Package 'tTOlr'

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Type Package

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

Version 0.2

Author John Maindonald

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

Description Several forms of likelihood ratio calculations are available.

License GPL (>= 2)

Encoding UTF-8

LazyData true

Suggests knitr, rmarkdown, bookdown, MASS, magrittr

Imports lattice, latticeExtra

VignetteBuilder knitr

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R topics documented:

tTOlr *Maximum Likelihood Under H1, Given 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. Additionally, return the likelihood under H0.

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.
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.

Value

List, with elements

- t - t-statistic
- df - Degrees of freedom
- pval - P-value
- lik0 - Likelihood under H0

- likDelta - Likelihood, given difference delta under H0
- lrDelta - Likelihood ratio, given difference delta under H0
- maxlik - Maximum likelihood, under allowed alternatives H1
- lrmax - Maximum of likelihood ratio, under allowed alternatives H1
- tmax - t-statistic for difference in means that makes likelihood under H1 a maximum

Examples

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

Because the t-distribution mean under H1 is a random variable, one has a non-central t, and the mode (which gives the maximum) differs somewhat from the mean.

Value

List, with elements

- maxlik - Maximum likelihood under H1
- tmax - t-statistic for difference in means that makes likelihood a maximum
- lik0 - Likelihood 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)
likrat <- stats[['maxlik']]/stats[['lik0']]
c("Maximum likelihood ratio"=likrat)
## 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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