Package 'likelihoodExplore'

October 13, 2022

Type Package

Title Likelihood Exploration

Version 0.1.0

Maintainer Ben Barnard <ben_barnard@outlook.com>

Description Provides likelihood functions as defined by Fisher (1922) <doi:10.1098/rsta.1922.0009> and a function that creates likelihood functions from density functions. The functions are meant to aid in education of likelihood based methods.

License GPL-2

LazyData TRUE

RoxygenNote 6.0.1

Suggests covr

Imports lazyeval, plyr

URL https://likelihoodExplore.bearstatistics.com

NeedsCompilation no

Author Ben Barnard [aut, cre]

Repository CRAN

Date/Publication 2017-11-14 15:51:01 UTC

R topics documented:

likbeta 2
likbinom 3
likcauchy 3
likchisq 4
likelihood 5
likelihoodExplore 5
likexp 6
likf 6
likgamma 7
likgeom 8

likhyper 9
liklnorm 9
liklogis 10
likmultinom 11
liknbinom 12
liknorm 13
likpois 13
likt 14
likunif 15
likweibull 16
likwilcox 16

Index **18**

`likbeta` *Beta Log Likelihood Function*

Description

The log likelihood of a beta density with data, x, shape1, shape2 and ncp parameters.

Usage

```
likbeta(x, shape1, shape2, ncp = 0, log = TRUE)
```

Arguments

`x`	vector of quantiles.
`shape1`	non-negative parameters of the Beta distribution.
`shape2`	non-negative parameters of the Beta distribution.
`ncp`	non-centrality parameter.
`log`	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the beta density given the data where shape1, shape2, and ncp can be held constant or if vector were given vector will be returned.

Examples

```
likbeta(x = rbeta(n = 2, shape1 = 3, shape2 = 4),
        shape1 = 3, shape2 = 4)
```

likbinom *Binomial Log Likelihood Function*

Description

The log likelihood of a binomial density with data, x, size and prob parameters.

Usage

```
likbinom(x, size, prob, log = TRUE)
```

Arguments

x	vector of quantiles.
size	number of trials (zero or more).
prob	probability of success on each trial.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the binomial density given the data where size and prob can be held constant or if vector were given vector will be returned.

Examples

```
likbinom(x = rbinom(n = 2, size = 3, prob = .4),
        size = 3, prob = .4)
```

likcauchy *Cauchy Log Likelihood Function*

Description

The log likelihood of a Cauchy density with data, x, location and scale parameters.

Usage

```
likcauchy(x, location = 0, scale = 1, log = TRUE)
```

Arguments

x	vector of quantiles.
location	location and scale parameters.
scale	location and scale parameters.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the Cauchy density given the data where location and scale can be held constant or if vector were given vector will be returned.

Examples

```
likcauchy(x = rcauchy(n = 2))
```

---

likchisq *Chi-Squared Log Likelihood Function*

Description

The log likelihood of a chi-squared density with data, x, df and ncp parameters.

Usage

```
likchisq(x, df, ncp = 0, log = TRUE)
```

Arguments

x	vector of quantiles.
df	degrees of freedom (non-negative, but can be non-integer).
ncp	non-centrality parameter (non-negative).
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the chi-squared density given the data where df and ncp can be held constant or if vector were given vector will be returned.

Examples

```
likchisq(x = rchisq(n = 2, df = 4),
        df = 4)
```

`likelihood` *Log Likelihood Function Maker*

Description

Function that creates a log likelihood function given a density function density.

Usage

```
likelihood(density, ...)
```

Arguments

`density`	density function used
`...`	other options

Details

The log likelihood is the log of a function of parameters given the data.

Value

A function that is the log likelihood function from density function density.

Examples

```
likelihood(dnorm, x = rnorm(100))
```

`likelihoodExplore` *Likelihood Exploration*

Description

A package of likelihood functions as defined by Fisher <doi:10.1098/rsta.1922.0009> and a function that creates likelihood functions from density functions. The functions are meant to aid in education of likelihood based methods.

likexp *Exponential Log Likelihood Function*

Description

The log likelihood of a exponential density with data, x, rate parameter.

Usage

```
likexp(x, rate = 1, log = TRUE)
```

Arguments

x	vector of quantiles.
rate	vector of rates.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the exponential density given the data where rate can be held constant or if vector were given vector will be returned.

Examples

```
likexp(x = rexp(n = 2))
```

likf *F Log Likelihood Function*

Description

The log likelihood of a F density with data, x, df1, df2 and ncp parameters.

Usage

```
likf(x, df1, df2, ncp, log = TRUE)
```

Arguments

x	vector of quantiles.
df1	degrees of freedom. Inf is allowed.
df2	degrees of freedom. Inf is allowed.
ncp	non-centrality parameter. If omitted the central F is assumed.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the f density given the data where df1, df2, and ncp can be held constant or if vector were given vector will be returned.

Examples

```
likf(x = rf(n = 2, df1 = 3, df2 = 4),
        df1 = 3, df2 = 4)
```

---

likgamma *Gamma Log Likelihood Function*

Description

The log likelihood of a gamma density with data, x, shape, rate and scale parameters.

Usage

```
likgamma(x, shape, rate = 1, scale = 1/rate, log = TRUE)
```

Arguments

x	vector of quantiles.
shape	shape and scale parameters. Must be positive, scale strictly.
rate	an alternative way to specify the scale.
scale	shape and scale parameters. Must be positive, scale strictly.
log	logical; if TRUE, probabilities/densities p are returned as $log(p)$.

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the gamma density given the data where shape, scale, and rate can be held constant or if vector were given vector will be returned.

Examples

```
likgamma(x = rgamma(n = 2, shape = 3),
        shape = 3)
```

`likgeom` *Geometric Log Likelihood Function*

Description

The log likelihood of a geometric density with data, x, prob parameter.

Usage

```
likgeom(x, prob, log = TRUE)
```

Arguments

`x`	vector of quantiles representing the number of failures in a sequence of Bernoulli trials before success occurs.
`prob`	probability of success in each trial. `0 < prob <= 1`.
`log`	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the geometric density given the data where prob can be held constant or if vector were given vector will be returned.

Examples

```
likgeom(x = rgeom(n = 2, prob = .4),
        prob = .4)
```

likhyper *Hypergeometric Log Likelihood Function*

Description

The log likelihood of a hypergeometric density with data, x, m, n and k parameters.

Usage

```
likhyper(x, m, n, k, log = TRUE)
```

Arguments

x	vector of quantiles representing the number of white balls drawn without replacement from an urn which contains both black and white balls.
m	the number of white balls in the urn.
n	the number of black balls in the urn.
k	the number of balls drawn from the urn.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the hypergeometric density given the data where m, n, and k can be held constant or if vector were given vector will be returned.

Examples

```
likhyper(x = rhyper(nn = 2, m = 3, n = 4, k = 2),
        m = 3, n = 4, k = 2)
```

liklnorm *Log Normal Log Likelihood Function*

Description

The log likelihood of a log normal density with data, x, meanlog and sdlog parameters.

Usage

```
liklnorm(x, meanlog = 0, sdlog = 1, log = TRUE)
```

Arguments

x	vector of quantiles.
meanlog	mean and standard deviation of the distribution on the log scale with default values of 0 and 1 respectively.
sdlog	mean and standard deviation of the distribution on the log scale with default values of 0 and 1 respectively.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the log normal density given the data where meanlog and sdlog can be held constant or if vector were given vector will be returned.

Examples

```
liklnorm(x = rlnorm(n = 2))
```

---

liklogis *Logistic Log Likelihood Function*

Description

The log likelihood of a logistic density with data, x, location and scale parameters.

Usage

```
liklogis(x, location = 0, scale = 1, log = TRUE)
```

Arguments

x	vector of quantiles.
location	location and scale parameters.
scale	location and scale parameters.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the logistic density given the data where location and scale can be held constant or if vector were given vector will be returned.

Examples

```
liklogis(x = rlogis(n = 2))
```

`likmultinom` *Multinomial Log Likelihood Function*

Description

The log likelihood of a multinomial density with data, x, size and prob parameters.

Usage

```
likmultinom(x, size = NULL, prob, log = TRUE)
```

Arguments

`x`	vector of length K of integers in `0:size`.
`size`	integer, say N, specifying the total number of objects that are put into K boxes in the typical multinomial experiment. For `dmultinom`, it defaults to `sum(x)`.
`prob`	numeric non-negative vector of length K, specifying the probability for the K classes; is internally normalized to sum 1. Infinite and missing values are not allowed.
`log`	logical; if TRUE, log probabilities are computed.

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the multinomial density given the data where size and prob can be held constant or if vector were given vector will be returned.

Examples

```
likmultinom(x = rmultinom(n = 2, size = 3, prob = .4),
        size = 3, prob = .4)
```

`liknbinom` *Negative Binomial Log Likelihood Function*

Description

The log likelihood of a negative binomial density with data, x, size, prob and mu parameters.

Usage

```
liknbinom(x, size, prob, mu, log = TRUE)
```

Arguments

`x`	vector of (non-negative integer) quantiles.
`size`	target for number of successful trials, or dispersion parameter (the shape parameter of the gamma mixing distribution). Must be strictly positive, need not be integer.
`prob`	probability of success in each trial. `0 < prob <= 1`.
`mu`	alternative parametrization via mean: see 'Details'.
`log`	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the negative binomial density given the data where size, prob, and mu can be held constant or if vector were given vector will be returned.

Examples

```
liknbinom(x = rnbinom(n = 2, size = 3, prob = .4),
        size = 3, prob = .4)
```

liknorm *Normal Log Likelihood Function*

Description

The log likelihood of a normal density with data, x, mean and sd parameters.

Usage

```
liknorm(x, mean = 0, sd = 1, log = TRUE)
```

Arguments

x	vector of quantiles.
mean	vector of means.
sd	vector of standard deviations.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the normal density given the data where mean and sd can be held constant or if vector were given vector will be returned.

Examples

```
liknorm(x = rnorm(n = 2))
```

likpois *Poisson Log Likelihood Function*

Description

The log likelihood of a Poisson density with data, x, lambda parameter.

Usage

```
likpois(x, lambda, log = TRUE)
```

Arguments

x	vector of (non-negative integer) quantiles.
lambda	vector of (non-negative) means.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the Poisson density given the data where lambda can be held constant or if vector were given vector will be returned.

Examples

```
likpois(x = rpois(n = 2, lambda = 4),
        lambda = 4)
```

---

likt *Student's t Log Likelihood Function*

Description

The log likelihood of a Student's t density with data, x, df and ncp parameters.

Usage

```
likt(x, df, ncp, log = TRUE)
```

Arguments

x	vector of quantiles.
df	degrees of freedom (> 0, maybe non-integer). df = Inf is allowed.
ncp	non-centrality parameter δ; currently except for rt(), only for abs(ncp) <= 37.62. If omitted, use the central t distribution.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the Student's t density given the data where df and ncp can be held constant or if vector were given vector will be returned.

Examples

```
likt(x = rt(n = 2, df = 4),
       df = 4)
```

`likunif` *Uniform Log Likelihood Function*

Description

The log likelihood of a uniform density with data, x, min and max parameters.

Usage

```
likunif(x, min = 0, max = 1, log = TRUE)
```

Arguments

`x`	vector of quantiles.
`min`	lower and upper limits of the distribution. Must be finite.
`max`	lower and upper limits of the distribution. Must be finite.
`log`	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the uniform density given the data where min and max can be held constant or if vector were given vector will be returned.

Examples

```
likunif(x = runif(n = 2))
```

likweibull *Weibull Log Likelihood Function*

Description

The log likelihood of a Weibull density with data, x, shape and scale parameters.

Usage

```
likweibull(x, shape, scale = 1, log = TRUE)
```

Arguments

x	vector of quantiles.
shape	shape and scale parameters, the latter defaulting to 1.
scale	shape and scale parameters, the latter defaulting to 1.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the Weibull density given the data where shape and scale can be held constant or if vector were given vector will be returned.

Examples

```
likweibull(x = rweibull(n = 2, shape = 3),
        shape = 3)
```

likwilcox *Wilcoxon Rank Sum Log Likelihood Function*

Description

The log likelihood of a Wilcoxon rank sum density with data, x, m and n parameters.

Usage

```
likwilcox(x, m, n, log = TRUE)
```

Arguments

x	vector of quantiles.
m	numbers of observations in the first and second sample, respectively. Can be vectors of positive integers.
n	numbers of observations in the first and second sample, respectively. Can be vectors of positive integers.
log	logical; if TRUE, probabilities p are given as log(p).

Details

The log likelihood is the log of a function of parameters given the data.

Value

A numeric scalar for the log likelihood of the Wilcoxon rank sum density given the data where m and n can be held constant or if vector were given vector will be returned.

Examples

```
likwilcox(x = rwilcox(nn = 2, m = 3, n = 4),
        m = 3, n = 4)
```

Index

likbeta, 2
likbinom, 3
likcauchy, 3
likchisq, 4
likelihood, 5
likelihoodExplore, 5
likelihoodExplore-package
        *(*likelihoodExplore*)*, 5
likexp, 6
likf, 6
likgamma, 7
likgeom, 8
likhyper, 9
liklnorm, 9
liklogis, 10
likmultinom, 11
liknbinom, 12
liknorm, 13
likpois, 13
likt, 14
likunif, 15
likweibull, 16
likwilcox, 16