Package 'poisbinom'

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Type Package

Title A Faster Implementation of the Poisson-Binomial Distribution

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Description Provides the probability, distribution, and quantile functions and random number generator for the Poisson-Binomial distribution. This package relies on FFTW to implement the discrete Fourier transform, so that it is much faster than the existing implementation of the same algorithm in R.

License GPL (>= 2)

Imports Rcpp (>= 0.12.10)

SystemRequirements fftw3 (>= 3)

LinkingTo Rcpp

NeedsCompilation yes

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Poisson-Binomial *The Poisson Binomial Distribution*

Description

Probability mass, distribution, quantile and function, and random number generator for the Poisson-Binomial distribution with parameter vector pp (the probability parameter of the component Binomial random variables).

Usage

```
dpoisbinom(x, pp, log_d = FALSE)
ppoisbinom(q, pp, lower_tail = TRUE, log_p = FALSE)
qpoisbinom(p, pp, lower_tail = TRUE, log_p = FALSE)
rpoisbinom(n,pp)
```

Arguments

x, q	vector of quantiles.
p, pp	vector of probabilities.
n	number of random deviates.
log_d, log_p	logical; if TRUE, probabilities are given in the log scale.
lower_tail	logical; if TRUE (default), probabilities are $Pr(X \leq x)$, otherwise, $Pr(X > x)$.

Details

The Poisson-Binomial distribution is the distribution of a sum of n independent and *not* identically distributed Binomial random variables. It is parameterized by the vector of n possibly distinct probability parameters of these Binomial distributions, and is computed using a discrete Fourier transform. See Hong (2013) for details.

Value

dpoisbinom gives the mass, ppoisbinom gives the distribution function, qpoisbinom gives the quantile function and rpoisbinom generates random deviates.

If pp contains values outside of $[0, 1]$, an error is returned.

The length of the result is determined by n in rpoisbinom, and is the length of the first argument for all other functions.

Author(s)

Shiraito, Y. and Olivella, S. (2017).

References

Hong, Y. (2013) "On computing the distribution function for the Poisson binomial distribution". *Computational Statistics and Data Analysis*, 59, 41–51.

Examples

```
## Binomial probabilities
pp <- runif(500)

## PMF
dpoisbinom(36, pp)

## CDF
ppoisbinom(36, pp)

## Quantile function
qpoisbinom(0.3, pp)

## Random deviates
rpoisbinom(5, pp)
```

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