Package ‘sprtt’

October 14, 2022

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) 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) and Rashon (1952), and Hajnal (1961), 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).

License GPL (>= 3)

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

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

Depends R (>= 3.5.0)

Imports methods, stats

Suggests knitr, rmarkdown, testthat (>= 3.0.0), testthis, dplyr, effsize

VignetteBuilder knitr

Encoding UTF-8

Language en-US

LazyData true

RoxygenNote 7.1.1

NeedsCompilation no
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**

```r
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**

```r
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.
seq_ttest_results-class

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

```r
# 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)
```

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.

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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

```r
## 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

```r
## 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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