Package ‘ztpln’

October 9, 2021

Type Package
Title Zero-Truncated Poisson Lognormal Distribution
Version 0.1.2
Date 2021-10-09
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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.
License MIT + file LICENSE
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, tidyverse (>= 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

R topics documented:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>dztpln</td>
<td>2</td>
</tr>
<tr>
<td>dztplnm</td>
<td>3</td>
</tr>
<tr>
<td>ztplnMLE</td>
<td>4</td>
</tr>
<tr>
<td>ztplnmMLE</td>
<td>5</td>
</tr>
</tbody>
</table>
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

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

rztpn(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 $\lambda$ is a random variable with lognormal distribution, that is to say $\log \lambda$ are normally distributed with mean $\mu$ and variance $\sigma^2$ (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 rztpn generates random variates.

References


See Also
dztplnm
**dztplnm**

The zero-truncated compound poisson-lognormal distributions mixture

**Examples**

```r
dztplnm(n = 10, mu = 0, sig = 1, type1 = TRUE)
dztplnm(n = 10, mu = 6, sig = 4, type1 = TRUE)
dztplnm(x = 1:5, mu = 1, sig = 2)
```

**Description**

Density function and random generation for Zero-Truncated Poisson Lognormal distribution with parameters \( \mu \), \( \sigma \), and \( \theta \).

**Usage**

```r
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**

```r
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 fits the Zero-truncated Poisson lognormal distribution to data and estimates parameters mean \( \mu \) and standard deviation \( \sigma \) in the lognormal distribution.

**Usage**

```r
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 \( \mu \) and standard deviation \( \sigma \) 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 \( \sigma \)
- `loglik`: loglikelihood
Examples

```r
y <- rztpln(100, 3, 2)
ztplnmLE(y)
```

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**ztplnmLE**  
*MLE for the Zero-truncated Poisson Lognormal mixture distribution*

**Description**

`ztplnmLE` 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**

```r
ztplnmLE(
  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

```r
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