

Package ‘LRTeR’

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Title Likelihood Ratio Tests and Confidence Intervals

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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>.

License GPL-3

Encoding UTF-8

Imports stats, rlang, statmod

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R topics documented:

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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
- 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
- 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
- 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
- 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
- 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
- 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
- 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. (location₁ = location₂ ... 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
- 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
- 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

| | |
|------------|---|
| 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 scales are equal. (scale₁ = scale₂ ... 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
- 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)
```

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
- 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
- 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
- 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
- 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
- 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. (scale₁ = scale₂ ... 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
- 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
- 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. ($\text{shape}_1 = \text{shape}_2 \dots \text{shape}_k$).
- 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
- 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
- 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
- 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
- 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
- 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
- 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
- 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
- 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
- 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_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
- 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. (shape_1 = shape_2 ... 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
- 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
- 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
- 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
- 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
- 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.lrttest | <i>Print results of tests.</i> |
|---------------|--------------------------------|

Description

Print results of tests.

Usage

```
## S3 method for class 'lrttest'
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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