot of the two-parameter exponential distribution with `theta` and `beta`

Usage

```
surplot(x, theta, beta)
```

Arguments

`x`	vector of quantile.
`theta`	location parameter, where $\theta > 0$.
`beta`	scale parameter, where $\beta > 0$.

Value

a survival function plot of the two-parameter exponential distribution

Examples

```
x <- seq(0,20,by=0.01)
theta <- 8
beta <- 1
surplot(x,theta,beta)
```

tpexp — *The two-parameter exponential distribution(tpexp)*

Description

Density, distribution function, quantile function, and random generation function for the two-parameter exponential distribution with `theta` and `beta`

Usage

```
dtpexp(x, theta = 0, beta = 1, log = FALSE)

ptpexp(q, theta = 0, beta = 1, lower.tail = TRUE, log.p = FALSE)

qtpexp(p, theta = 0, beta = 1, lower.tail = TRUE, log.p = FALSE)

rtpexp(n, theta = 0, beta = 1)
```

Arguments

`x, q`	vector of quantile.
`theta`	location parameter, where $\theta > 0$.
`beta`	scale parameter, where $\beta > 0$ and $rate = 1/\beta$.
`log, log.p`	logical; (default = `FALSE`), if `TRUE`, then probabilities are given as `log(p)`.
`lower.tail`	logical; if `TRUE` (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$.
`p`	vector of probabilities
`n`	number of observations. If `length(n) > 1`, the length is taken to be the number required.

Value

`dtpexp` gives the density, `ptpexp` gives the distribution function, `qtpexp` gives the quantile function, and `rtpexp` generates random samples.

Examples

```
x <- c(0.1,0.2,0.3,0.4,0.5,0.6,0.7,0.8,0.9,1.0)
dtpexp(x,theta=0,beta=1)
dtpexp(x,theta=0,beta=1,log=TRUE)

q <- c(0.1,0.2,0.3,0.4,0.5,0.6,0.7,0.8,0.9,1.0)
ptpexp(q,theta = 0, beta = 1)
ptpexp(q,theta=0, beta = 1, lower.tail = FALSE)

q <- c(0.1,0.2,0.3,0.4,0.5,0.6,0.7,0.8,0.9,1.0)
p<- ptpexp(q,theta = 0, beta = 1); p
qtpexp(p,theta=0, beta = 1)

rtpexp(5, theta=0, beta=1)
rtpexp(10, theta=1, beta=1.5)
```

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