Package ‘tidyBF’

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Type Package

Title Tidy Wrapper for 'BayesFactor' Package

Version 0.2.0

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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, dplyr, ipmisc, metaBMA, rlang, tidyr
Suggests ggplot2, knitr, rmarkdown, spelling, testthat

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LazyData true

RoxygenNote 7.1.0.9000

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**bf_contingency_tab**

**Bayesian contingency table analysis**

**Description**

Bayesian contingency table analysis

**Usage**

```r
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,
  ...
)
```

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

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).

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

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/a4cd3a2051f373db917550d67131dab4.

See Also

bf_corr_test, bf_oneway_anova, bf_ttest
Examples

# for reproducibility
set.seed(123)
library(tidyBF)

# ------------------ association tests ------------------------------
# to get caption (in favor of null)
bf_contingency_tab(
  data = mtcars,
  x = am,
  y = cyl,
  fixed.margin = "cols"
)

# to see results
bf_contingency_tab(
  data = mtcars,
  x = am,
  y = cyl,
  sampling.plan = "jointMulti",
  fixed.margin = "rows",
  prior.concentration = 1
)

# ------------------ goodness of fit tests --------------------
bf_contingency_tab(
  data = mtcars,
  x = am,
  prior.concentration = 10
)

bf_corr_test

Bayesian correlation test.

Usage

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

hypothesis.text = TRUE,
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).

hypothesis.text Logical that decides whether the expression containing result should have text to describe the hypothesis test being described. For output = "null", this is "In favor of null: ", otherwise "In favor of alternative: ".

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 see results
bf_corr_test(
  data = anscombe,
  x = x1,
  y = y4,
  bf.prior = 1
)

# to get caption
bf_corr_test(
    data = anscombe,
    x = x1,
    y = y4,
    bf.prior = 0.8,
    output = "null"
)

---

bf_expr

Prepare caption with expression for Bayes Factor results

Description

Convenience function to create an expression with Bayes Factor results.

Usage

bf_expr(
  bf.df,  
  k = 2L,  
  output = "null",  
  hypothesis.text = TRUE,  
  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).

hypothesis.text  Logical that decides whether the expression containing result should have text to describe the hypothesis test being described. For output = "null", this is "In favor of null: ", otherwise "In favor of alternative: ".

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

...  Additional arguments (ignored).
Examples

```r
# for reproducibility
set.seed(123)
library(tidyBF)

# 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, output = "null",
        k = 3,
        caption = "Note: Iris dataset")

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

---

bf_extractor

> Extract Bayes Factors from BayesFactor model object.

**Description**

Extract Bayes Factors from BayesFactor model object.

**Usage**

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

**Arguments**

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

**Note**

*Important*: don’t enter 1/bf_obj to extract results for null hypothesis; # doing so will return wrong results.
### Examples

```r
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
bf_extractor(bf_obj)
```

---

**bf_meta**

Bayes factor for random-effects meta-analysis

### Description

Bayes factor 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 = 2L,
  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`).
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

Deprecated. Retained only for backward compatibility.

... 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,
0.062215818388157
),
row.names = c(NA, -5L),
class = c("tbl_df", "tbl", "data.frame")
)

# getting Bayes factor in favor of null hypothesis
bf_meta(
  data = df,
  k = 3,
  iter = 1500,
  messages = TRUE,
  # customizing analysis with additional arguments
  control = list(max_treedepth = 15)
)

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",
  hypothesis.text = TRUE,
  paired = FALSE,
  k = 2,
  ...
)
bf_oneway_anova

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).
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).
hypothesis.text Logical that decides whether the expression containing result should have text to describe the hypothesis test being described. For output = "null", this is "In favor of null: ", otherwise "In favor of alternative: ".
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
)

# within-subjects --------------------------------------------------------
bf_oneway_anova(
  data = bugs_long,
  x = condition,
  y = desire,
  paired = TRUE
)
Bayes Factor for t-test

**Description**
Bayes Factor for t-test

**Usage**

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

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

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

**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., \( y \)).
- **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).
- **hypothesis.text** Logical that decides whether the expression containing result should have text to describe the hypothesis test being described. For output = "null", this is "In favor of null: ", otherwise "In favor of alternative: ".
- **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
)

bugs_long

Tidy version of the "Bugs" dataset.

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 freighteniness and low disgustingness; LFHD: low freighteniness and high disgustingness; HFHD: high freighteniness and low disgustingness; HFHD: high freighteniness 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 freighteniness (low, high) and disgustingness (low, high). Each participant rates their attitudes towards all anthropods. Subset of the data reported by Ryan et al. (2013).
meta_data_check

Source

Examples

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

---

**meta_data_check**

*Helper function to check column names for meta-analysis.*

**Description**

Helper function to check column names for meta-analysis.

**Usage**

```
meta_data_check(data)
```

**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).
Index

∗Topic datasets
   bugs_long, 14
bf_contingency_tab, 2, 5, 11, 13
bf_corr_test, 3, 4, 11, 13
bf_expr, 6
bf_extractor, 7
bf_meta, 8
bf_one_sample_ttest (bf_ttest), 12
bf_oneway_anova, 3, 5, 10, 13
bf_ttest, 3, 5, 11, 12
bf_two_sample_ttest (bf_ttest), 12
bugs_long, 14
integrate, 9
meta_data_check, 15
metaBMA::meta_random, 9
prior, 8