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

LazyData true

RoxygenNote 7.1.1

NeedsCompilation yes

Repository CRAN

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R topics documented:

`dztpln` *The zero-truncated compund poisson-lognormal distributions*

Description

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

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` *The zero-truncated compund 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 mu and standard deviation sig 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 natrual logarithm.
lower_sig, upper_sig	numeric values of lower and upper bounds for standard deviatoin of the variables's natrual logarithm
type1	logical; if TRUE, Use type 1 ztpln else use type 2.

Details

The function searches the maximum likelihood estimates of mean mu and standard deviation sig 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
loglik	loglikelihood

Examples

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

`ztplnmMLE` *MLE for the Zero-truncated Poisson Lognormal mixture distribtuion*

Description

`ztplnmMLE` fits the Zero-truncated Poisson lognormal mixture distribution to data and estimates parameters mean `mu`, standard deviation `sig` and mixture weight `theta` 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 `mu`, standard deviation vector `sig` and mixture weight vector `theta` 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