Package 'sprtt'

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Type Package

Title Sequential Probability Ratio Tests: Using t-Statistic

Version 0.1.0

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Description The seq_ttest() function is the implementation of Abraham Wald's (1947) <doi:10.2134/agronj1947.00021962003900070011x> Sequential Probability Ratio Test (SPRT) for the test of a normal mean (difference) with unknown variance in R (R Core Team, 2018). It performs sequential t tests developed by Rushton (1950) <doi:10.2307/2332385>, Rushton (1952) <doi:10.2307/2334026> and Hajnal (1961) <doi:10.2307/2333131>, based on the SPRT. Specifically, seq_ttest() performs one-sample, two-sample, and paired t tests for testing one- and two-sided hypotheses. The test is to be applied to the data during the sampling process, ideally after each observation. At any stage, it will return a decision to either continue sampling or terminate and accept one of the specified hypotheses. For more information on the SPRT t test, see Schnuerch & Erdfelder (2019) <doi:10.1037/met0000234>.

License GPL (>= 3)

URL https://meikesteinhilber.github.io/sprtt/

BugReports https://github.com/MeikeSteinhilber/sprtt/issues

Depends R (>= 3.5.0)

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`df_cancer` *Test data to run the examples*

Description

A dataset that includes 120 individuals.

Usage

```
df_cancer
```

Format

A data frame with 2 variables:

treatment_group

control_group

df_income *Test data to run the examples*

Description

A dataset that includes 120 individuals with sex gender and monthly income.

Usage

```
df_income
```

Format

A data frame with 2 variables:

monthly_income

sex

df_stress *Test data to run the examples*

Description

A dataset that includes 120 individuals.

Usage

```
df_stress
```

Format

A data frame with 2 variables:

baseline_stress

one_year_stress

`seq_ttest` *Sequential Probability Ratio Test using t-statistic*

Description

Performs one and two sample sequential t-tests on vectors of data.

Usage

```
seq_ttest(
  x,
  y = NULL,
  data = NULL,
  mu = 0,
  d,
  alpha = 0.05,
  power = 0.95,
  alternative = "two.sided",
  paired = FALSE,
  na.rm = TRUE,
  verbose = TRUE
)
```

Arguments

`x`	Works with two classes: `numeric` and `formula`. Therefore you can write `"x"` or `"x~y"`. • `"numeric input"`: a (non-empty) numeric vector of data values. • `"formula input"`: a formula of the form lhs ~ rhs where lhs is a numeric variable giving the data values and rhs either 1 for a one-sample test or a factor with two levels giving the corresponding groups.
`y`	an optional (non-empty) numeric vector of data values.
`data`	an optional `data.frame`, which you can use only in combination with a `"formula input"` in argument `x`.
`mu`	a number indicating the true value of the mean (or difference in means if you are performing a two sample test).
`d`	a number indicating the specified effect size (Cohen's d)
`alpha`	the type I error. A number between 0 and 1.
`power`	1 - beta (beta is the type II error probability). A number between 0 and 1.
`alternative`	a character string specifying the alternative hypothesis, must be one of `two.sided` (default), `greater` or `less`. You can specify just the initial letter.
`paired`	a logical indicating whether you want a paired t-test.
`na.rm`	a logical value indicating whether `NA` values should be stripped before the computation proceeds.
`verbose`	a logical value whether you want a verbose output or not.

Value

An object of the S4 class seq_ttest_results. Click on the class link to see the full description of the slots. To get access to the object use the @-operator or []-brackets instead of $. See the examples below.

Examples

```
# set seed ------------------------------------------------------------------
set.seed(333)

# load library --------------------------------------------------------------
library(sprtt)

# one sample: numeric input -------------------------------------------------
treatment_group <- rnorm(20, mean = 0, sd = 1)
results <- seq_ttest(treatment_group, mu = 1, d = 0.8)

# get access to the slots ---------------------------------------------------
# @ Operator
results@likelihood_ratio

# [] Operator
results["likelihood_ratio"]

# two sample: numeric input-------------------------------------------------
treatment_group <- stats::rnorm(20, mean = 0, sd = 1)
control_group <- stats::rnorm(20, mean = 1, sd = 1)
seq_ttest(treatment_group, control_group, d = 0.8)

# two sample: formula input -------------------------------------------------
stress_level <- stats::rnorm(20, mean = 0, sd = 1)
sex <- as.factor(c(rep(1, 10), rep(2, 10)))
seq_ttest(stress_level ~ sex, d = 0.8)

# NA in the data ------------------------------------------------------------
stress_level <- c(NA, stats::rnorm(20, mean = 0, sd = 2), NA)
sex <- as.factor(c(rep(1, 11), rep(2, 11)))
seq_ttest(stress_level ~ sex, d = 0.8, na.rm = TRUE)

# work with dataset (data are in the package included) ----------------------
seq_ttest(monthly_income ~ sex, data = df_income, d = 0.8)
```

---

seq_ttest_results-class

An S4 class to represent the results of a sequential t-test.

Description

An S4 class to represent the results of a sequential t-test.

Slots

`likelihood_ratio_log` the logarithmic test statistic.

`decision` the test decision: "accept H1", "accept H0", or "continue sampling".

`A_boundary_log` the lower logarithmic boundary of the test.

`B_boundary_log` the upper logarithmic boundary of the test.

`d` a number indicating the specified effect size (Cohen's d).

`mu` a number indicating the true value of the mean (or difference in means if you are performing a two sample test).

`alpha` the type I error. A number between 0 and 1.

`power` 1 - beta (beta is the type II error probability). A number between 0 and 1.

`likelihood_ratio` the likelihood ratio of the test without logarithm.

`likelihood_1` the likelihood of the alternative Hypothesis (H1).

`likelihood_0` the likelihood of the null Hypothesis (H0).

`likelihood_1_log` the logarithmic likelihood of the alternative Hypothesis (H1).

`likelihood_0_log` the logarithmic likelihood of the null Hypothesis (H0).

`non_centrality_parameter` parameter to calculate the likelihoods

`t_value` the t-value of the t-statistic.

`p_value` the p-value of the t-test.

`df` degrees of freedom.

`mean_estimate` the estimated mean or difference in means depending on whether it was a one-sample test or a two-sample test.

`alternative` a character string specifying the alternative hypothesis: "two.sided" (default), "greater" or "less".

`one_sample` "true" if it is a one-sample test, "false" if it is a two-sample test.

`ttest_method` a character string indicating what type of t-test was performed.

`data_name` a character string giving the name(s) of the data.

`verbose` a logical value whether you want a verbose output or not.

`sprtt` *sprtt: help page.*

Description

This package provides the implementation of sequential probability ratio tests using t-statistic.

detailed help pages

For detailed instructions on the `sprtt` package, see: `vignette("sprtt")` or https://meikesteinhilber.github.io/sprtt/"

sprtt functions

- `seq_ttest` Performs one and two sample sequential t-tests on vectors of data.

[,seq_ttest_arguments-method

Method to retrieve the contents of a slot of an object of the seq_ttest_arguments class.

Description

This method is only used internally to process the input arguments of the `seq_ttest` function. As a normal user, you can ignore this specific documentation.

Usage

```
## S4 method for signature 'seq_ttest_arguments'
x[i, j, drop]
```

Arguments

`x`	the seq_ttest_arguments object.
`i`	indices indicating elements to extract.
`j`	not used.
`drop`	not used.
`seq_ttest_arguments`	the corresponding class to this method.

Value

Returns the contents of the specified slot of an seq_ttest_arguments object. For more information, see the arguments of the `seq_ttest` function.

[,seq_ttest_results-method

Method to retrieve the contents of a slot of an object of the `seq_ttest_results` class.

Description

Method to retrieve the contents of a slot of an object of the `seq_ttest_results` class.

Usage

```
## S4 method for signature 'seq_ttest_results'
x[i, j, drop]
```

Arguments

x	the seq_ttest_results object.
i	indices indicating elements to extract.
j	not used.
drop	not used.
seq_ttest_results	the corresponding class to this method.

Value

Returns the contents of the specified slot. For more information, see the documentation for the seq_ttest_results class.

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