

Package ‘tidyBF’

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Type Package

Title Tidy Wrapper for 'BayesFactor' Package

Version 0.4.0

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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. Posterior estimation is carried out using the 'bayestestR' package.

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URL <https://indrajeetpatil.github.io/tidyBF/>,
<https://github.com/IndrajeetPatil/tidyBF>

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

Encoding UTF-8

Language en-US

LazyData true

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Depends R (>= 3.6.0)

Imports BayesFactor, dplyr, effectsize (>= 0.4.0), insight (>= 0.10.0), ipmisc (>= 4.1.0), lme4, metaBMA (>= 0.6.5), parameters (>= 0.9.0), performance (>= 0.5.1), rlang, tidyR

Suggests ggplot2, knitr, rmarkdown, spelling, testthat, utils

NeedsCompilation no

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bf_contingency_tab	<i>Bayes Factor for contingency table analysis</i>
--------------------	--

Description

Bayes Factor for contingency table analysis

Usage

```
bf_contingency_tab(
  data,
  x,
  y = NULL,
  counts = NULL,
  ratio = NULL,
  sampling.plan = "indepMulti",
  fixed.margin = "rows",
  prior.concentration = 1,
  top.text = NULL,
  output = "dataframe",
  k = 2L,
  ...
)
```

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 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.

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 <code>ratio = c(0.5, 0.5)</code> or if there are four levels this will be <code>ratio = c(0.25, 0.25, 0.25, 0.25)</code> , etc.
sampling.plan	Character describing the sampling plan. Possible options are "indepMulti" (independent multinomial; default), "poisson", "jointMulti" (joint multinomial), "hypergeom" (hypergeometric). For more, see <code>?BayesFactor::contingencyTableBF()</code> .
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.
top.text	Text to display as top.text (will be displayed on top of the Bayes Factor top.text/message).
output	If "expression", will return expression with statistical details, while "dataframe" will return a dataframe containing the results.
k	Number of digits after decimal point (should be an integer) (Default: <code>k = 2L</code>).
...	Arguments passed on to <code>bf_extractor</code>
conf.level	Confidence/Credible Interval (CI) level. Default to 0.95 (95%).
centrality	The point-estimates (centrality indices) to compute. Character (vector) or list with one or more of these options: "median", "mean", "MAP" or "all".
conf.method	The type of index used for Credible Interval. Can be "hdi" (default, see <code>bayestestR::hdi()</code>), "eti" (see <code>bayestestR::eti()</code>) or "si" (see <code>bayestestR::si()</code>).

See Also

[bf_corr_test](#), [bf_oneway_anova](#), [bf_ttest](#)

Examples

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

# ----- association tests -----

# to get dataframe
bf_contingency_tab(
  data = mtcars,
  x = am,
  y = cyl,
  output = "dataframe"
)

# ----- goodness of fit tests -----
```

```
# to get expression
bf_contingency_tab(
  data = mtcars,
  x = am,
  prior.concentration = 10,
  output = "expression"
)
```

bf_corr_test
Bayes Factor for correlation test

Description

Bayes Factor for correlation test

Usage

```
bf_corr_test(data, x, y, bf.prior = 0.707, ...)
```

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 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.
...	Arguments passed on to bf_extractor
conf.level	Confidence/Credible Interval (CI) level. Default to 0.95 (95%).
centrality	The point-estimates (centrality indices) to compute. Character (vector) or list with one or more of these options: "median", "mean", "MAP" or "all".
conf.method	The type of index used for Credible Interval. Can be "hdi" (default, see bayestestR::hdi()), "eti" (see bayestestR::eti()) or "si" (see bayestestR::si()).
k	Number of digits after decimal point (should be an integer) (Default: k = 2L).
top.text	Text to display as top.text (will be displayed on top of the Bayes Factor top.text/message).
output	If "expression", will return expression with statistical details, while "dataframe" will return a dataframe containing the results.

See Also

[bf_contingency_tab](#), [bf_oneway_anova](#), [bf_ttest](#)

Examples

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

# to get dataframe
bf_corr_test(
  data = anscombe,
  x = x1,
  y = y4,
  bf.prior = 0.3,
  output = "dataframe"
)

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

bf_expr_template

Expression template for Bayes Factor results

Description

Expression template for Bayes Factor results

Usage

```
bf_expr_template(
  top.text,
  prior.type = quote(italic("r")["Cauchy"]^"JZS"),
  estimate.type = quote(delta),
  estimate.df,
  centrality = "median",
  conf.level = 0.95,
  conf.method = "HDI",
  k = 2L,
  ...
)
```

Arguments

top.text	Text to display as top.text (will be displayed on top of the Bayes Factor top.text/message).
prior.type	A character that specifies the prior type.
estimate.type	A character that specifies the relevant effect size.
estimate.df	Dataframe containing estimates and their credible intervals along with Bayes Factor value. The columns should be named as estimate, estimate.LB, estimate.UB, and bf10.
centrality	The point-estimates (centrality indices) to compute. Character (vector) or list with one or more of these options: "median", "mean", "MAP" or "all".
conf.level	Confidence/Credible Interval (CI) level. Default to 0.95 (95%).
conf.method	The type of index used for Credible Interval. Can be "hdi" (default, see <code>bayestestR::hdi()</code>), "eti" (see <code>bayestestR::eti()</code>) or "si" (see <code>bayestestR::si()</code>).
k	Number of digits after decimal point (should be an integer) (Default: k = 2L).
...	Currently ignored.

bf_extractor

Extract Bayes Factors from BayesFactor model object.

Description

Extract Bayes Factors from BayesFactor model object.

Usage

```
bf_extractor(
  bf.object,
  conf.method = "hdi",
  centrality = "median",
  conf.level = 0.95,
  k = 2L,
  top.text = NULL,
  output = "dataframe",
  ...
)
```

Arguments

bf.object	An object from BayesFactor package.
conf.method	The type of index used for Credible Interval. Can be "hdi" (default, see <code>bayestestR::hdi()</code>), "eti" (see <code>bayestestR::eti()</code>) or "si" (see <code>bayestestR::si()</code>).
centrality	The point-estimates (centrality indices) to compute. Character (vector) or list with one or more of these options: "median", "mean", "MAP" or "all".
conf.level	Confidence/Credible Interval (CI) level. Default to 0.95 (95%).

k	Number of digits after decimal point (should be an integer) (Default: k = 2L).
top.text	Text to display as top.text (will be displayed on top of the Bayes Factor top.text/message).
output	If "expression", will return expression with statistical details, while "dataframe" will return a dataframe containing the results.
...	Additional arguments passed to <code>parameters::model_parameters.BFBayesFactor()</code> .

Note

Important: don't enter `1/bf.object` to extract results for null hypothesis; doing so will return wrong results.

Examples

```
# setup
library(tidyBF)
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_random	<i>Bayes factor for random-effects meta-analysis</i>
----------------	--

Description

Bayes factor for random-effects meta-analysis

Usage

```
bf_meta_random(
  data,
  d = prior("norm", c(mean = 0, sd = 0.3)),
  tau = prior("invgamma", c(shape = 1, scale = 0.15)),
  metaBMA.args = list(),
  ...
)
```

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 y and SE arguments in metaBMA::meta_random.
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 .
metaBMA.args	A list of additional arguments to be passed to metaBMA::meta_random.
...	Arguments passed on to bf_extractor
conf.level	Confidence/Credible Interval (CI) level. Default to 0.95 (95%).
centrality	The point-estimates (centrality indices) to compute. Character (vector) or list with one or more of these options: "median", "mean", "MAP" or "all".
conf.method	The type of index used for Credible Interval. Can be "hdi" (default, see bayestestR::hdi()), "eti" (see bayestestR::eti()) or "si" (see bayestestR::si()).
k	Number of digits after decimal point (should be an integer) (Default: k = 2L).
top.text	Text to display as top.text (will be displayed on top of the Bayes Factor top.text/message).
output	If "expression", will return expression with statistical details, while "dataframe" will return a dataframe containing the results.

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,
      0.0362834986178494,
```



```

      0.0480571500648261,
      0.062215818388157
    )
  ),
  row.names = c(NA, -5L),
  class = c("tbl_df", "tbl", "data.frame")
))

# to get dataframe
bf_meta_random(
  data = df,
  k = 3,
  metaBMA.args = list(iter = 500, rscale_discrete = 0.880),
  output = "dataframe"
)

```

bf_oneway_anova

Bayes Factor for one-way analysis of variance (ANOVA)

Description

Bayes Factor for one-way analysis of variance (ANOVA)

Usage

```

bf_oneway_anova(
  data,
  x,
  y,
  subject.id = NULL,
  paired = FALSE,
  bf.prior = 0.707,
  ...
)

```

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.
subject.id	In case of repeated measures design (<code>paired = TRUE</code> , i.e.), this argument specifies the subject or repeated measures id. Note that if this argument is <code>NULL</code> (which is the default), the function assumes that the data has already been sorted by such an id by the user and creates an internal identifier. So if your data is not sorted and you leave this argument unspecified, the results can be inaccurate.

paired	Decides whether the design is repeated measures or not (Default: FALSE).
bf.prior	A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.
...	Arguments passed on to bf_extractor
conf.level	Confidence/Credible Interval (CI) level. Default to 0.95 (95%).
centrality	The point-estimates (centrality indices) to compute. Character (vector) or list with one or more of these options: "median", "mean", "MAP" or "all".
conf.method	The type of index used for Credible Interval. Can be "hdi" (default, see bayestestR::hdi()), "eti" (see bayestestR::eti()) or "si" (see bayestestR::si()).
k	Number of digits after decimal point (should be an integer) (Default: k = 2L).
top.text	Text to display as top.text (will be displayed on top of the Bayes Factor top.text/message).
output	If "expression", will return expression with statistical details, while "dataframe" will return a dataframe containing the results.

Note

If you want to set paired = TRUE, you are going to need to install the development version of BayesFactor (0.9.12-4.3). You can download it by running: `remotes::install_github("richarddmorey/BayesFactor/`

See Also

[bf_contingency_tab](#), [bf_corr_test](#), [bf_ttest](#)

Examples

```
# setup
set.seed(123)

# between-subjects -----

# to get dataframe
bf_oneway_anova(
  data = iris,
  x = Species,
  y = Sepal.Length,
  bf.prior = 0.8,
  output = "dataframe"
)

# within-subjects -----

# to get expression (needs `BayesFactor 0.9.12-4.3`)
if (utils::packageVersion("BayesFactor") >= package_version("0.9.12-4.3")) {
  bf_oneway_anova(
    data = bugs_long,
    x = condition,
```

```

    y = desire,
    subject.id = subject,
    paired = TRUE,
    output = "expression"
  )
}

```

bf_ttest

*Bayes Factor for t-test***Description**Bayes Factor for *t*-test**Usage**

```

bf_ttest(
  data,
  x,
  y = NULL,
  subject.id = NULL,
  paired = FALSE,
  test.value = 0,
  bf.prior = 0.707,
  ...
)

```

Arguments

data	A dataframe (or a tibble) from which variables specified are to be taken. A matrix or tables will not be accepted.
x	Either the grouping variable from the dataframe data if it's a two-sample <i>t</i> -test or a numeric variable if it's a one-sample <i>t</i> -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).
subject.id	In case of repeated measures design (paired = TRUE, i.e.), this argument specifies the subject or repeated measures id. Note that if this argument is NULL (which is the default), the function assumes that the data has already been sorted by such an id by the user and creates an internal identifier. So if your data is not sorted and you leave this argument unspecified, the results can be inaccurate.
paired	Decides whether the design is repeated measures or not (Default: FALSE).
test.value	A number specifying the value of the null hypothesis (Default: 0).
bf.prior	A number between 0.5 and 2 (default 0.707), the prior width to use in calculating Bayes factors.

... Arguments passed on to [bf_extractor](#)

`conf.level` Confidence/Credible Interval (CI) level. Default to 0.95 (95%).

`centrality` The point-estimates (centrality indices) to compute. Character (vector) or list with one or more of these options: "median", "mean", "MAP" or "all".

`conf.method` The type of index used for Credible Interval. Can be "hdi" (default, see [bayestestR::hdi\(\)](#)), "eti" (see [bayestestR::eti\(\)](#)) or "si" (see [bayestestR::si\(\)](#)).

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

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

`output` If "expression", will return expression with statistical details, while "dataframe" will return a dataframe containing the results.

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

```
# ----- two-samples tests -----

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

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

# to get expression (within-subjects)
bf_ttest(
  data = dplyr::filter(bugs_long, condition %in% c("LDLF", "LDHF")),
  x = condition,
  y = desire,
  subject.id = subject,
  paired = TRUE,
  bf.prior = 0.880,
```

```
    output = "dataframe"
  )

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

# to get expression
bf_ttest(
  data = iris,
  x = Sepal.Length,
  test.value = 5.85,
  output = "expression"
)
```

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 frighteningness and low disgustingness; **LFHD**: low frighteningness and high disgustingness; **HFHD**: high frighteningness and low disgustingness; **HFHD**: high frighteningness 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 frighteningness (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

<https://www.sciencedirect.com/science/article/pii/S0747563213000277>

Examples

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

meta_data_check	<i>Helper function to check column names for meta-analysis.</i>
-----------------	---

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 y and SE arguments in metaBMA::meta_random.
------	---

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