Package ‘ztpln’

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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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The zero-truncated compound poisson-lognormal distributions

Description
Density function and random generation for Zero-Trauncated Poisson Lognormal distribution with parameters \( \mu \) and \( \sigma \).

Usage

\[
dztpln(x, \mu, \sigma, \log = \text{FALSE}, \text{type1} = \text{TRUE})
\]

\[
rztpln(n, \mu, \sigma, \text{type1} = \text{TRUE})
\]

Arguments

- \( x \) vector of (non-negative integer) quantiles.
- \( \mu \) mean of lognormal distribution.
- \( \sigma \) standard deviation of lognormal distribution.
- \( \log \) logical; if TRUE, probabilities \( p \) are given as \( \log(p) \).
- \( \text{type1} \) 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 rztpln generates random variates.

References


See Also

dztpln
The zero-truncated compound poisson-lognormal distributions mixture

Description

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

Usage

\[
dztplnm(x, \mu, \sigma, \theta, \log = \text{FALSE}, \text{type1} = \text{TRUE})
\]

\[
rztplnm(n, \mu, \sigma, \theta, \text{type1} = \text{TRUE})
\]

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 \texttt{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

\[
rztplnm(n = 100, \mu = c(0, 5), \sigma = c(1, 2), \theta = c(0.2, 0.8))
\]

\[
dztplnm(x = 1:100, \mu = c(0, 5), \sigma = c(1, 2), \theta = c(0.2, 0.8))
\]

\[
dztplnm(x = 1:100, \mu = c(0, 5), \sigma = c(1, 2), \theta = c(0.2, 0.8), \text{type1} = \text{FALSE})
\]
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 variable's natural logarithm.
- `lower_sig`, `upper_sig`: numeric values of lower and upper bounds for standard deviation of the variable'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)
```

---

**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 \( \sigma \) 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 \( \sigma \) 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 \( \sigma \)
- **theta**: Maximum likelihood estimates of \( \theta \)
- **loglik**: loglikelihood

Examples

```r
y <- rztp1nm(100, c(1, 10), c(2, 1), c(0.2, 0.8))
ztplnmMLE(y)
```
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