

# Package ‘LRTeR’

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**Title** Likelihood Ratio Tests and Confidence Intervals

**Version** 1.2.1

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**Description** A collection of hypothesis tests and confidence intervals based on the likelihood ratio  
<[https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)>.

**License** GPL-3

**Encoding** UTF-8

**Imports** stats, rlang, statmod, stringr, EnvStats

**RoxygenNote** 7.2.3

**Suggests** covr, testthat, lmtest, knitr, rmarkdown, emplik, emplik2,  
datasets

**VignetteBuilder** knitr

**URL** <https://github.com/gmcmacran/LRTeR>

**BugReports** <https://github.com/gmcmacran/LRTeR/issues>

**NeedsCompilation** no

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---

beta\_shape1\_one\_sample

*Test the shape1 parameter of a beta distribution.*

---

**Description**

Test the shape1 parameter of a beta distribution.

**Usage**

beta\_shape1\_one\_sample(x, shape1, alternative = "two.sided", conf.level = 0.95)

**Arguments**

x	a numeric vector of at least 50 data values.
shape1	a number indicating the tested value of the shape1 parameter.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTester)

# Null is true
set.seed(1)
x <- rbeta(100, shape1 = 1, shape2 = 2)
beta_shape1_one_sample(x, 1, "two.sided")

# Null is false
set.seed(1)
x <- rbeta(100, shape1 = 3, shape2 = 2)
beta_shape1_one_sample(x, 1, "greater")
```

---

beta\_shape1\_one\_way    *Test the equality of shape 1 parameters of beta distributions.*

---

**Description**

Test the equality of shape 1 parameters of beta distributions.

**Usage**

```
beta_shape1_one_way(x, fctr, conf.level = 0.95)
```

**Arguments**

x	a numeric vector of at least 50 data values per group.
fctr	a factor vector indicating groups.
conf.level	overall confidence level of the likelihood intervals. Uses Bonferroni correction.

**Details**

- Null: All shape1s are equal. ( $\text{shape1}_1 = \text{shape1}_2 \dots \text{shape1}_k$ ).
- Alternative: At least one shape1 is not equal.

**Value**

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rbeta(150, 1, 2)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
beta_shape1_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rbeta(50, 1, 2), rbeta(50, 2, 2), rbeta(50, 3, 2))
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
beta_shape1_one_way(x, fctr, .95)
```

---

beta\_shape2\_one\_sample

*Test the shape2 parameter of a beta distribution.*

---

**Description**

Test the shape2 parameter of a beta distribution.

**Usage**

```
beta_shape2_one_sample(x, shape2, alternative = "two.sided", conf.level = 0.95)
```

**Arguments**

x	a numeric vector of at least 50 data values.
shape2	a number indicating the tested value of the shape2 parameter.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTester)

# Null is true
set.seed(1)
x <- rbeta(100, shape1 = 1, shape2 = 1)
beta_shape2_one_sample(x, 1, "two.sided")

# Null is false
set.seed(1)
x <- rbeta(100, shape1 = 1, shape2 = 3)
beta_shape2_one_sample(x, 1, "greater")
```

---

beta\_shape2\_one\_way     *Test the equality of shape 2 parameters of beta distributions.*

---

**Description**

Test the equality of shape 2 parameters of beta distributions.

**Usage**

```
beta_shape2_one_way(x, fctr, conf.level = 0.95)
```

**Arguments**

x	a numeric vector of at least 50 data values per group.
fctr	a factor vector indicating groups.
conf.level	overall confidence level of the likelihood intervals. Uses Bonferroni correction.

**Details**

- Null: All shape2s are equal. ( $\text{shape2}_1 = \text{shape2}_2 \dots \text{shape2}_k$ ).
- Alternative: At least one shape2 is not equal.

**Value**

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTester)

# Null is true
set.seed(1)
x <- rbeta(150, 2, 2)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
beta_shape2_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rbeta(50, 2, 1), rbeta(50, 2, 2), rbeta(50, 2, 3))
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
beta_shape2_one_way(x, fctr, .95)
```

---

binomial\_p\_one\_sample *Test the p parameter of a binomial distribution.*

---

**Description**

Test the p parameter of a binomial distribution.

**Usage**

```
binomial_p_one_sample(x, n, p, alternative = "two.sided", conf.level = 0.95)
```

**Arguments**

x	Number of successes.
n	Number of trials.
p	Hypothesized probability of success.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)

# Null is true. 52 successes. 100 trials
binomial_p_one_sample(52, 100, .50, "two.sided")

# Null is false. 75 successes. 100 trials
binomial_p_one_sample(75, 100, .50, "two.sided")
```

---

binomial\_p\_one\_way     *Test the equality of p parameters of binomial distributions.*

---

**Description**

Test the equality of p parameters of binomial distributions.

**Usage**

```
binomial_p_one_way(x, n, fctr, conf.level = 0.95)
```

**Arguments**

x	a numeric vector indicating number of successes per group.
n	a numeric vector indicating number of attempts per group.
fctr	a factor vector indicating groups.
conf.level	overall confidence level of the likelihood intervals. Uses Bonferroni correction.

**Value**

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTester)

# Null is true.
set.seed(1)
x <- rbinom(3, 50, .5)
n <- rep(50, length(x))
fctr <- factor(1:length(x))
binomial_p_one_way(x, n, fctr, .95)

# Null is false
set.seed(1)
x <- rbinom(3, 50, c(.25, .50, .75))
n <- rep(50, length(x))
fctr <- factor(1:length(x))
binomial_p_one_way(x, n, fctr, .95)
```

---

cauchy\_location\_one\_sample

*Test the location parameter of a cauchy distribution.*

---

**Description**

Test the location parameter of a cauchy distribution.

**Usage**

```
cauchy_location_one_sample(
  x,
  location,
  alternative = "two.sided",
  conf.level = 0.95
)
```



**Arguments**

x	a numeric vector of at least 50 data values.
location	a number indicating the tested value of the location parameter.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rcauchy(n = 100, location = 1, scale = 2)
cauchy_location_one_sample(x, 1, "two.sided")

# Null is false
set.seed(1)
x <- rcauchy(n = 100, location = 3, scale = 2)
cauchy_location_one_sample(x, 1, "greater")
```

---

cauchy\_location\_one\_way

*Test the equality of location parameters of cauchy distributions.*

---

**Description**

Test the equality of location parameters of cauchy distributions.

**Usage**

```
cauchy_location_one_way(x, fctr, conf.level = 0.95)
```

**Arguments**

x	a numeric vector of at least 50 data values per group.
fctr	a factor vector indicating groups.
conf.level	overall confidence level of the likelihood intervals. Uses Bonferroni correction.

**Details**

- All locations are equal. (location\_1 = location\_2 ... location\_k).
- Alternative: At least one location is not equal.

**Value**

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rcauchy(n = 150, location = 1, scale = 2)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
cauchy_location_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rcauchy(50, 1, 2), rcauchy(50, 2, 2), rcauchy(50, 3, 2))
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
cauchy_location_one_way(x, fctr, .95)
```

---

cauchy\_scale\_one\_sample

*Test the scale parameter of a cauchy distribution.*

---

**Description**

Test the scale parameter of a cauchy distribution.

**Usage**

```
cauchy_scale_one_sample(x, scale, alternative = "two.sided", conf.level = 0.95)
```

**Arguments**

x	a numeric vector of at least 50 data values.
scale	a number indicating the tested value of the scale parameter.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTester)

# Null is true
set.seed(1)
x <- rcauchy(n = 100, location = 1, scale = 2)
cauchy_scale_one_sample(x, 2, "two.sided")

# Null is false
set.seed(1)
x <- rcauchy(n = 100, location = 3, scale = 2)
cauchy_scale_one_sample(x, 1, "greater")
```

---

cauchy\_scale\_one\_way *Test the equality of scale parameters of cauchy distributions.*

---

**Description**

Test the equality of scale parameters of cauchy distributions.

**Usage**

```
cauchy_scale_one_way(x, fctr, conf.level = 0.95)
```

**Arguments**

<code>x</code>	a numeric vector of at least 50 data values per group.
<code>fctr</code>	a factor vector indicating groups.
<code>conf.level</code>	overall confidence level of the likelihood intervals. Uses Bonferroni correction.

**Details**

- Null: All scales are equal. ( $scale_1 = scale_2 \dots scale_k$ ).
- Alternative: At least one scale is not equal.

**Value**

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rcauchy(n = 150, 1, 2)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
cauchy_scale_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rcauchy(50, 2, 1), rcauchy(50, 2, 2), rcauchy(50, 2, 3))
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
cauchy_scale_one_way(x, fctr, .95)
```

---

empirical\_mu\_one\_sample

*Test the mean parameter of an unknown distribution.*

---

**Description**

Test the mean parameter of an unknown distribution.

**Usage**

```
empirical_mu_one_sample(x, mu, alternative = "two.sided", conf.level = 0.95)
```

**Arguments**

x	a numeric vector.
mu	a number indicating the tested value of mu.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Owen. Empirical Likelihood. Chapman & Hall/CRC.

**Examples**

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rnorm(25, 0, 1)
empirical_mu_one_sample(x, 0, "two.sided")

# Null is false
set.seed(1)
x <- rnorm(25, 2, 1)
empirical_mu_one_sample(x, 1, "greater")
```

---

empirical\_mu\_one\_way *Test the equality of means of an unknown distribution.*

---

**Description**

Test the equality of means of an unknown distribution.

**Usage**

```
empirical_mu_one_way(x, fctr, conf.level = 0.95)
```

**Arguments**

x	a numeric vector.
fctr	a factor vector indicating groups.
conf.level	overall confidence level of the likelihood intervals. Uses Bonferroni correction.

**Details**

- Null: All mus are equal. ( $\mu_1 = \mu_2 \dots \mu_k$ ).
- Alternative: At least one mu is not equal.

**Value**

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

**Source**

- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Owen. Empirical Likelihood. Chapman & Hall/CRC.

**Examples**

```
library(LRTester)

# Null is true
set.seed(1)
x <- rnorm(75, 1, 1)
fctr <- c(rep(1, 25), rep(2, 25), rep(3, 25))
fctr <- factor(fctr, levels = c("1", "2", "3"))
empirical_mu_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rnorm(25, 1, 1), rnorm(25, 2, 1), rnorm(25, 3, 1))
fctr <- c(rep(1, 25), rep(2, 25), rep(3, 25))
fctr <- factor(fctr, levels = c("1", "2", "3"))
empirical_mu_one_way(x, fctr, .95)
```

---

empirical\_quantile\_one\_sample

*Test a quantile of an unknown distribution.*

---

**Description**

Test a quantile of an unknown distribution.

**Usage**

```
empirical_quantile_one_sample(  
  x,  
  Q,  
  value,  
  alternative = "two.sided",  
  conf.level = 0.95  
)
```

**Arguments**

x	a numeric vector.
Q	The quantile. A single numeric number. (.50 is median.)
value	A single numeric value that is the hypothesized Q quantile.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Details**

For confidence intervals, an endpoint may be outside the observed range of x. In this case, NA is returned. Reducing confidence or collecting more data will make the CI computable.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Owen. Empirical Likelihood. Chapman & Hall/CRC.

**Examples**

```
library(LRTester)  
  
# Null is true  
set.seed(1)  
x <- rnorm(25, 0, 1)  
empirical_quantile_one_sample(x, .5, 0, "two.sided")  
  
# Null is false  
set.seed(1)  
x <- rnorm(25, 2, 1)  
empirical_quantile_one_sample(x, .5, 1, "greater")
```

---

`empirical_quantile_one_way`*Test the equality of a quantile from an unknown distribution.*

---

## Description

Test the equality of a quantile from an unknown distribution.

## Usage

```
empirical_quantile_one_way(x, Q, fctr, conf.level = 0.95)
```

## Arguments

<code>x</code>	a numeric vector.
<code>Q</code>	The quantile. A single numeric number. (.50 is median.)
<code>fctr</code>	a factor vector indicating groups.
<code>conf.level</code>	overall confidence level of the likelihood intervals. Uses Bonferroni correction.

## Details

- Null: Quantiles are equal. ( $Q_1 = Q_2 \dots Q_k$ ).
- Alternative: At least one quantile is not equal.

## Value

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

## Source

- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Owen. Empirical Likelihood. Chapman & Hall/CRC.

## Examples

```
library(LRTester)

# Null is true
set.seed(1)
x <- rnorm(75, 1, 1)
fctr <- c(rep(1, 25), rep(2, 25), rep(3, 25))
fctr <- factor(fctr, levels = c("1", "2", "3"))
empirical_quantile_one_way(x, .50, fctr, .95)

# Null is false
set.seed(1)
```



```
x <- c(rnorm(25, 1, 1), rnorm(25, 2, 1), rnorm(25, 3, 1))
fctr <- c(rep(1, 25), rep(2, 25), rep(3, 25))
fctr <- factor(fctr, levels = c("1", "2", "3"))
empirical_quantile_one_way(x, .50, fctr, .95)
```

---

exponential\_rate\_one\_sample

*Test the rate parameter of a exponential distribution.*

---

### Description

Test the rate parameter of a exponential distribution.

### Usage

```
exponential_rate_one_sample(
  x,
  rate,
  alternative = "two.sided",
  conf.level = 0.95
)
```

### Arguments

x	a numeric vector of at least 50 data values.
rate	a number indicating the tested value of rate.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

### Value

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

### Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

## Examples

```
library(LRTester)

# Null is true
set.seed(1)
x <- rexp(100, 1)
exponential_rate_one_sample(x, 1, "two.sided")

# Null is false
set.seed(1)
x <- rexp(100, 3)
exponential_rate_one_sample(x, 1, "greater")
```

---

exponential\_rate\_one\_way

*Test the equality of rate parameters of exponential distributions.*

---

## Description

Test the equality of rate parameters of exponential distributions.

## Usage

```
exponential_rate_one_way(x, fctr, conf.level = 0.95)
```

## Arguments

**x** a numeric vector of at least 50 data values per group.  
**fctr** a factor vector indicating groups.  
**conf.level** overall confidence level of the likelihood intervals. Uses Bonferroni correction.

## Details

- Null: All lambdas are equal. ( $\lambda_1 = \lambda_2 \dots \lambda_k$ ).
- Alternative: At least one lambda is not equal.

## Value

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

## Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

## Examples

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rexp(150, 1)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
exponential_rate_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rexp(50, 1), rexp(50, 2), rexp(50, 3))
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
exponential_rate_one_way(x, fctr, .95)
```

---

gamma\_rate\_one\_sample *Test the rate parameter of a gamma distribution.*

---

## Description

Test the rate parameter of a gamma distribution.

## Usage

```
gamma_rate_one_sample(x, rate, alternative = "two.sided", conf.level = 0.95)
```

## Arguments

x	a numeric vector of at least 50 data values.
rate	a number indicating the tested value of the rate parameter.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

## Value

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

## Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

## Examples

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rgamma(100, shape = 1, rate = 1)
gamma_rate_one_sample(x, 1, "two.sided")

# Null is false
set.seed(1)
x <- rgamma(100, shape = 1, rate = 2)
gamma_rate_one_sample(x, 1, "greater")
```

---

gamma\_rate\_one\_way      *Test the equality of rate parameters of gamma distributions.*

---

## Description

Test the equality of rate parameters of gamma distributions.

## Usage

```
gamma_rate_one_way(x, fctr, conf.level = 0.95)
```

## Arguments

`x`                      a numeric vector of at least 50 data values per group.  
`fctr`                    a factor vector indicating groups.  
`conf.level`            overall confidence level of the likelihood intervals. Uses Bonferroni correction.

## Details

- Null: All rates are equal. ( $\text{rate}_1 = \text{rate}_2 \dots \text{rate}_k$ ).
- Alternative: At least one rate is not equal.

## Value

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

## Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

## Examples

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rgamma(150, 1, 2)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
gamma_rate_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rgamma(50, 2, 1), rgamma(50, 2, 2), rgamma(50, 2, 3))
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
gamma_rate_one_way(x, fctr, .95)
```

---

gamma\_scale\_one\_sample

*Test the scale parameter of a gamma distribution.*

---

## Description

Test the scale parameter of a gamma distribution.

## Usage

```
gamma_scale_one_sample(x, scale, alternative = "two.sided", conf.level = 0.95)
```

## Arguments

x	a numeric vector of at least 50 data values.
scale	a number indicating the tested value of the scale parameter.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

## Value

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

## Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

## Examples

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rgamma(100, shape = 1, scale = 2)
gamma_scale_one_sample(x, 2, "two.sided")

# Null is false
set.seed(1)
x <- rgamma(100, shape = 1, scale = 2)
gamma_scale_one_sample(x, 1, "greater")
```

---

gamma\_scale\_one\_way    *Test the equality of scale parameters of gamma distributions.*

---

## Description

Test the equality of scale parameters of gamma distributions.

## Usage

```
gamma_scale_one_way(x, fctr, conf.level = 0.95)
```

## Arguments

`x`                    a numeric vector of at least 50 data values per group.  
`fctr`                  a factor vector indicating groups.  
`conf.level`          overall confidence level of the likelihood intervals. Uses Bonferroni correction.

## Details

- Null: Null: All scales are equal. ( $scale_1 = scale_2 \dots scale_k$ ).
- Alternative: At least one scale is not equal.

## Value

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

## Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```

library(LRTesteR)

# Null is true
set.seed(1)
x <- rgamma(150, 1, scale = 2)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
gamma_scale_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rgamma(50, 2, scale = 1), rgamma(50, 2, scale = 2), rgamma(50, 2, scale = 3))
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
gamma_scale_one_way(x, fctr, .95)

```

---

gamma\_shape\_one\_sample

*Test the shape parameter of a gamma distribution.*

---

**Description**

Test the shape parameter of a gamma distribution.

**Usage**

```
gamma_shape_one_sample(x, shape, alternative = "two.sided", conf.level = 0.95)
```

**Arguments**

x	a numeric vector of at least 50 data values.
shape	a number indicating the tested value of the shape parameter.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

## Examples

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rgamma(100, shape = 1, scale = 2)
gamma_shape_one_sample(x, 1, "two.sided")

# Null is false
set.seed(1)
x <- rgamma(100, shape = 3, scale = 2)
gamma_shape_one_sample(x, 1, "greater")
```

---

gamma\_shape\_one\_way    *Test the equality of shape parameters of gamma distributions.*

---

## Description

Test the equality of shape parameters of gamma distributions.

## Usage

```
gamma_shape_one_way(x, fctr, conf.level = 0.95)
```

## Arguments

x	a numeric vector of at least 50 data values per group.
fctr	a factor vector indicating groups.
conf.level	overall confidence level of the likelihood intervals. Uses Bonferroni correction.

## Details

- Null: All shapes are equal. (shape<sub>1</sub> = shape<sub>2</sub> ... shape<sub>k</sub>).
- Alternative: At least one shape is not equal.

## Value

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

## Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.



## Examples

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rgamma(150, 2, 2)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
gamma_shape_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rgamma(50, 1, 2), rgamma(50, 2, 2), rgamma(50, 3, 2))
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
gamma_shape_one_way(x, fctr, .95)
```

---

gaussian\_mu\_one\_sample

*Test the mean of a gaussian distribution.*

---

## Description

Test the mean of a gaussian distribution.

## Usage

```
gaussian_mu_one_sample(x, mu, alternative = "two.sided", conf.level = 0.95)
```

## Arguments

x	a numeric vector of at least 50 data values.
mu	a number indicating the tested value of mu.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

## Value

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

## Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

## Examples

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rnorm(100, 0, 1)
gaussian_mu_one_sample(x, 0, "two.sided")

# Null is false
set.seed(1)
x <- rnorm(100, 3, 1)
gaussian_mu_one_sample(x, 0, "greater")
```

---

gaussian\_mu\_one\_way    *Test the equality of means of gaussian distributions.*

---

## Description

Test the equality of means of gaussian distributions.

## Usage

```
gaussian_mu_one_way(x, fctr, conf.level = 0.95)
```

## Arguments

x	a numeric vector of at least 50 data values per group.
fctr	a factor vector indicating groups.
conf.level	overall confidence level of the likelihood intervals. Uses Bonferroni correction.

## Details

- Null: All mus are equal. ( $\mu_1 = \mu_2 \dots \mu_k$ ).
- Alternative: At least one mu is not equal.

## Value

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

## Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rnorm(150, 1, 1)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
gaussian_mu_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rnorm(50, 1, 1), rnorm(50, 2, 1), rnorm(50, 3, 1))
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
gaussian_mu_one_way(x, fctr, .95)
```

---

gaussian\_variance\_one\_sample

*Test the variance of a gaussian distribution.*

---

**Description**

Test the variance of a gaussian distribution.

**Usage**

```
gaussian_variance_one_sample(  
  x,  
  sigma.squared,  
  alternative = "two.sided",  
  conf.level = 0.95  
)
```

**Arguments**

x	a numeric vector of at least 50 data values.
sigma.squared	a number indicating the tested value of sigma squared.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rnorm(100, 0, 1)
gaussian_variance_one_sample(x, 1, "two.sided")

# Null is false
set.seed(1)
x <- rnorm(100, 0, 2)
gaussian_variance_one_sample(x, 1, "greater")
```

---

gaussian\_variance\_one\_way

*Test the equality of variance parameters of gaussian distributions.*

---

**Description**

Test the equality of variance parameters of gaussian distributions.

**Usage**

```
gaussian_variance_one_way(x, fctr, conf.level = 0.95)
```

**Arguments**

x	a numeric vector of at least 50 data values per group.
fctr	a factor vector indicating groups.
conf.level	overall confidence level of the likelihood intervals. Uses Bonferroni correction.

**Details**

- Null: All variances are equal. ( $\sigma^2_1 = \sigma^2_2 \dots \sigma^2_k$ ).
- Alternative: At least one variance is not equal.

**Value**

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rnorm(150, 1, 1)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
gaussian_variance_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rnorm(50, 1, 1), rnorm(50, 1, 2), rnorm(50, 1, 3))
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
gaussian_variance_one_way(x, fctr, .95)
```

---

```
inverse_gaussian_dispersion_one_sample
```

*Test the dispersion parameter of an inverse gaussian distribution.*

---

**Description**

Test the dispersion parameter of an inverse gaussian distribution.

**Usage**

```
inverse_gaussian_dispersion_one_sample(
  x,
  dispersion,
  alternative = "two.sided",
  conf.level = 0.95
)
```

**Arguments**

x	a numeric vector of at least 50 data values.
dispersion	a number indicating the tested value of the dispersion parameter.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)
library(statmod)

# Null is true
set.seed(1)
x <- rinvgauss(n = 100, mean = 1, dispersion = 2)
inverse_gaussian_dispersion_one_sample(x, 2, "two.sided")

# Null is false
set.seed(1)
x <- rinvgauss(n = 100, mean = 1, dispersion = 2)
inverse_gaussian_dispersion_one_sample(x, 1, "greater")
```

---

inverse\_gaussian\_dispersion\_one\_way

*Test the equality of dispersion parameters of inverse gaussian distributions.*

---

**Description**

Test the equality of dispersion parameters of inverse gaussian distributions.

**Usage**

```
inverse_gaussian_dispersion_one_way(x, fctr, conf.level = 0.95)
```

**Arguments**

x                    a numeric vector of at least 50 data values per group.  
fctr                  a factor vector indicating groups.  
conf.level          overall confidence level of the likelihood intervals. Uses Bonferroni correction.

**Details**

- Null: Null: All dispersion parameters are equal. (dispersion\_1 = dispersion\_2 ... dispersion\_k).
- Alternative: At least one dispersion is not equal.

**Value**

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)
library(statmod)

# Null is true
set.seed(1)
x <- rinvgauss(n = 150, mean = 1, dispersion = 2)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
inverse_gaussian_dispersion_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(
  rinvgauss(n = 50, mean = 1, dispersion = 1),
  rinvgauss(n = 50, mean = 1, dispersion = 3),
  rinvgauss(n = 50, mean = 1, dispersion = 4)
)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
inverse_gaussian_dispersion_one_way(x, fctr, .95)
```

---

inverse\_gaussian\_mu\_one\_sample

*Test the mean of an inverse gaussian distribution.*

---

**Description**

Test the mean of an inverse gaussian distribution.

**Usage**

```
inverse_gaussian_mu_one_sample(  
  x,  
  mu,  
  alternative = "two.sided",  
  conf.level = 0.95  
)
```

**Arguments**

x	a numeric vector of at least 50 data values.
mu	a number indicating the tested value of mu.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)  
library(statmod)  
  
# Null is true  
set.seed(1)  
x <- rinvgauss(n = 100, mean = 1, shape = 2)  
inverse_gaussian_mu_one_sample(x, 1, "two.sided")  
  
# Null is false  
set.seed(1)  
x <- rinvgauss(n = 100, mean = 3, shape = 2)  
inverse_gaussian_mu_one_sample(x, 1, "greater")
```



---

`inverse_gaussian_mu_one_way`*Test the equality of means of inverse gaussian distributions.*

---

## Description

Test the equality of means of inverse gaussian distributions.

## Usage

```
inverse_gaussian_mu_one_way(x, fctr, conf.level = 0.95)
```

## Arguments

`x` a numeric vector of at least 50 data values per group.  
`fctr` a factor vector indicating groups.  
`conf.level` overall confidence level of the likelihood intervals. Uses Bonferroni correction.

## Details

- Null: All mus are equal. ( $\mu_1 = \mu_2 \dots \mu_k$ ).
- Alternative: At least one mu is not equal.

## Value

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

## Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

## Examples

```
library(LRTesteR)
library(statmod)

# Null is true
set.seed(1)
x <- ringauss(n = 150, mean = 1, shape = 2)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
inverse_gaussian_mu_one_way(x, fctr, .95)

# Null is false
```

```
set.seed(1)
x <- c(
  rinvgauss(n = 50, mean = 1, shape = 2),
  rinvgauss(n = 50, mean = 2, shape = 2),
  rinvgauss(n = 50, mean = 3, shape = 2)
)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
inverse_gaussian_mu_one_way(x, fctr, .95)
```

---

inverse\_gaussian\_shape\_one\_sample

*Test the shape parameter of an inverse gaussian distribution.*

---

### Description

Test the shape parameter of an inverse gaussian distribution.

### Usage

```
inverse_gaussian_shape_one_sample(
  x,
  shape,
  alternative = "two.sided",
  conf.level = 0.95
)
```

### Arguments

x	a numeric vector of at least 50 data values.
shape	a number indicating the tested value of the shape parameter.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

### Value

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

### Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

### Examples

```
library(LRTesteR)
library(statmod)

# Null is true
set.seed(1)
x <- rinvgauss(n = 100, mean = 1, shape = 2)
inverse_gaussian_shape_one_sample(x, 2, "two.sided")

# Null is false
set.seed(1)
x <- rinvgauss(n = 100, mean = 1, shape = 2)
inverse_gaussian_shape_one_sample(x, 1, "greater")
```

---

inverse\_gaussian\_shape\_one\_way

*Test the equality of shape parameters of inverse gaussian distributions.*

---

### Description

Test the equality of shape parameters of inverse gaussian distributions.

### Usage

```
inverse_gaussian_shape_one_way(x, fctr, conf.level = 0.95)
```

### Arguments

**x** a numeric vector of at least 50 data values per group.  
**fctr** a factor vector indicating groups.  
**conf.level** overall confidence level of the likelihood intervals. Uses Bonferroni correction.

### Details

- Null: Null: All shapes are equal. ( $\text{shape}_1 = \text{shape}_2 \dots \text{shape}_k$ ).
- Alternative: At least one shape is not equal.

### Value

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

### Source

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

### Examples

```
library(LRTesteR)
library(statmod)

# Null is true
set.seed(1)
x <- rinvgauss(n = 150, mean = 1, shape = 2)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
inverse_gaussian_shape_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(
  rinvgauss(n = 50, mean = 1, shape = 1),
  rinvgauss(n = 50, mean = 1, shape = 3),
  rinvgauss(n = 50, mean = 1, shape = 4)
)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
inverse_gaussian_shape_one_way(x, fctr, .95)
```

---

negative\_binomial\_p\_one\_sample

*Test the p parameter of a negative binomial distribution.*

---

### Description

Test the p parameter of a negative binomial distribution.

### Usage

```
negative_binomial_p_one_sample(
  num_failures,
  num_successes,
  p,
  alternative = "two.sided",
  conf.level = 0.95
)
```

### Arguments

num_failures	Number of failures.
num_successes	Number of successes.
p	Hypothesized probability of success.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTester)

# Null is true. 48 failures before 52 successes.
negative_binomial_p_one_sample(48, 52, .50, "two.sided")

# Null is false. 25 failures before 75 successes.
negative_binomial_p_one_sample(25, 75, .50, "two.sided")
```

---

negative\_binomial\_p\_one\_way

*Test the equality of p parameters of negative binomial distributions.*

---

**Description**

Test the equality of p parameters of negative binomial distributions.

**Usage**

```
negative_binomial_p_one_way(  
  num_failures,  
  num_successes,  
  fctr,  
  conf.level = 0.95  
)
```

**Arguments**

num\_failures a numeric vector indicating number of failures per group.  
num\_successes a numeric vector indicating number of successes per group.  
fctr a factor vector indicating groups.  
conf.level overall confidence level of the likelihood intervals. Uses Bonferroni correction.

**Value**

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)

# Null is true.
set.seed(1)
num_failures <- rnbino(3, 50, .5)
num_successes <- rep(50, length(num_failures))
fctr <- factor(1:length(num_failures))
negative_binomial_p_one_way(num_failures, num_successes, fctr, .95)

# Null is false
set.seed(1)
num_failures <- rnbino(3, 50, c(.25, .50, .75))
num_successes <- rep(50, length(num_failures))
fctr <- factor(1:length(num_failures))
negative_binomial_p_one_way(num_failures, num_successes, fctr, .95)
```

---

poisson\_lambda\_one\_sample

*Test the lambda parameter of a poisson distribution.*

---

**Description**

Test the lambda parameter of a poisson distribution.

**Usage**

```
poisson_lambda_one_sample(  
  x,  
  lambda,  
  alternative = "two.sided",  
  conf.level = 0.95  
)
```

**Arguments**

x	a numeric vector of at least 50 data values.
lambda	a number indicating the tested value of lambda
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the likelihood interval.

**Value**

An S3 class containing the test statistic, p value, likelihood based confidence interval, and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTesteR)

# Null is true
set.seed(1)
x <- rpois(100, 1)
poisson_lambda_one_sample(x, 1, "two.sided")

# Null is false
set.seed(1)
x <- rpois(100, 2)
poisson_lambda_one_sample(x, 1, "greater")
```

---

poisson\_lambda\_one\_way

*Test the equality of lambda parameters of poisson distributions.*

---

**Description**

Test the equality of lambda parameters of poisson distributions.

**Usage**

```
poisson_lambda_one_way(x, fctr, conf.level = 0.95)
```

**Arguments**

x	a numeric vector of at least 50 data values per group.
fctr	a factor vector indicating groups.
conf.level	overall confidence level of the likelihood intervals. Uses Bonferroni correction.

**Details**

- All lambdas are equal. ( $\lambda_1 = \lambda_2 \dots \lambda_k$ ).
- Alternative: At least one lambda is not equal.

**Value**

An S3 class containing the test statistic, p value, list of likelihood based confidence intervals, overall confidence level, individual confidence level of each interval and alternative hypothesis.

**Source**

- [https://en.wikipedia.org/wiki/Likelihood-ratio\\_test](https://en.wikipedia.org/wiki/Likelihood-ratio_test)
- Yudi Pawitan. In All Likelihood. Oxford University Press.
- Hodd, McKean, and Craig. Introduction to Mathematical Statistics. Pearson.

**Examples**

```
library(LRTester)

# Null is true
set.seed(1)
x <- rpois(150, 1)
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
poisson_lambda_one_way(x, fctr, .95)

# Null is false
set.seed(1)
x <- c(rpois(50, 1), rpois(50, 2), rpois(50, 3))
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))
fctr <- factor(fctr, levels = c("1", "2", "3"))
poisson_lambda_one_way(x, fctr, .95)
```

---

```
print.lrtest
```

*Print results of tests.*

---

**Description**

Print results of tests.



**Usage**

```
## S3 method for class 'lrtest'  
print(x, ...)
```

**Arguments**

x	a test from LRTesteR.
...	arguments passed to other methods.

**Examples**

```
library(LRTesteR)  
  
set.seed(1)  
x <- rnorm(100, 0, 1)  
test <- gaussian_mu_one_sample(x, 0, "two.sided")  
print(test)  
  
set.seed(1)  
x <- rnorm(150, 1, 1)  
fctr <- c(rep(1, 50), rep(2, 50), rep(3, 50))  
fctr <- factor(fctr, levels = c("1", "2", "3"))  
test <- gaussian_mu_one_way(x, fctr, .95)  
print(test)
```

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