Package: tTOlr (via r-universe)

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Type Package

Title Likelihood Ratio Statistics for One or Two Sample T-Tests

Version 0.2.3

Maintainer John Maindonald <john@statsresearch.co.nz>

Description Likelihood ratio and maximum likelihood statistics are provided that can be used as alternatives to p-values Colquhoun (2017) <doi:10.1098/rsos.171085>. Arguments can be either p-values or t-statistics. together with degrees of freedom. For the function 'tTOlr', the argument 'twoSided' has the default 'twoSided = TRUE'.

License GPL (>= 2)

Encoding UTF-8

Suggests knitr, rmarkdown, bookdown, MASS, magrittr

Imports lattice, latticeExtra

VignetteBuilder knitr

RoxygenNote 7.2.3

NeedsCompilation no

Author John Maindonald [aut, cre] (<https://orcid.org/0000-0002-0106-9224>)

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tTOlr *Maximum Likelihood ratio for H1 versus H0, given t-statistic or p-value*

Description

Given the t-statistic for a difference in means, or for a mean difference, and degrees of freedom, determine the maximum likelihood under the alternative H1, and the t-statistic for the difference in means that makes the likelihood under H1 a maximum. Also available is the likelihood that corresponds to a particular value of a particular effect size (mean divided by standard deviation) delta.

Usage

```
tTOlr(
  t = NULL,
  df = NULL,
  nsamp = NULL,
  pval = NULL,
  delta = NULL,
  sd = 1,
  twoSided = TRUE,
  showMax = TRUE
)
```

Arguments

t	t-statistic. If NULL, this is calculated from the p-value.
df	Degrees of freedom.
nsamp	Sample size. For a two-sample test, this should be a vector of length 2.
pval	p-value. If NULL, this is calculated from the t-statistic and degrees of freedom.
delta	If not NULL, this specifies the t-statistic for the difference from H0 that is of interest, allowing the calculation of the corresponding likelihood and likelihood ratio.
sd	Standard deviation.
twoSided	Set either to TRUE for a two-sided test, or FALSE for a one-sided test.
showMax	Set to TRUE if the maximum of the likelihood and the likelihood ratio is required.

Details

The function returns the maximum likelihood estimate of the maximum likelihood on the scale of the t-statistic, for the likelihood under the alternative, when the when the t-statistic is used as non-centrality parameter. This results in a value for the likelihood ratio that differs from (and is smaller than) the standard likelihood ratio statistic. Additionally, return the likelihoods under H0 and H1.

Value

List, with elements

- t - t-statistic
- df - Degrees of freedom
- pval - P-value
- likDelta - Likelihood, given difference delta under H0
- lrDelta - Likelihood ratio, given difference delta under H0
- maxlik - Maximum likelihood, under allowed alternatives H1
- lrmax - Maximum likelihood under H1, on the scale of the t-statistic
- tmax - t-statistic for difference in means that makes likelihood under H1 a maximum

Note

The likelihood estimate for H1 versus H0 is unchanged if the roles of H0 and H1 are reversed.

Examples

```
likStats <- tTOlr(pval=0.02, nsamp=c(9,9), twoSided=TRUE,
                  delta=1.4, sd=1.2)
print(likStats,digits=2)
likStats <- tTOlr(t=2.58, df=16, nsamp=c(9,9), twoSided=TRUE,
                    delta=1.4, sd=1.2)
print(likStats,digits=2)
likStats <- tTOlr(pval=0.02, nsamp=9, twoSided=FALSE,
                  delta=1.4, sd=1.2)
print(likStats,digits=2)
likStats <- tTOlr(t=2.45, df=8, nsamp=9, twoSided=FALSE,
                    delta=1.4, sd=1.2)
print(likStats,digits=2)
```

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tTOmaxlik *Maximum Likelihood Under H1, Given T-statistic*

Description

Given the t-statistic for a difference in means, or for a mean difference, and degrees of freedom, determine the maximum likelihood under the alternative H1, and the t-statistic for the difference in means that makes the likelihood under H1 a maximum. Additionally, return the likelihood under H0.

Usage

```
tTOmaxlik(t, df)
```

Arguments

t	t-statistic.
df	Degrees of freedom.

Details

#' @details The function returns the maximum likelihood estimate of the maximum likelihood on the scale of the t-statistic, for the likelihood under the alternative, when the when the t-statistic is used as non-centrality parameter. This results in a value for the likelihood ratio that differs from (and is smaller than) the standard likelihood ratio statistic. Additionally, return the likelihoods under H0 and H1.

Value

List, with elements

- maxlik - Maximum likelihood under H1
- tmax - t-statistic for difference in means that makes likelihood a maximum under H1
- lik0 - Density (one-sided) under H0

References

van Aubel, A; Gawronski, W (2003). Analytic properties of noncentral distributions. Applied Mathematics and Computation. 141: 3–12. doi:10.1016/S0096-3003(02)00316-8.

Examples

```
stats <- tTOmaxlik(t=2, df=5)
## Likelihood ratio, 1-sided test and 2-sided test, p=0.05
tvals1 <- qt(0.05, df=c(2,5,20), lower.tail=FALSE)
tvals2 <- qt(0.025, df=c(2,5,20), lower.tail=FALSE)
likrat1 <- likrat2 <- numeric(3)
for(i in 1:3){
stats1 <- tTOmaxlik(t=tvals1[i], df=c(2,5,20)[i])
likrat1[i] <- stats1[['maxlik']]/stats1[['lik0']]
stats2 <- tTOmaxlik(t=tvals2[i], df=c(2,5,20)[i])
likrat2[i] <- stats2[['maxlik']]/(2*stats2[['lik0']])
# NB: 2*stats2[['lik0']] in denominator.
}
likrat <- rbind('One-sided'=likrat1, 'Two-sided'=likrat2)
colnames(likrat) <- paste0('df=',c(2,5,20))
likrat
```

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