Package ‘likelihoodExplore’

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Maintainer Ben Barnard <ben_barnard@outlook.com>
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<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.
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Author Ben Barnard [aut, cre]
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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)
likchisq

Arguments

x
location
scale
log
ter of quantiles.
location and scale parameters.
location and scale parameters.
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
df
ncp
log
vector of quantiles.
degrees of freedom (non-negative, but can be non-integer).
non-centrality parameter (non-negative).
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.
likelihood

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)
likgamma

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 = RL df1 = 3L dfR = TI

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

```r
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

```r
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. \(0 < \text{prob} \leq 1\).
- `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

```r
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.
**likmultinom**

**Examples**

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

---

**Description**

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

**Usage**

```r
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**

```r
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. $0 < \text{prob} \leq 1$.
- `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**

```r
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

```r
likpois(x = rpois(n = 2, lambda = TIL lambda = TI
```
**likunif**

**Examples**

```
lik(t(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)
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