Package 'SMR'

January 20, 2025

Title Externally Studentized Midrange Distribution

Version 2.1.0

Description Computes the studentized midrange distribution (pdf, cdf and quantile) and generates random numbers.

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URL https://bendeivide.github.io/SMR/,
https://github.com/bendeivide/SMR

BugReports https://github.com/bendeivide/SMR/issues

RoxygenNote 7.2.0

LinkingTo Rcpp

Imports Rcpp

NeedsCompilation yes

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Date/Publication 2023-10-07 22:40:10 UTC

Contents

SMR *The externally studentized normal midrange distribution*

Description

Computes the probability density, the cumulative distribution function and the quantile function and generates random samples for the externally studentized normal midrange distribution with the numbers means equal to `size`, the degrees of freedom equal to `df` and the number of points of the Gauss-Legendre quadrature equal to `np`.

Usage

```
dSMR(x, size, df, np=32, log = FALSE)
pSMR(q, size, df, np=32, lower.tail = TRUE, log.p = FALSE)
qSMR(p, size, df, np=32, eps = 1e-13, maxit = 5000, lower.tail = TRUE, log.p = FALSE)
rSMR(n, size,  df = Inf)
```

Arguments

`x`, `q`	vector of quantiles $x \in R$ and $q \in R$.
`p`	vector of probabilities $(0, 1)$.
`size`	sample size. Only for $size > 1$.
`n`	vector size to be simulated $n > 1$.
`df`	degrees of freedom $df > 0$.
`np`	number of points of the gaussian quadrature $np > 2$.
`log`, `log.p`	logical argument; if `TRUE`, the probabilities p are given as $log(p)$.
`lower.tail`	logical argument; if `TRUE`, the probabilities are $P[X \leq x]$ otherside, $P[X \geq x]$.
`eps`	stopping criterion for Newton-Raphson's iteraction method.
`maxit`	maximum number of interaction in the Newton-Raphson method.

Details

Assumes np = 32 as default value for dSMR, pSMR and qSMR. If `df` is not specified, it assumes the default value `Inf` in `rSMR`. When `df=1`, the convergence of the routines requires `np>250` to obtain the desired result accurately. The Midrange distribution has density

$$f(\overline{q}; n, \nu) = \int_0^{\infty} \int_{-\infty}^{x\overline{q}} 2n(n-1)x\phi(y)\phi(2x\overline{q} - y)[\Phi(2x\overline{q} - y) - \Phi(y)]^{n-2} f(x; \nu) dy dx,$$

where, q is the quantile of externally studentized midrange distribution, n (`size`) is the sample size and ν is the degrees of freedon.

The externally studentized midrange distribution function is given by

$$F(\overline{q}; n, \nu) = \int_{-\infty}^{\overline{q}} \int_{0}^{\infty} \int_{-\infty}^{x\overline{q}} 2n(n-1)x\phi(y)\phi(2xz-y)[\Phi(2xz-y)-\Phi(y)]^{n-2} f(x;\nu)dydxdz.$$

where, q is the quantile of externally studentized midrange distribution, n (`size`) is the sample size and ν is the degrees of freedon.

Value

`dSMR` gives the density, `pSMR` gives the cumulative distribution function, `qSMR` gives the quantile function, and `rSMR` generates random deviates.

References

BATISTA, B. D. de O.; FERREIRA, D. F. SMR: An R package for computing the externally studentized normal midrange distribution. The R Journal, v. 6, n. 2, p. 123-136, dez. 2014.

Examples

```
library(SMR)

#example 1:
x  <- 2
q  <- 1
p  <- 0.9
n  <- 30
size  <- 5
df <- 3
np <- 32
dSMR(x, size, df, np)
pSMR(q, size, df, np)
qSMR(p, size, df, np)
rSMR(n, size, df)

#example 2:
x  <- c(-1, 2, 1.1)
q  <- c(1, 0, -1.5)
p  <- c(0.9, 1, 0.8)
n  <- 10
size  <- 5
df <- 3
np <- 32
dSMR(x, size, df, np)
pSMR(q, size, df, np)
qSMR(p, size, df, np)
rSMR(n, size, df)
```

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