

# 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** 7.1.2

**NeedsCompilation** yes

**Repository** CRAN

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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  $\lambda$  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("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  $\mu$  and standard deviation  $\sigma$  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  $\mu$  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**

```
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  $\mu$ , standard deviation  $\sigma$  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  $\sigma$  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)
```

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