Package ‘tidyBF’

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Type Package

Title Tidy Wrapper for ‘BayesFactor’ Package

Version 0.1.0

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Description Provides helper functions that make it easy to run 'BayesFactor' package tests on a data which is in a tidy format. Additionally, it provides a more consistent syntax and by default returns a dataframe with rich details. These functions can also return expressions containing results from Bayes Factor tests that can then be displayed on custom plots.

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BugReports https://github.com/IndrajeetPatil/tidyBF/issues

Depends R (>= 3.5.0)

Imports BayesFactor, broomExtra, dplyr, ipmisc, metaBMA, rlang, tibble, tidyr

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Repository CRAN

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bf_contingency_tab

Description

Bayesian contingency table analysis

Usage

bf_contingency_tab(
  data,
  x,
  y = NULL,
  counts = NULL,
  ratio = NULL,
  sampling.plan = "indepMulti",
  fixed.margin = "rows",
  prior.concentration = 1,
  caption = NULL,
  output = "results",
  k = 2,
  ...
)

bf_onesample_proptest(
  data,
  x,
  y = NULL,
  counts = NULL,
  ratio = NULL,
  sampling.plan = "indepMulti",
  fixed.margin = "rows",
  prior.concentration = 1,
  caption = NULL,
  output = "results",
)
Arguments

- **data** for use with `formula`, a data frame containing all the data
- **x** The variable to use as the **rows** in the contingency table.
- **y** The variable to use as the **columns** in the contingency table. Default is `NULL`. If `NULL`, one-sample proportion test (a goodness of fit test) will be run for the main variable. Otherwise an appropriate association test will be run.
- **counts** A string naming a variable in data containing counts, or `NULL` if each row represents a single observation (Default).
- **ratio** A vector of proportions: the expected proportions for the proportion test (should sum to 1). Default is `NULL`, which means the null is equal theoretical proportions across the levels of the nominal variable. This means if there are two levels this will be `ratio = c(0.5, 0.5)` or if there are four levels this will be `ratio = c(0.25, 0.25, 0.25, 0.25)`, etc.
- **sampling.plan** Character describing the sampling plan. Possible options are "indepmulti" (independent multinomial; default), "poisson", "jointmulti" (joint multinomial), "hypergeom" (hypergeometric). For more, see `?BayesFactor::contingencyTableBF()`.
- **fixed.margin** For the independent multinomial sampling plan, which margin is fixed ("rows" or "cols"). Defaults to "rows".
- **prior.concentration** Specifies the prior concentration parameter, set to 1 by default. It indexes the expected deviation from the null hypothesis under the alternative, and corresponds to Gunel and Dickey’s (1974) "a" parameter.
- **caption** Text to display as caption (will be displayed on top of the Bayes Factor caption/message).
- **output** Can either be "null" (or "caption" or "H0" or "h0"), which will return expression with evidence in favor of the null hypothesis, or "alternative" (or "title" or "H1" or "h1"), which will return expression with evidence in favor of the alternative hypothesis, or "results", which will return a dataframe with results all the details).
- **k** Number of digits after decimal point (should be an integer) (Default: `k = 2`).
- **...** further arguments to be passed to or from methods.

Note

Bayes Factor for goodness of fit test is based on gist provided by Richard Morey: https://gist.github.com/richarddmorey/a4cd3a2051f373db917550d67131dba4.

See Also

- `bf_corr_test`, `bf_oneway_anova`, `bf_ttest`
bf_corr_test

Bayesian correlation test.

Description

Bayesian correlation test.

Usage

bf_corr_test(
  data,
  x,
  y,
  bf.prior = 0.707,
  caption = NULL,
  output = "results",
)
bf_corr_test

k = 2,
...
)

Arguments

data for use with formula, a data frame containing all the data
x The column in data containing the explanatory variable to be plotted on the x-axis. Can be entered either as a character string (e.g., "x") or as a bare expression (e.g, x).
y The column in data containing the response (outcome) variable to be plotted on the y-axis. Can be entered either as a character string (e.g., "y") or as a bare expression (e.g, y).
bf.prior A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.
caption Text to display as caption (will be displayed on top of the Bayes Factor caption/message).
output Can either be "null" (or "caption" or "H0" or "h0"), which will return expression with evidence in favor of the null hypothesis, or "alternative" (or "title" or "H1" or "h1"), which will return expression with evidence in favor of the alternative hypothesis, or "results", which will return a dataframe with results all the details).
k Number of digits after decimal point (should be an integer) (Default: k = 2).
... Additional arguments (ignored).

See Also
bf_contingency_tab, bf_oneway_anova, bf_ttest

Examples

# for reproducibility
set.seed(123)

# to get caption (default)
bf_corr_test(  
  data = anscombe,
  x = x1,
  y = y4,
  bf.prior = 1
)

# to see results
bf_corr_test(  
  data = anscombe,
  x = x1,
  y = y4,
  bf.prior = 0.8
)
Prepare caption with expression for Bayes Factor results

Description

Convenience function to write a caption message with bayes factors in favor of the null hypothesis.

Usage

bf_expr(bf.df, k = 2L, output = "null", caption = NULL, ...)

Arguments

bf.df A dataframe containing two columns log_e_bf01 (for evidence in favor of null hypothesis) and bf.prior. If dataframe contains more than two rows, only the first row will be used.

k Number of digits after decimal point (should be an integer) (Default: k = 2).

output Can either be "null" (or "caption" or "H0" or "h0"), which will return expression with evidence in favor of the null hypothesis, or "alternative" (or "title" or "H1" or "h1"), which will return expression with evidence in favor of the alternative hypothesis, or "results", which will return a dataframe with results all the details).

caption Text to display as caption (will be displayed on top of the Bayes Factor caption/message).

... Additional arguments (ignored).

Examples

# for reproducibility
set.seed(123)

# dataframe containing results
bf.df <-
  bf_extractor(BayesFactor::correlationBF(
    x = iris$Sepal.Length,
    y = iris$Petal.Length
  )) %>%
dplyr::mutate(.data = ., bf.prior = 0.707)

# creating caption (for null)
bf_expr(
  bf.df = bf.df,
  output = "null",
  k = 3,
  caption = "Note: Iris dataset"
)
bf_extractor

# creating caption (for alternative)
bf_expr(
  bf.df = bf.df,
  output = "alternative"
)

### bf_extractor

*Extract Bayes Factors from BayesFactor model object.*

**Description**

Extract Bayes Factors from BayesFactor model object.

**Usage**

```
bf_extractor(bf.object, ...)
```

**Arguments**

- `bf.object` An object from BayesFactor package.
- `...` Currently ignored.

**Examples**

```
set.seed(123)

# creating a `BayesFactor` object
bf_obj <-
  BayesFactor::anovaBF(
    formula = Sepal.Length ~ Species,
    data = iris,
    progress = FALSE
  )

# extracting Bayes Factors in a dataframe
# *important*: don't enter `1/bf_obj` to extract results for null hypothesis;
# doing so will return wrong results
bf_extractor(bf_obj)
```
Bayes factor message for random-effects meta-analysis

**Description**

Bayes factor message for random-effects meta-analysis

**Usage**

```r
bf_meta(
  data,
  d = prior("norm", c(mean = 0, sd = 0.3)),
  tau = prior("invgamma", c(shape = 1, scale = 0.15)),
  k = 2,
  output = "results",
  caption = NULL,
  messages = TRUE,
  ...
)
```

**Arguments**

- `data`: A dataframe. It **must** contain columns named `estimate` (effect sizes or outcomes) and `std.error` (corresponding standard errors). These two columns will be used for `yi` and `sei` arguments in `metafor::rma` (for parametric analysis) or `metaplus::metaplus` (for robust analysis).
- `d`: prior distribution on the average effect size `d`. The prior probability density function is defined via `prior`.
- `tau`: prior distribution on the between-study heterogeneity `tau` (i.e., the standard deviation of the study effect sizes `dstudy` in a random-effects meta-analysis. A (nonnegative) prior probability density function is defined via `prior`.
- `k`: Number of digits after decimal point (should be an integer) (Default: `k = 2`).
- `output`: Can either be "null" (or "caption" or "H0" or "h0"), which will return expression with evidence in favor of the null hypothesis, or "alternative" (or "title" or "H1" or "h1"), which will return expression with evidence in favor of the alternative hypothesis, or "results", which will return a dataframe with results all the details).
- `caption`: Text to display as caption (will be displayed on top of the Bayes Factor caption/message).
- `messages`: Decides whether messages references, notes, and warnings are to be displayed (Default: TRUE).
- `...`: Arguments passed on to `metaBMA::meta_random`

labels: optional: character values with study labels. Can be a character vector or the quoted or unquoted name of the variable in `data`
rscale_contin scale parameter of the JZS prior for the continuous covariates.
rscale_discrete scale parameter of the JZS prior for discrete moderators.
centering whether continuous moderators are centered.
logml how to estimate the log-marginal likelihood: either by numerical integration ("integrate") or by bridge sampling using MCMC/Stan samples ("stan"). To obtain high precision with logml="stan", many MCMC samples are required (e.g., logml_iter=10000, warmup=1000).
summarize how to estimate parameter summaries (mean, median, SD, etc.):
    Either by numerical integration (summarize = "integrate") or based on MCMC/Stan samples (summarize = "stan").
ci probability for the credibility/highest-density intervals.
rel.tol relative tolerance used for numerical integration using integrate.
    Use rel.tol=.Machine$double.eps for maximal precision (however, this might be slow).
logml_iter number of iterations (per chain) from the posterior distribution of d and tau. The samples are used for computing the marginal likelihood of the random-effects model with bridge sampling (if logml="stan") and for obtaining parameter estimates (if summarize="stan"). Note that the argument iter=2000 controls the number of iterations for estimation of the random-effect parameters per study in random-effects meta-analysis.
silent_stan whether to suppress the Stan progress bar.

Examples

# setup
set.seed(123)
library(metaBMA)

# creating a dataframe
(df <-
 structure(
 .Data = list(
     study = c("1", "2", "3", "4", "5"),
     estimate = c(0.382047603321706, 0.780783111514665, 0.425607573765058, 0.558365541235078, 0.956473848429961),
     std.error = c(0.0465576338644502, 0.0330218199731529, 0.0425607573765058, 0.0558365541235078, 0.0956473848429961)
    ),

# calling the function
bf_oneway_anova

Bayesian one-way analysis of variance.

Description

Bayesian one-way analysis of variance.

Usage

bf_oneway_anova(
  data,
  x,
  y,
  bf.prior = 0.707,
  caption = NULL,
  output = "results",
  paired = FALSE,
  k = 2,
  ...
)

Arguments

data A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.
x The grouping variable from the dataframe data.
y The response (a.k.a. outcome or dependent) variable from the dataframe data.
bf.prior A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.
caption Text to display as caption (will be displayed on top of the Bayes Factor caption/message).
bf_ttest

Bayes Factor for t-test

Description

Bayes Factor for t-test

output Can either be "null" (or "caption" or "H0" or "h0"), which will return expression with evidence in favor of the null hypothesis, or "alternative" (or "title" or "H1" or "h1"), which will return expression with evidence in favor of the alternative hypothesis, or "results", which will return a dataframe with results all the details).

paired if TRUE, observations are paired

k Number of digits after decimal point (should be an integer) (Default: k = 2).

... Additional arguments.

See Also

bf_contingency_tab, bf_corr_test, bf_ttest

Examples

# setup
set.seed(123)

# between-subjects
bf_oneway_anova(
  data = iris,
  x = Species,
  y = Sepal.Length,
  bf.prior = 0.8,
  output = "results"
)

# within-subjects
bf_oneway_anova(
  data = bugs_long,
  x = condition,
  y = desire,
  paired = TRUE
)
Usage

```r
bf_ttest(
  data,
  x,
  y = NULL,
  test.value = 0,
  paired = FALSE,
  bf.prior = 0.707,
  caption = NULL,
  output = "results",
  k = 2,
  ...
)
```

```r
bf_one_sample_ttest(
  data,
  x,
  y = NULL,
  test.value = 0,
  paired = FALSE,
  bf.prior = 0.707,
  caption = NULL,
  output = "results",
  k = 2,
  ...
)
```

```r
bf_two_sample_ttest(
  data,
  x,
  y = NULL,
  test.value = 0,
  paired = FALSE,
  bf.prior = 0.707,
  caption = NULL,
  output = "results",
  k = 2,
  ...
)
```

Arguments

- **data** for use with `formula`, a data frame containing all the data
- **x** Either the grouping variable from the dataframe `data` if it's a two-sample t-test or a numeric variable if it's a one-sample t-test.
- **y** The column in `data` containing the response (outcome) variable to be plotted on the y-axis. Can be entered either as a character string (e.g., "y") or as a bare expression (e.g., `y`).
**bf_ttest**

- **test.value**: A number specifying the value of the null hypothesis (Default: 0).
- **paired**: if TRUE, observations are paired
- **bf.prior**: A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.
- **caption**: Text to display as caption (will be displayed on top of the Bayes Factor caption/message).
- **output**: Can either be "null" (or "caption" or "H0" or "h0"), which will return expression with evidence in favor of the null hypothesis, or "alternative" (or "title" or "H1" or "h1"), which will return expression with evidence in favor of the alternative hypothesis, or "results", which will return a dataframe with results all the details).
- **k**: Number of digits after decimal point (should be an integer) (Default: k = 2).
- **...**: Additional arguments (ignored).

**Details**

If `y` is NULL, a one-sample t-test will be carried out, otherwise a two-sample t-test will be carried out.

**See Also**

`bf_contingency_tab, bf_corr_test, bf_oneway_anova`

**Examples**

```r
# ------------------- two-samples tests -----------------------------------
# for reproducibility
set.seed(123)
library(tidyBF)

# to get dataframe
bf_ttest(
  data = mtcars,
  x = am,
  y = wt,
  paired = FALSE,
  bf.prior = 0.880
)

# ------------------- one-samples test -----------------------------------

# to get dataframe
bf_ttest(
  data = iris,
  x = Sepal.Length,
  test.value = 5.85
)
```
b**ugs_long**

**Description**

Tidy version of the "Bugs" dataset.

**Usage**

`bugs_long`

**Format**

A data frame with 372 rows and 6 variables

- subject. Dummy identity number for each participant.
- gender. Participant's gender (Female, Male).
- region. Region of the world the participant was from.
- education. Level of education.
- condition. Condition of the experiment the participant gave rating for (**LDLF**: low freighteningness and low disgustingness; **LFHD**: low freighteningness and high disgustingness; **HFHD**: high freighteningness and low disgustingness; **HFHD**: high freighteningness and high disgustingness).
- desire. The desire to kill an arthropod was indicated on a scale from 0 to 10.

**Details**

This data set, "Bugs", provides the extent to which men and women want to kill arthropods that vary in freighteningness (low, high) and disgustingness (low, high). Each participant rates their attitudes towards all anthropods. Subset of the data reported by Ryan et al. (2013).

**Source**


**Examples**

```r
dim(bugs_long)
head(bugs_long)
dplyr::glimpse(bugs_long)
```
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