Package 'mbir'

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Type Package

Title Magnitude-Based Inferences

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Description Allows practitioners and researchers a wholesale approach for deriving magnitude-based inferences from raw data. A major goal of 'mbir' is to programmatically detect appropriate statistical tests to run in lieu of relying on practitioners to determine correct stepwise procedures independently.

Imports graphics, stats, utils, effsize, psych

URL http://mbir-project.us/

License GPL-2

Encoding UTF-8

LazyData true

RoxygenNote 6.1.0

Suggests knitr, testthat, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

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Repository CRAN

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Contents

`aipe_smd` *Accuracy in Parameter Estimation: Standardized Mean Difference*

Description

Estimates sample size for paired or independent, two-sample study desings via Accuracy in Parameter Estimation. Calculates *n* so a given study is likely to obtain margin of error no larger than chosen target margin of error.

Usage

```
aipe_smd(moe, paired = c(TRUE, FALSE), conf.int, assur.lvl, r)
```

Arguments

`moe`	target margin of error in standard deviation units
`paired`	(character) logical indicator specifying if `x` and `y` are paired (`TRUE`) or independent (`FALSE`)
`conf.int`	(optional) confidence level of the interval. Defaults to `0.90`
`assur.lvl`	(optional) desired level of *assurance* (percent experiments whose MOE is less than target MOE). Defaults to `0.99`
`r`	(required if `paired = TRUE`) population correlation between the two measures

Details

Refer to vignette for further information.

References

Maxwell SE, Kelley K & Rausch JR. (2008). Sample size planning for statistical power and accuracy in parameter estimation. *Annual Review of Psychology*, 59, 537-563.

Kelley K & Rausch JR. (2006). Sample size planning for the standardized mean difference: Accuracy in parameter estimation via narrow confidence intervals. *Psychological Methods*, 11, 363–385.

Examples

```
aipe_smd(moe = 0.55, paired = TRUE, conf.int = .9, assur.lvl = .99, r = 0.75)
```

`boot_test` *Bootstrap Confidence Intervals via Resampling*

Description

Provides nonparametric confidence intervals via percentile-based resampling.

Usage

```
boot_test(x, y, conf.int, resample, med)
```

Arguments

`x, y`	numeric vectors of data values
`conf.int`	(optional) confidence level of the interval. Defaults to `0.90`
`resample`	(optional) number of resamples. Defaults to 10,000
`med`	(optional) number indicating true difference in medians to test against. Defaults to zero.

Details

Refer to vignette for further information.

Examples

```
require(graphics)

a <- rnorm(25, 80, 35)
b <- rnorm(25, 100, 50)

boot_test(a, b, 0.95, 10000)
```

corr *Correlation Coefficient*

Description

Provides magnitude-based inferences upon given *r* value and sample size. Based upon WG Hopkins Microsoft Excel spreadsheet.

Usage

```
corr(r, n, conf.int = 0.9, swc = 0.1, plot = FALSE)
```

Arguments

r	correlation coefficient
n	sample size
conf.int	(optional) confidence level of the interval. Defaults to 0.90
swc	(optional) number indicating smallest worthwhile change. Defaults to 0.1
plot	(optional) logical indicator specifying to print associated plot. Defaults to FALSE

Details

Refer to vignette for further information.

References

Hopkins WG. (2007). A spreadsheet for deriving a confidence interval, mechanistic inference and clinical inference from a *p* value. *Sportscience* 11, 16-20. sportsci.org/2007/wghinf.htm

Examples

```
corr(.40, 25, 0.95)
```

corr_diff *Test of Two Correlations*

Description

Provides statistical inference upon the difference between two independent correlations.

Usage

```
corr_diff(r1, n1, r2, n2, conf.int = 0.9, plot = FALSE)
```

Arguments

r1	correlation of group 1
n1	sample size of group 1
r2	correlation of group 2
n2	sample size of group 2
conf.int	(optional) confidence level of the interval. Defaults to 0.90
plot	(optional) logical indicator specifying to print associated plot. Defaults to FALSE

Details

Refer to vignette for further information.

References

Zou GY. (2007). Toward using confidence intervals to compare correlations. *Psychological Methods*, 12, 399-413.

Examples

```
corr_diff(r1 = 0.20, n1 = 71, r2 = 0.55, n2 = 46)
```

---

corr_test *Correlation Coefficient Test*

Description

Provides magnitude-based inferences for the association between given data vectors. Evaluates normality assumption, performs either Pearson or Spearman correlation and subsequently estimates magnitude-based inferences.

Usage

```
corr_test(x, y, conf.int = 0.9, auto = TRUE, method = "pearson",
  swc = 0.1, plot = FALSE)
```

Arguments

x, y	numeric vectors of data values
conf.int	(optional) confidence level of the interval. Defaults to 0.90
auto	(character) logical indicator specifying if user wants function to programmatically detect statistical procedures. Defaults to TRUE
method	(character) if auto = F, logical indicator specifying which correlation to execute (pearson, spearman, kendall). Defaults to "pearson".
swc	(optional) number indicating smallest worthwhile change. Defaults to 0.1
plot	(optional) logical indicator specifying to print associated plot. Defaults to FALSE

Details

Refer to vignette for further information.

Value

Associated effect size measure, *r*, and respective confidence intervals.

Examples

```
a <- rnorm(25, 80, 35)
b <- rnorm(25, 100, 35)

corr_test(a, b, 0.95)
```

---

es_convert *Effect Size Converter*

Description

Converts between equivalent effect size measures: *d*, *r*, odds ratio.

Usage

```
es_convert(x, from = c("d", "or", "r"), to = c("d", "or", "r"))
```

Arguments

x	numeric value
from	(character) current effect size of x
to	(character) effect size measure to convert to

Details

Refer to vignette for further information.

References

Rosenthal R. (1994). Parametric measures of effect size. In H. Cooper & LV. Hedges (Eds.), *The Handbook of Research Synthesis*. New York, NY: Sage.

Borenstein M, Hedges LV, Higgins JPT & Rothstein HR. (2009). *Introduction to Meta-Analysis*. Chichester, West Sussex, UK: Wiley.

Examples

```
# Odds ratio to Cohen's d
es_convert(1.25, from = "or", to = "d")
```

odds *Odds Ratio*

Description

Provides magnitude-based inferences upon given odds ratio and *p*-value. Based upon WG Hopkins Microsoft Excel spreadsheet.

Usage

```
odds(or, p, conf.int = 0.9)
```

Arguments

or	odds ratio
p	associated *p*-value
conf.int	(optional) confidence level of the interval. Defaults to 0.90

Details

Refer to vignette for further information.

References

Hopkins WG. (2007). A spreadsheet for deriving a confidence interval, mechanistic inference and clinical inference from a *p* value. *Sportscience* 11, 16-20. sportsci.org/2007/wghinf.htm

Examples

```
odds(1.25, 0.06, 0.95)
```

prop *Test of Two Proportions*

Description

Provides magnitude-based inferences upon given proportions and sample sizes. Based upon WG Hopkins Microsoft Excel spreadsheet.

Usage

```
prop(p1, n1, p2, n2, conf.int)
```

Arguments

p1	proportion of group 1
n1	sample size of group 1
p2	proportion of group 2
n2	sample size of group 2
conf.int	(optional) confidence level of the interval. Defaults to 0.90

Details

Refer to vignette for further information.

References

Hopkins WG. (2007). A spreadsheet for deriving a confidence interval, mechanistic inference and clinical inference from a *p* value. *Sportscience* 11, 16-20. sportsci.org/2007/wghinf.htm

Examples

```
prop(p1 = 0.7, n1 = 25, p2 = 0.5, n2 = 20)
```

---

smd *Standardized Mean Difference*

Description

Provides magnitude-based inferences upon given *d*, *p*-value, and degrees of freedom. Based upon WG Hopkins Microsoft Excel spreadsheet.

Usage

```
smd(es, p, df, conf.int = 0.9, swc = 0.5, plot = FALSE)
```

Arguments

es	effect size measure (Cohen's *d*)
p	associated *p*-value from t-statistic
df	associated degrees of freedom from t-statistic
conf.int	(optional) confidence level of the interval. Defaults to 0.90
swc	(optional) number indicating smallest worthwhile change. Defaults to 0.5
plot	(optional) logical indicator specifying to print associated plot. Defaults to FALSE

Details

Refer to vignette for further information.

References

Hopkins WG. (2007). A spreadsheet for deriving a confidence interval, mechanistic inference and clinical inference from a *p* value. *Sportscience* 11, 16-20. sportsci.org/2007/wghinf.htm

Examples

```
smd(.75, 0.06, 20, 0.95)
```

`smd_test` *Standardized Mean Difference Test*

Description

Performs two-sample difference of means analysis to produce magnitude-based inferences. Evaluates both normality and homogeneity, performs either t-test or wilcoxon test, computes effect sizes and estimates magnitude-based inferences. Allows both independent and paired designs.

Usage

```
smd_test(x, y, paired = c(TRUE, FALSE), auto = TRUE, var = TRUE,
  normal = TRUE, conf.int = 0.9, mu = 0, swc = 0.5, plot = FALSE)
```

Arguments

`x, y`	numeric vectors of data values
`paired`	(character) logical indicator specifying if `x` and `y` are paired (`TRUE`) or independent (`FALSE`)
`auto`	(character) logical indicator specifying if user wants function to programmatically detect statistical procedures. Defaults to `TRUE`
`var`	(optional) if `auto = F`, logical indicator specifying if homogeneity of variance assumed. Defaults to `TRUE`
`normal`	(optional) if `auto = F`, logical indicator specifying if normality assumed. Defaults to `TRUE`
`conf.int`	(optional) confidence level of the interval. Defaults to `0.90`
`mu`	(optional) number indicating true difference in means to test against. Defaults to zero.
`swc`	(optional) number indicating smallest worthwhile change. Defaults to `0.5`
`plot`	(optional) logical indicator specifying to print associated plot. Defaults to `FALSE`

Details

Refer to vignette for further information.

Value

Associated effect size measures (*d*, *r*, odds ratio) and respective confidence intervals based upon which statistical test(s) performed.

Examples

```
a <- rnorm(25, 80, 35)
b <- rnorm(25, 100, 50)

smd_test(a, b, paired = FALSE, conf.int=0.95)
```

---

ss_corr *Sample Size Estimation: Correlation Coefficient*

Description

Estimates magnitude-based inferences upon planned sample size and *r* value. Based upon WG Hopkins Microsoft Excel spreadsheet.

Usage

```
ss_corr(n, r)
```

Arguments

n	planned sample size
r	planned correlation coefficient

Details

Refer to vignette for further information.

References

Hopkins WG. (2006). Estimating sample size for magnitude-based inferences. *Sportscience* 10, 63-70. sportsci.org/2006/wghss.htm

Examples

```
ss_corr(n = 20, r = 0.2)
```

ss_odds *Sample Size Estimation: Odds Ratio*

Description

Estimates magnitude-based inferences upon planned sample size and odds ratio. Based upon WG Hopkins Microsoft Excel spreadsheet.

Usage

```
ss_odds(exp, con, or)
```

Arguments

exp	planned sample size of experimental group
con	planned sample size of control group
or	planned odds ratio

Details

Refer to vignette for further information.

References

Hopkins WG. (2006). Estimating sample size for magnitude-based inferences. *Sportscience* 10, 63-70. sportsci.org/2006/wghss.htm

Examples

```
ss_odds(exp = 15, con = 18, or = 3.25)
```

ss_smd *Sample Size Estimation: Standardized Mean Difference*

Description

Estimates magnitude-based inferences upon planned sample size and *d* value. Based upon WG Hopkins Microsoft Excel spreadsheet.

Usage

```
ss_smd(exp, con, es)
```

Arguments

exp	planned sample size of experimental group
con	planned sample size of control group
es	planned Cohen's *d*

Details

Refer to vignette for further information.

References

Hopkins WG. (2006). Estimating sample size for magnitude-based inferences. *Sportscience* 10, 63-70. sportsci.org/2006/wghss.htm

Examples

```
ss_smd(exp = 20, con = 15, es = 0.6)
```

---

swc_ind *Smallest Worthwhile Change: Individual*

Description

Provides longitudinal magnitude-based inferences for an individual's change from previous time point and magnitude of deviation from trend line.

Usage

```
swc_ind(x, swc, type = c("previous", "trend"), ts, te, main, xlab, ylab)
```

Arguments

x	numeric vectors of data values
swc	smallest worthwhile change
type	(character) indicator specifying which type of analysis: "previous" or "trend"
ts	(required if type = "trend") target slope
te	(optional) typical error. Defaults to typical error of the estimate
main	(optional) plot title. Defaults to blank
xlab	(optional) x-axis label. Defaults to "Measurement"
ylab	(optional) y-axis label. Defaults to name of x

Details

Refer to vignette for further information.

References

Hopkins WG. (2017). A spreadsheet for monitoring an individual's changes and trend. *Sportscience* 21, 5-9. sportsci.org/2017/wghtrend.htm

Examples

```
df<-c(97.5,99.9,100.2,101,101.2,99.8)

swc_ind(x = df, swc = 0.5, te = 1, ts = 0.25, type = "trend")
```

Index