Package ‘exceedProb’

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Title Confidence Intervals for Exceedance Probability
Description Computes confidence intervals for the exceedance probability of normally distributed estimators. Currently only supports general linear models. Please see Segal (2019) <arXiv:1803.03356> for more information.
Depends R (>= 3.1)
Imports Rcpp (>= 1.0.2)
LinkingTo Rcpp, BH
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R topics documented:

  exceedProb ................................................................. 2
  getDeltaCI ................................................................. 3
  pnct ................................................................. 4
  tRoot ................................................................. 4

Index 5
Description

This function obtains confidence intervals for exceedance probability.

Usage

```r
exceedProb(cutoff, theta_hat, sd_hat, alpha, d, n, m, interval = c(-100, 100), lower_tail = FALSE)
```

Arguments

- `cutoff`: Cutoff values (scalar or vector)
- `theta_hat`: Point estimate for the parameter of interest
- `sd_hat`: Estimated standard deviation for the parameter of interest (Note: not the standard error)
- `alpha`: Significance level
- `d`: Number of parameters in the general linear model
- `n`: Number of observations in the initial study
- `m`: Number of observations in the replication study
- `interval`: Interval within which to search for roots
- `lower_tail`: If TRUE, reports lower tail probabilities

Value

`ep` Exceedance probability with confidence intervals

Examples

```r
library(exceedProb)

# Sample mean
n <- 100
x <- rnorm(n = n)
theta_hat <- mean(x)
sd_hat <- sd(x)
cutoff <- seq(from = theta_hat - 0.5, to = theta_hat + 0.5, by = 0.1)
exceedProb(cutoff = cutoff, theta_hat = theta_hat, sd_hat = sd_hat, alpha = 0.05)
```
getDeltaCI

```r
d = 1,  
n = n,  
m = n)

# Linear regression -----------------------------------------------
n <- 100
beta <- c(1, 2)
x <- runif(n = n, min = 0, max = 10)
y <- rnorm(n = n, mean = cbind(1, x) %*% beta, sd = 1)

j <- 2
fit <- lm(y ~ x)
theta_hat <- coef(fit)[j]
sd_hat <- sqrt(n * vcov(fit)[j, j])
cutoff <- seq(from = theta_hat - 0.5, to = theta_hat + 0.5, by = 0.1)

exceedProb(cutoff = cutoff, 
theta_hat = theta_hat,  
sd_hat = sd_hat,  
alpha = 0.05,  
d = length(beta),  
n = n,  
m = n)
```

getDeltaCI  
Confidence intervals for noncentrality parameter of t-distribution

Description

This function obtains confidence intervals for the non-centrality parameter of a t-distribution.

Usage

getDeltaCI(test_stat, alpha, d, n, interval)

Arguments

- `test_stat`  Test statistics
- `alpha`  Significance level
- `d`  Number of parameters in general linear model
- `n`  Number of observations in initial study
- `interval`  Interval within which to search for roots

Value

- `ep`  Exceedance probability with confidence intervals (vector if cutoff is scalar and matrix otherwise)
**pnct**  
*t-distribution with Boost*

**Description**

This function returns the cdf of a noncentral t-distribution. It is more accurate than stats::pt() for large ncp.

**Usage**

pnct(x, df, ncp)

**Arguments**

- **x**: Test statistic
- **df**: Degrees of freedom
- **ncp**: Noncentrality parameter

**Value**

Cumulative probability

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**tRoot**  
*This function is used to find the root for a t-distribution pivotal quantity*

**Description**

This function returns the difference between the lower tail probability of a non-central t-distribution and a confidence level q where the t-distribution has df degrees of freedom and non-centrality parameter delta.

**Usage**

tRoot(delta, test_stat, df, conf_level)

**Arguments**

- **delta**: Non-centrality parameter
- **test_stat**: Test statistic at which to evaluate the t-distribution
- **df**: Degrees of freedom
- **conf_level**: Confidence level (usually alpha/2 or 1-alpha/2)

**Value**

dif Difference between t-distribution quantile and confidence level
Index

exceedProb, 2
getDeltaCI, 3
pnct, 4
tRoot, 4