

Package ‘ztpln’

October 9, 2021

Type Package

Title Zero-Truncated Poisson Lognormal Distribution

Version 0.1.2

Date 2021-10-09

Author Masatoshi Katabuchi

Maintainer Masatoshi Katabuchi <mattozzi27@gmail.com>

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/mattozzi27/ztpln>

BugReports <https://github.com/mattozzi27/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 7.1.2

NeedsCompilation yes

Repository CRAN

Date/Publication 2021-10-09 14:50:02 UTC

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dztpln

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

Density function and random generation for Zero-Trauncated Poisson Lognormal distribution with parameters μ and σ .

Usage

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

```
rztpln(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 ztpln 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("ztpln")`

Value

dztpln gives the (log) density and rztpln generates random variates.

References

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

See Also

[dztplnm](#)

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	<i>The zero-truncated compound poisson-lognormal distributions mixture</i>
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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. `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)

```

ztpInMLE

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

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

Usage

```
ztpInMLE(
  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 ztpIn 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 distribution

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

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

Examples

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

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