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.
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, tidyr(>= 1.0.0)
LinkingTo  Rcpp (>= 0.12.0), RcppEigen (>= 0.3.3.3.0), RcppNumerical
           (>= 0.3-2)
VignetteBuilder  knitr
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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
```r
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.
- \( \sigma \): 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
dztplnm
Examples

\begin{itemize}
  \item \texttt{rztpln(n = 10, mu = 0, sig = 1, type1 = TRUE)}
  \item \texttt{rztpln(n = 10, mu = 6, sig = 4, type1 = TRUE)}
  \item \texttt{dztpln(x = 1:5, mu = 1, sig = 2)}
\end{itemize}

\section*{dztplnm}

\textit{The zero-truncated compound poisson-lognormal distributions mixture}

\section*{Description}

Density function and random generation for Zero-Truncated Poisson Lognormal distribution with parameters \texttt{mu}, \texttt{sig}, and \texttt{theta}.

\section*{Usage}

\begin{itemize}
  \item \texttt{dztplnm(x, mu, sig, theta, log = FALSE, type1 = TRUE)}
  \item \texttt{rztplnm(n, mu, sig, theta, type1 = TRUE)}
\end{itemize}

\section*{Arguments}

\begin{itemize}
  \item \texttt{x} vector of (non-negative integer) quantiles.
  \item \texttt{mu} vector of mean of lognormal distribution in sample.
  \item \texttt{sig} vector standard deviation of lognormal distribution in sample.
  \item \texttt{theta} vector of mixture weights
  \item \texttt{log} logical; if TRUE, probabilities \texttt{p} are given as \texttt{log(p)}.
  \item \texttt{type1} logical; if TRUE, Use type 1 ztpln else use type 2.
  \item \texttt{n} number of random values to return.
\end{itemize}

\section*{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")}

\section*{Value}

dztplnm gives the (log) density and rztplnm generates random variates. function, qpois gives the quantile function, and rpois generates random deviates.

\section*{See Also}

dztpln

\section*{Examples}

\begin{itemize}
  \item \texttt{rztpln(n = 100, mu = c(0, 5), sig = c(1, 2), theta = c(0.2, 0.8))}
  \item \texttt{dztpln(x = 1:100, mu = c(0, 5), sig = c(1, 2), theta = c(0.2, 0.8))}
  \item \texttt{dztpln(x = 1:100, mu = c(0, 5), sig = c(1, 2), theta = c(0.2, 0.8), type1 = FALSE)}
\end{itemize}
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

```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 <- rztpin(100, 3, 2)
ztpInMLE(y)
```

---

**Description**

`ztpInMLE` 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
ztpInMLE(
  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 ztsln 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)
```
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