

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](https://arxiv.org/abs/1803.03356)> for more information.

Depends R (>= 3.1)

Imports Rcpp (>= 1.0.2)

LinkingTo Rcpp, BH

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License GPL (>= 3)

URL <https://github.com/bdsegal/exceedProb>

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exceedProb *Confidence intervals for the exceedance probability*

Description

This function obtains confidence intervals for exceedance probability

Usage

```
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

```
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,
```

```

      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)

punct *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

```
punct(x, df, ncp)
```

Arguments

x	Test statistic
df	Degrees of freedom
ncp	Noncentrality parameter

Value

Cumulative probability

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

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