Package ‘rootWishart’

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Title  Distribution of Largest Root for Single and Double Wishart Settings

Version  0.4.1

Description  Functions for hypothesis testing in single and double Wishart settings, based on Roy's largest root. This test statistic is especially useful in multivariate analysis. The computations are based on results by Chiani (2014) <DOI:10.1016/j.jmva.2014.04.002> and Chiani (2016) <DOI:10.1016/j.jmva.2015.10.007>. They use the fact that the CDF is related to the Pfaffian of a matrix that can be computed in a finite number of iterations. This package takes advantage of the Boost and Eigen C++ libraries to perform multi-precision linear algebra.

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License  GPL (>= 2)
Encoding  UTF-8
LazyData  true
NeedsCompilation  yes
RoxygenNote  6.0.1
LinkingTo  Rcpp, RcppEigen, BH
Imports  Rcpp
URL  http://github.com/turgeonmaxime/rootWishart

BugReports  http://github.com/turgeonmaxime/rootWishart/issues
Suggests  testthat
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**singleWishart**

**Description**

Computes the cumulative distribution function of the largest root in the single and double Wishart setting.

**Usage**

```r
singleWishart(x, p, n, type = c("double", "multiple"))
```

```r
doubleWishart(x, p, n, m, type = c("double", "multiple"))
```

**Arguments**

- `x`: Vector of numeric values at which to compute the CDF.
- `p, n, m`: Parameters of the single and double Wishart settings. See details.
- `type`: Character string. Select `"multi"` for multiprecision; select `"double"` for double precision. Defaults to adaptive selection of the precision type based on the input parameters.

**Details**

If $S$ follows a Wishart($p, n$) distribution, e.g. if we can write

$$ S = X^T X, $$

where $X$ is an $n \times p$ matrix with i.i.d rows coming from a $p$-variate standard normal, then `singleWishart` gives the distribution of the largest root of $S$.

As its name indicates, the double Wishart setting involves two Wishart variables: let $A$ and $B$ be Wishart($p, m$) and Wishart($p, n$), respectively. If $A + B$ is invertible, then `doubleWishart` gives the distribution of the largest root of

$$ (A + B)^{-1} B. $$

Alternatively, it gives the distribution of the largest root of the determinental equation

$$ det(B - \theta(A + B)). $$

**Value**

Returns the value of the CDF at $x$. 

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Examples

```r
x1 <- seq(0, 30, length.out = 50)
y1 <- singleWishart(x1, p = 5, n = 10)
plot(x1, y1, type='l')

x2 <- seq(0, 1, length.out = 50)
y2 <- doubleWishart(x2, p = 10, n = 10, m = 200)
plot(x2, y2, type='l')
```
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