Package ‘bain’

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Type Package

Title Bayes Factors for Informative Hypotheses

Version 0.2.11


License GPL (>= 3)

Encoding UTF-8

LazyData true

URL https://informative-hypotheses.sites.uu.nl/software/bain/

BugReports https://github.com/cjvanlissa/bain/

NeedsCompilation yes

RoxygenNote 7.3.1

Depends R (>= 3.0.0), stats

Imports lavaan

Suggests MASS, testthat, knitr, rmarkdown

VignetteBuilder knitr

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Jeff Jones [ctb],
Niels Waller [ctb]
**Description**

`bain` is an acronym for "Bayesian informative hypotheses evaluation". It uses the Bayes factor to evaluate hypotheses specified using equality and inequality constraints among (linear combinations of) parameters in a wide range of statistical models. A tutorial by Hoijtink, Mulder, van Lissa, and Gu (2018), was published in Psychological Methods. The preprint of that tutorial is available on PsyArxiv (doi:10.31234/osf.io/v3shc) or on the bain website at https://informative-hypotheses.sites.uu.nl/software/bain/ Users are advised to read the tutorial AND the vignette that is provided with this package before using `bain`.

**Usage**

`bain(x, hypothesis, fraction = 1, ...)`

**Arguments**

- `x` An R object containing the outcome of a statistical analysis. Currently, the following objects can be processed: `lm()`, `t.test()`, lavaan objects created with the `sem()`, `cfa()`, and `growth()` functions, and named vector objects. See the vignette for elaborations.

- `hypothesis` A character string containing the informative hypotheses to evaluate. See the vignette for elaborations.

- `fraction` A number representing the fraction of information in the data used to construct the prior distribution. The default value 1 denotes the minimal fraction, 2 denotes twice the minimal fraction, etc. See the vignette for elaborations.
Additional arguments. See the vignette for elaborations.

**Value**

The main output resulting from analyses with bain are Bayes factors and posterior model probabilities associated with the hypotheses that are evaluated. See the tutorial and the vignette for further elaborations.

**Author(s)**

The main authors of the bain package are Xin Gu, Caspar van Lissa, Herbert Hoijtink and Joris Mulder with smaller contributions by Marlyne Bosman, Camiel van Zundert, and Fayette Klaassen. Contact information can be found on the bain website at https://informative-hypotheses.sites.uu.nl/software/bain/

**References**

For a tutorial on this method, see:

For applications in structural equation modeling, see:

For the statistical underpinnings, see:


**Examples**

```r
# Evaluation of informative hypotheses for an ANOVA
# make a factor of variable site
sesamesim$site <- as.factor(sesamesim$site)
# execute an analysis of variance using lm() which, due to the -1, returns
# estimates of the means of postnumb per group
anov <- lm(postnumb~site-1,sesamesim)
# take a look at the estimated means and their names
coef(anov)
# set a seed value
set.seed(100)
# use the names to formulate and test hypotheses with bain
```
results <- bain(anov, "site1=site2=site3=site4=site5; site2>site5>site1>site3>site4")
#
# SEE THE TUTORIAL AND VIGNETTE FOR MANY ADDITIONAL EXAMPLES

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**bain_sensitivity**  
**Sensitivity analysis for bain**

**Description**

Conducts a sensitivity analysis for `bain`.

**Usage**

```r
bain_sensitivity(x, hypothesis, fractions = 1, ...)
```

**Arguments**

- `x`: An R object containing the outcome of a statistical analysis. Currently, the following objects can be processed: `lm()`, `t_test()`, `lavaan` objects created with the `sem()`, `cfa()`, and `growth()` functions, and named vector objects. See the vignette for elaborations.

- `hypothesis`: A character string containing the informative hypotheses to evaluate. See the vignette for elaborations.

- `fractions`: A number representing the fraction of information in the data used to construct the prior distribution. The default value 1 denotes the minimal fraction, 2 denotes twice the minimal fraction, etc. See the vignette for elaborations.

- `...`: Additional arguments passed to `bain`.

**Details**

The Bayes factor for equality constraints is sensitive to a scaling factor applied to the prior distribution. The argument `fraction` adjusts this scaling factor. The function `bain_sensitivity` is a wrapper for `bain`, which accepts a vector for the `fractions` argument, and returns a list of `bain` results objects. A table with a sensitivity analysis for specific statistics can be obtained using the `summary()` function, which accepts the argument `summary(which_stat = ...)`. The available statistics are elements of the `$fit` table (`Fit_eq`, `Com_eq`, `Fit_in`, `Com_in`, `Fit`, `Com`, `BF`, `PMPa`, and `PMPb`), and elements of the `BFmatrix`, which can be accessed by matrix notation, e.g.: `summary(bain_sens, which_stat = "BFmatrix[1,2]")`.

**Value**

A `data.frame` of class "bain_sensitivity".
**Examples**

```r
sesamesim$site <- as.factor(sesamesim$site)
res <- lm(sesamesim$postnumb~sesamesim$site-1)
set.seed(4583)
bain_sens <- bain_sensitivity(res, "site1=site2; site2>site5",
                              fractions = c(1,2,3))
summary(bain_sens, which_stat = "BF.c")
summary(bain_sens, which_stat = "BFmatrix[1,2]")
```

---

**kuiper2013**

*The Effect of Prior Interaction on Trust*

**Description**

These data were published in Kuiper and colleagues (2013), who set out to aggregate evidence for the effect of prior interactions between partners on trust in (economic) exchange relations across four heterogeneous replication studies. Batenburg et al. (2003) analyzed survey data using linear regression with covariates; Buskens and Raub (2002) analyzed experimental data using linear regression; Buskens and Weesie (2000) used an experimental design with a binary outcome, analyzed using probit regression; and Buskens, Raub, and Van der Veer (2010) used a longitudinal experimental design, analyzing the data with a three-level logistic regression. These studies each provide a regression coefficient (beta) assessing the effect of past experience on trust, and its estimated sampling variance (squared standard error). The sample sizes (n) were derived from the original publications.

**Usage**

```r
data(kuiper2013)
```

**Format**

A data frame with 4 rows and 4 variables.

**Details**

<table>
<thead>
<tr>
<th>Study</th>
<th>character</th>
<th>Reference of the original publication.</th>
</tr>
</thead>
<tbody>
<tr>
<td>beta</td>
<td>numeric</td>
<td>Regression coefficient for the effect of prior interaction on trust.</td>
</tr>
<tr>
<td>vi</td>
<td>numeric</td>
<td>Sampling variance of ‘beta’.</td>
</tr>
<tr>
<td>n</td>
<td>integer</td>
<td>Sample size.</td>
</tr>
</tbody>
</table>
References


pbf

Product Bayes Factor

Description

The product Bayes factor (PBF) aggregates evidence for an informative hypothesis across conceptual replication studies without imposing assumptions about heterogeneity.

Usage

pbf(...)

## Default S3 method:
pbf(x, ...)

## S3 method for class 'numeric'
pbf(yi, vi, ni, hypothesis = "y = 0", ...)

Arguments

... Additional arguments passed to ‘bain’.

x An object for which a method exists, see Details.

yi Numeric vector with the observed effect sizes.

vi Numeric vector with the observed sampling variances.

ni Integer vector with the sample sizes.

hypothesis A character string containing the informative hypotheses to evaluate.

Details

Currently, the argument ‘x’ accepts either: * A list of ‘bain’ objects, resulting from a call to ‘bain’.
* A list of model objects for which a ‘bain’ method exists; in this case, ‘pbf’ will call ‘bain’ on these model objects before aggregating the Bayes factors.
seBeta

Value

A ‘data.frame’ of class ‘pbf’.

References


Examples

```r
pbf(yi = c(-.33, .32, .39, .31),
   vi = c(.085, .034, .016, .071),
   ni = c(7, 10, 13, 20))
```

```
  seBeta                        Standard Errors and CIs for Standardized Regression Coefficients

Description

Computes Normal Theory and ADF Standard Errors and CIs for Standardized Regression Coefficients

Usage

```r
seBeta(
  X = NULL,
  y = NULL,
  cov.x = NULL,
  cov.xy = NULL,
  var.y = NULL,
  Nobs = NULL,
  alpha = 0.05,
  estimator = "ADF"
)
```

Arguments

- `X` : Matrix of predictor scores.
- `y` : Vector of criterion scores.
- `cov.x` : Covariance or correlation matrix of predictors.
- `cov.xy` : Vector of covariances or correlations between predictors and criterion.
- `var.y` : Criterion variance.
- `Nobs` : Number of observations.
- `alpha` : Desired Type I error rate; default = .05.
- `estimator` : ‘ADF’ or ‘Normal’ confidence intervals - requires raw X and raw y; default = ‘ADF’.
seBeta

Value

cov.Beta: Normal theory or ADF covariance matrix of standardized regression coefficients.

se.Beta: standard errors for standardized regression coefficients.

alpha: desired Type-I error rate.

CI.Beta: Normal theory or ADF (1-alpha) intervals for standardized regression coefficients.

estimator: estimator = "ADF" or "Normal".

Author(s)

Jeff Jones and Niels Waller

References


Examples

```r
set.seed(123)

R <- matrix(.5, 3, 3)
diag(R) <- 1
X <- sesamesim[, c("peabody", "prenumb", "postnumb")]
y <- sesamesim$age
results <- seBeta(X, y, Nobs = nrow(sesamesim), alpha = .05, estimator = 'ADF')
print(results, digits = 3)

library(MASS)

set.seed(123)

R <- matrix(.5, 3, 3)
diag(R) <- 1
X <- mvrnorm(n = 200, mu = rep(0, 3), Sigma = R, empirical = TRUE)
Beta <- c(.2, .3, .4)
y <- X %*% Beta + .64 * scale(rnorm(200))
results <- seBeta(X, y, Nobs = 200, alpha = .05, estimator = 'ADF')
print(results, digits = 3)
```
**Description**

This is a simulated counterpart of part of the Sesame Street data presented by Stevens (1996, Appendix A) concerning the effect of the first year of the Sesame Street series on the knowledge of 240 children in the age range 34 to 69 months. We will use the following variables: sex; site of child’s origin; setting in which Sesame Street is watched; age; whether or not the child is encouraged to watch; Peabody mental age score; score on numbers test before, after and in a follow up measurement; and scores on knowledge of body parts, letters, forms, numbers, relations, and classifications, both before and after watching Sesame Street for a year.

**Usage**

data(sesamesim)

**Format**

A data frame with 240 rows and 21 variables.

**Details**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sex</td>
<td>integer</td>
<td>Sex of the child; 1 = boy, 2 = girl</td>
</tr>
<tr>
<td>site</td>
<td>integer</td>
<td>Site of the child’s origin; 1 = disadvantaged inner city, 2 = advantaged suburban, 3 = advantaged rural, 4 = disadvantaged rural, 5 = disadvantaged Spanish speaking</td>
</tr>
<tr>
<td>setting</td>
<td>integer</td>
<td>Setting in which the child watches Sesame Street; 1 = at home, 2 = at school</td>
</tr>
<tr>
<td>age</td>
<td>integer</td>
<td>Age of the child in months</td>
</tr>
<tr>
<td>viewenc</td>
<td>integer</td>
<td>Whether or not the child is encouraged to watch Sesame Street; 0 = no, 1 = yes</td>
</tr>
<tr>
<td>peabody</td>
<td>integer</td>
<td>Peabody mental age score of the child; the higher the score the higher the mental age</td>
</tr>
<tr>
<td>prenumb</td>
<td>integer</td>
<td>Score on a numbers test before watching Sesame Street for a year</td>
</tr>
<tr>
<td>postnumb</td>
<td>integer</td>
<td>Score on a numbers test after watching Sesame Street for a year</td>
</tr>
<tr>
<td>funumb</td>
<td>integer</td>
<td>Follow up numbers test score measured one year after postnumb</td>
</tr>
<tr>
<td>Bb</td>
<td>integer</td>
<td>Knowledge of body parts before</td>
</tr>
<tr>
<td>Bl</td>
<td>integer</td>
<td>Knowledge of letters before</td>
</tr>
<tr>
<td>Bf</td>
<td>integer</td>
<td>Knowledge of forms before</td>
</tr>
<tr>
<td>Bn</td>
<td>integer</td>
<td>Knowledge of numbers before</td>
</tr>
<tr>
<td>Br</td>
<td>integer</td>
<td>Knowledge of relations before</td>
</tr>
<tr>
<td>Bc</td>
<td>integer</td>
<td>Knowledge of classifications before</td>
</tr>
<tr>
<td>Ab</td>
<td>integer</td>
<td>Knowledge of body parts after</td>
</tr>
<tr>
<td>Al</td>
<td>integer</td>
<td>Knowledge of letters after</td>
</tr>
<tr>
<td>Af</td>
<td>integer</td>
<td>Knowledge of forms after</td>
</tr>
<tr>
<td>An</td>
<td>integer</td>
<td>Knowledge of numbers after</td>
</tr>
<tr>
<td>Ar</td>
<td>integer</td>
<td>Knowledge of relations after</td>
</tr>
<tr>
<td>Ac</td>
<td>integer</td>
<td>Knowledge of classifications after</td>
</tr>
</tbody>
</table>
References

---

**synthetic_dk**

*Simulated data about morality and politics in Denmark*

**Description**
This is a simulated counterpart of data presented by Van Leeuwen and colleagues (2022) concerning associations between moral dispositions (measured using the Morality As Cooperation questionnaire, MAC; see Curry et al., 2019) and political orientation.

**Usage**
data(synthetic_dk)

**Format**
A data frame with 552 rows and 31 variables.

**Details**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sepa_soc_1</td>
<td>numeric</td>
<td>Item 1 of the Policy Attitudes social (PA-social) scale.</td>
</tr>
<tr>
<td>sepa_soc_2</td>
<td>numeric</td>
<td>Item 2 of the Policy Attitudes social (PA-social) scale.</td>
</tr>
<tr>
<td>sepa_soc_3</td>
<td>numeric</td>
<td>Item 3 of the Policy Attitudes social (PA-social) scale.</td>
</tr>
<tr>
<td>sepa_soc_4</td>
<td>numeric</td>
<td>Item 4 of the Policy Attitudes social (PA-social) scale.</td>
</tr>
<tr>
<td>sepa_soc_5</td>
<td>numeric</td>
<td>Item 5 of the Policy Attitudes social (PA-social) scale.</td>
</tr>
<tr>
<td>sepa_eco_1</td>
<td>numeric</td>
<td>Item 1 of the Policy Attitudes economic (PA-economic) scale.</td>
</tr>
<tr>
<td>sepa_eco_2</td>
<td>numeric</td>
<td>Item 2 of the Policy Attitudes economic (PA-economic) scale.</td>
</tr>
<tr>
<td>sepa_eco_3</td>
<td>numeric</td>
<td>Item 3 of the Policy Attitudes economic (PA-economic) scale.</td>
</tr>
<tr>
<td>sepa_eco_4</td>
<td>numeric</td>
<td>Item 4 of the Policy Attitudes economic (PA-economic) scale.</td>
</tr>
<tr>
<td>sepa_eco_5</td>
<td>numeric</td>
<td>Item 5 of the Policy Attitudes economic (PA-economic) scale.</td>
</tr>
<tr>
<td>fam_1</td>
<td>numeric</td>
<td>Item 1 of the MAC (family subscale) scale.</td>
</tr>
<tr>
<td>fam_2</td>
<td>numeric</td>
<td>Item 2 of the MAC (family subscale) scale.</td>
</tr>
<tr>
<td>fam_3</td>
<td>numeric</td>
<td>Item 3 of the MAC (family subscale) scale.</td>
</tr>
<tr>
<td>grp_1</td>
<td>numeric</td>
<td>Item 1 of the MAC (group subscale) scale.</td>
</tr>
<tr>
<td>grp_2</td>
<td>numeric</td>
<td>Item 2 of the MAC (group subscale) scale.</td>
</tr>
<tr>
<td>grp_3</td>
<td>numeric</td>
<td>Item 3 of the MAC (group subscale) scale.</td>
</tr>
<tr>
<td>rec_1</td>
<td>numeric</td>
<td>Item 1 of the MAC (reciprocity subscale) scale.</td>
</tr>
<tr>
<td>rec_2</td>
<td>numeric</td>
<td>Item 2 of the MAC (reciprocity subscale) scale.</td>
</tr>
<tr>
<td>rec_3</td>
<td>numeric</td>
<td>Item 3 of the MAC (reciprocity subscale) scale.</td>
</tr>
<tr>
<td>her_1</td>
<td>numeric</td>
<td>Item 1 of the MAC (heroism subscale) scale.</td>
</tr>
<tr>
<td>her_2</td>
<td>numeric</td>
<td>Item 2 of the MAC (heroism subscale) scale.</td>
</tr>
<tr>
<td>her_3</td>
<td>numeric</td>
<td>Item 3 of the MAC (heroism subscale) scale.</td>
</tr>
<tr>
<td>def_1</td>
<td>numeric</td>
<td>Item 1 of the MAC (deference subscale) scale.</td>
</tr>
</tbody>
</table>
def_2 numeric Item 2 of the MAC (deference subscale) scale.
def_3 numeric Item 3 of the MAC (deference subscale) scale.
fai_1 numeric Item 1 of the MAC (fairness subscale) scale.
fai_2 numeric Item 2 of the MAC (fairness subscale) scale.
fai_3 numeric Item 3 of the MAC (fairness subscale) scale.
pro_1 numeric Item 1 of the MAC (property subscale) scale.
pro_2 numeric Item 2 of the MAC (property subscale) scale.
pro_3 numeric Item 3 of the MAC (property subscale) scale.

References

simulated_netherlands
Simulated data about morality and politics in The Netherlands

Description
This is a simulated counterpart of data presented by Van Leeuwen and colleagues (2022) concerning associations between moral dispositions (measured using the Morality As Cooperation questionnaire, MAC; see Curry et al., 2019) and political orientation.

Usage
data(synthetic_nl)

Format
A data frame with 401 rows and 38 variables.

Details
sepa_soc_1 numeric Item 1 of the Policy Attitudes social (PA-social) scale.
sepa_soc_2 numeric Item 2 of the Policy Attitudes social (PA-social) scale.
sepa_soc_3 numeric Item 3 of the Policy Attitudes social (PA-social) scale.
sepa_soc_4 numeric Item 4 of the Policy Attitudes social (PA-social) scale.
sepa_soc_5 numeric Item 5 of the Policy Attitudes social (PA-social) scale.
sepa_eco_1 numeric Item 1 of the Policy Attitudes economic (PA-economic) scale.
sepa_eco_2 numeric Item 2 of the Policy Attitudes economic (PA-economic) scale.
Item 3 of the Policy Attitudes economic (PA-economic) scale.
Item 4 of the Policy Attitudes economic (PA-economic) scale.
Item 5 of the Policy Attitudes economic (PA-economic) scale.
Item 1 of the Social and Economic Conservatism Scale (social subscale) scale.
Item 2 of the Social and Economic Conservatism Scale (social subscale) scale.
Item 3 of the Social and Economic Conservatism Scale (social subscale) scale.
Item 4 of the Social and Economic Conservatism Scale (social subscale) scale.
Item 5 of the Social and Economic Conservatism Scale (social subscale) scale.
Item 6 of the Social and Economic Conservatism Scale (social subscale) scale.
Item 7 of the Social and Economic Conservatism Scale (social subscale) scale.
Item 1 of the MAC (family subscale) scale.
Item 2 of the MAC (family subscale) scale.
Item 3 of the MAC (family subscale) scale.
Item 1 of the MAC (group subscale) scale.
Item 2 of the MAC (group subscale) scale.
Item 3 of the MAC (group subscale) scale.
Item 1 of the MAC (reciprocity subscale) scale.
Item 2 of the MAC (reciprocity subscale) scale.
Item 3 of the MAC (reciprocity subscale) scale.
Item 1 of the MAC (heroism subscale) scale.
Item 2 of the MAC (heroism subscale) scale.
Item 3 of the MAC (heroism subscale) scale.
Item 1 of the MAC (deference subscale) scale.
Item 2 of the MAC (deference subscale) scale.
Item 3 of the MAC (deference subscale) scale.
Item 1 of the MAC (fairness subscale) scale.
Item 2 of the MAC (fairness subscale) scale.
Item 3 of the MAC (fairness subscale) scale.
Item 1 of the MAC (property subscale) scale.
Item 2 of the MAC (property subscale) scale.
Item 3 of the MAC (property subscale) scale.

References


Description

This is a simulated counterpart of data presented by Van Leeuwen and colleagues (2022) concerning associations between moral dispositions (measured using the Morality As Cooperation questionnaire, MAC; see Curry et al., 2019) and political orientation.

Usage

data(synthetic_us)

Format

A data frame with 518 rows and 33 variables.

Details

<table>
<thead>
<tr>
<th></th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>secs_soc_1</td>
<td>numeric</td>
<td>Item 1 of the Social and Economic Conservatism Scale (social subscale) scale.</td>
</tr>
<tr>
<td>secs_soc_2</td>
<td>numeric</td>
<td>Item 2 of the Social and Economic Conservatism Scale (social subscale) scale.</td>
</tr>
<tr>
<td>secs_soc_3</td>
<td>numeric</td>
<td>Item 3 of the Social and Economic Conservatism Scale (social subscale) scale.</td>
</tr>
<tr>
<td>secs_soc_4</td>
<td>numeric</td>
<td>Item 4 of the Social and Economic Conservatism Scale (social subscale) scale.</td>
</tr>
<tr>
<td>secs_soc_5</td>
<td>numeric</td>
<td>Item 5 of the Social and Economic Conservatism Scale (social subscale) scale.</td>
</tr>
<tr>
<td>secs_soc_6</td>
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<td>Item 6 of the Social and Economic Conservatism Scale (social subscale) scale.</td>
</tr>
<tr>
<td>secs_soc_7</td>
<td>numeric</td>
<td>Item 7 of the Social and Economic Conservatism Scale (social subscale) scale.</td>
</tr>
<tr>
<td>secs_eco_1</td>
<td>numeric</td>
<td>Item 1 of the Social and Economic Conservatism Scale (economic subscale) scale.</td>
</tr>
<tr>
<td>secs_eco_2</td>
<td>numeric</td>
<td>Item 2 of the Social and Economic Conservatism Scale (economic subscale) scale.</td>
</tr>
<tr>
<td>secs_eco_3</td>
<td>numeric</td>
<td>Item 3 of the Social and Economic Conservatism Scale (economic subscale) scale.</td>
</tr>
<tr>
<td>secs_eco_4</td>
<td>numeric</td>
<td>Item 4 of the Social and Economic Conservatism Scale (economic subscale) scale.</td>
</tr>
<tr>
<td>secs_eco_5</td>
<td>numeric</td>
<td>Item 5 of the Social and Economic Conservatism Scale (economic subscale) scale.</td>
</tr>
<tr>
<td>fam_1</td>
<td>numeric</td>
<td>Item 1 of the MAC (family subscale) scale.</td>
</tr>
<tr>
<td>fam_2</td>
<td>numeric</td>
<td>Item 2 of the MAC (family subscale) scale.</td>
</tr>
<tr>
<td>fam_3</td>
<td>numeric</td>
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</tr>
<tr>
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<td>numeric</td>
<td>Item 1 of the MAC (group subscale) scale.</td>
</tr>
<tr>
<td>grp_2</td>
<td>numeric</td>
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<tr>
<td>grp_3</td>
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<td>Item 3 of the MAC (group subscale) scale.</td>
</tr>
<tr>
<td>rec_1</td>
<td>numeric</td>
<td>Item 1 of the MAC (reciprocity subscale) scale.</td>
</tr>
<tr>
<td>rec_2</td>
<td>numeric</td>
<td>Item 2 of the MAC (reciprocity subscale) scale.</td>
</tr>
<tr>
<td>rec_3</td>
<td>numeric</td>
<td>Item 3 of the MAC (reciprocity subscale) scale.</td>
</tr>
<tr>
<td>her_1</td>
<td>numeric</td>
<td>Item 1 of the MAC (heroism subscale) scale.</td>
</tr>
<tr>
<td>her_2</td>
<td>numeric</td>
<td>Item 2 of the MAC (heroism subscale) scale.</td>
</tr>
<tr>
<td>her_3</td>
<td>numeric</td>
<td>Item 3 of the MAC (heroism subscale) scale.</td>
</tr>
<tr>
<td>def_1</td>
<td>numeric</td>
<td>Item 1 of the MAC (deference subscale) scale.</td>
</tr>
<tr>
<td>def_2</td>
<td>numeric</td>
<td>Item 2 of the MAC (deference subscale) scale.</td>
</tr>
<tr>
<td>def_3</td>
<td>numeric</td>
<td>Item 3 of the MAC (deference subscale) scale.</td>
</tr>
<tr>
<td>fai_1</td>
<td>numeric</td>
<td>Item 1 of the MAC (fairness subscale) scale.</td>
</tr>
<tr>
<td>fai_2</td>
<td>numeric</td>
<td>Item 2 of the MAC (fairness subscale) scale.</td>
</tr>
<tr>
<td>fai_3</td>
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<td>Item 3 of the MAC (fairness subscale) scale.</td>
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<tr>
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</tr>
<tr>
<td>pro_3</td>
<td>numeric</td>
<td>Item 3 of the MAC (property subscale) scale.</td>
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</table>
References

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### t_test

*Student's t-test*

**Description**
This function is a wrapper for the function `t.test`, which returns group-specific sample sizes and variances, in addition to the usual output of `t.test`.

**Usage**

`t_test(x, ...)`

**Arguments**
- `x` An object for which an S3 method of `t.test` exists (vector or formula).
- `...` arguments passed to `t.test`.

**Details**
This wrapper allows users to enjoy the functionality of bain with the familiar interface of the stats-function `t.test`.
For more documentation, see `t.test`.

**Value**
A list with class "t_test" containing the following components:
- `statistic` the value of the t-statistic.
- `parameter` the degrees of freedom for the t-statistic.
- `p.value` the p-value for the test.
- `conf.int` a confidence interval for the mean appropriate to the specified alternative hypothesis.
- `estimate` the estimated mean or difference in means depending on whether it was a one-sample test or a two-sample test.
- `null.value` the specified hypothesized value of the mean or mean difference depending on whether it was a one-sample test or a two-sample test.
alternative  a character string describing the alternative hypothesis.
method     a character string indicating what type of t-test was performed.
data.name  a character string giving the name(s) of the data.
v          The variance or group-specific variances.
n          The sample size, or group-specific sample size.

See Also

t.test

Examples

tmp <- t_test(extra ~ group, data = sleep)
tmp$n
tmp$v
tmp2 <- t_test(extra ~ group, data = sleep)
tmp2$n
tmp2$v
tmp <- t_test(Pair(sleep$extra[sleep$group == 1], sleep$extra[sleep$group == 2]) ~ 1)
tmp$n
tmp$v

t_test(sesamesim$postnumb)
tmp <- t_test(sesamesim$prenumb)
tmp$n
tmp$v
tmp2 <- t_test(sesamesim$prenumb)
tmp2$n
tmp2$v
tmp <- t_test(sesamesim$prenumb, sesamesim$postnumb)
tmp$n
tmp$v
tmp2 <- t_test(sesamesim$prenumb, sesamesim$postnumb)
tmp2$n
tmp2$v
tmp <- t_test(sesamesim$prenumb, sesamesim$postnumb, paired = TRUE)
tmp$n
tmp$v
tmp2 <- t_test(sesamesim$prenumb, sesamesim$postnumb, paired = TRUE)
tmp2$n
tmp2$v
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