

Package ‘ztpln’

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Type Package

Title Zero-Truncated Poisson Lognormal Distribution

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Description Functions for obtaining the density, random variates and maximum likelihood estimates of the Zero-truncated Poisson lognormal distribution and their mixture distribution.

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URL <https://github.com/mattocci27/ztpln>

BugReports <https://github.com/mattocci27/ztpln/issues>

Depends R (>= 3.5)

Imports DistributionUtils, Rcpp (>= 0.12.0), mixtools, stats

Suggests knitr, dplyr, ggplot2, rmarkdown, testthat, tidyr (>= 1.0.0)

LinkingTo Rcpp (>= 0.12.0), RcppEigen (>= 0.3.3.3.0), RcppNumerical (>= 0.3-2)

VignetteBuilder knitr

Encoding UTF-8

RoxygenNote 7.3.2

NeedsCompilation yes

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Contents

dztpln	2
dztplnm	3
ztplnMLE	4
ztplnmMLE	5

Index[7](#)

dztpIn

*The zero-truncated compound poisson-lognormal distributions***Description**

Density function and random generation for Zero-Trauncated Poisson Lognormal distribution with parameters mu and sd sig.

Usage

```
dztpIn(x, mu, sig, log = FALSE, type1 = TRUE)
```

```
rztpIn(n, mu, sig, type1 = TRUE)
```

Arguments

x	vector of (non-negative integer) quantiles.
mu	mean of lognormal distribution.
sig	standard deviation of lognormal distribution.
log	logical; if TRUE, probabilities p are given as log(p).
type1	logical; if TRUE, Use type 1 ztpIn else use type 2.
n	number of random values to return.

Details

A compound Poisson-lognormal distribution is a Poisson probability distribution where its parameter λ is a random variable with lognormal distribution, that is to say $\log \lambda$ are normally distributed with mean μ and variance σ^2 (Bulmer 1974). The zero-truncated Poisson-lognormal distribution can be derived from a zero-truncated Poisson distribution.

Type 1 ZTPLN truncates zero based on Poisson-lognormal distribution and type 2 ZTPLN truncates zero based on zero-truncated Poisson distribution. For mathematical details, please see `vignette("ztpIn")`

Value

dztpIn gives the (log) density and rztpIn generates random variates.

References

Bulmer, M. G. 1974. On Fitting the Poisson Lognormal Distribution to Species-Abundance Data. *Biometrics* 30:101-110.

See Also

[dztpInm](#)

Examples

```

rztpln(n = 10, mu = 0, sig = 1, type1 = TRUE)
rztpln(n = 10, mu = 6, sig = 4, type1 = TRUE)
dztpln(x = 1:5, mu = 1, sig = 2)

```

dztplnm

*The zero-truncated compound poisson-lognormal distributions mixture***Description**

Density function and random generation for Zero-Truncated Poisson Lognormal distribution with parameters mu, sig, and theta.

Usage

```

dztplnm(x, mu, sig, theta, log = FALSE, type1 = TRUE)

rztplnm(n, mu, sig, theta, type1 = TRUE)

```

Arguments

x	vector of (non-negative integer) quantiles.
mu	vector of mean of lognormal distribution in sample.
sig	vector standard deviation of lognormal distribution in sample.
theta	vector of mixture weights
log	logical; if TRUE, probabilities p are given as log(p).
type1	logical; if TRUE, Use type 1 ztpln else use type 2.
n	number of random values to return.

Details

Type 1 ZTPLN truncates zero based on Poisson-lognormal distribution and type 2 ZTPLN truncates zero based on zero-truncated Poisson distribution. For mathematical details, please see `vignette("ztpln")`

Value

dztplnm gives the (log) density and rztplnm generates random variates. `function`, `qpois` gives the quantile function, and `rpois` generates random deviates.

See Also

[dztpln](#)

Examples

```

rztplnm(n = 100, mu = c(0, 5), sig = c(1, 2), theta = c(0.2, 0.8))
dztplnm(x = 1:100, mu = c(0, 5), sig = c(1, 2), theta = c(0.2, 0.8))
dztplnm(x = 1:100, mu = c(0, 5), sig = c(1, 2), theta = c(0.2, 0.8), type1 = FALSE)

```

ztplnMLE

*MLE for the Zero-truncated Poisson Lognormal distribution***Description**

ztplnMLE fits the Zero-truncated Poisson lognormal distribution to data and estimates parameters mean μ and standard deviation σ in the lognormal distribution

Usage

```
ztplnMLE(
  n,
  lower_mu = 0,
  upper_mu = log(max(n)),
  lower_sig = 0.001,
  upper_sig = 10,
  type1 = TRUE
)
```

Arguments

n a integer vector of counts

lower_mu, upper_mu numeric values of lower and upper bounds for mean of the variables's natural logarithm.

lower_sig, upper_sig numeric values of lower and upper bounds for standard deviation of the variables's natural logarithm

type1 logical; if TRUE, Use type 1 ztpln else use type 2.

Details

The function searches the maximum likelihood estimates of mean μ and standard deviation σ using the optimization procedures in [nlminb](#).

Value

convergence An integer code. 0 indicates successful convergence.

iterations Number of iterations performed.

message A character string giving any additional information returned by the optimizer, or NULL. For details, see PORT documentation.

evaluation Number of objective function and gradient function evaluations

mu Maximum likelihood estimates of μ

sig Maximum likelihood estimates of σ

loglik loglikelihood

Examples

```
y <- rztpln(100, 3, 2)
ztplnmMLE(y)
```

ztplnmMLE

*MLE for the Zero-truncated Poisson Lognormal mixture distribuion***Description**

ztplnmMLE fits the Zero-truncated Poisson lognormal mixture distribution to data and estimates parameters mean μ , standard deviation σ and mixture weight θ in the lognormal distribution.

Usage

```
ztplnmMLE(
  n,
  K = 2,
  lower_mu = rep(0, K),
  upper_mu = rep(log(max(n)), K),
  lower_sig = rep(0.001, K),
  upper_sig = rep(10, K),
  lower_theta = rep(0.001, K),
  upper_theta = rep(0.999, K),
  type1 = TRUE,
  message = FALSE
)
```

Arguments

n	a vector of counts
K	number of components
lower_mu, upper_mu	numeric values of lower and upper bounds for mean of the variables's natural logarithm.
lower_sig, upper_sig	numeric values of lower and upper bounds for standard deviation of the variables's natural logarithm
lower_theta, upper_theta	numeric values of lower and upper bounds for mixture weights.
type1	logical; if TRUE, Use type 1 ztpln else use type 2.
message	mean of lognormal distribution in sample 3.

Details

The function searches the maximum likelihood estimators of mean vector μ , standard deviation vector σ and mixture weight vector θ using the optimization procedures in [nlminb](#).

Value

convergence	An integer code. 0 indicates successful convergence.
iterations	Number of iterations performed.
message	A character string giving any additional information returned by the optimizer, or NULL. For details, see PORT documentation.
evaluation	Number of objective function and gradient function evaluations
mu	Maximum likelihood estimates of mu
sig	Maximum likelihood estimates of sig
theta	Maximum likelihood estimates of theta
loglik	loglikelihood

Examples

```
y <- rztplnm(100, c(1, 10), c(2, 1), c(0.2, 0.8))  
ztplnmMLE(y)
```

Index

dztpln, [2](#), [3](#)

dztplnm, [2](#), [3](#)

nlminb, [4](#), [5](#)

rztpln(dztpln), [2](#)

rztplnm(dztplnm), [3](#)

ztplnMLE, [4](#)

ztplnmMLE, [5](#)