The mvtnormpcs Package

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Type Package

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Title Multivariate Normal and T Distribution functions of (Dunnett, 1989)

Author Duane Currie <duane.currie@acadiau.ca> and Jianan Peng, using code from (Dunnett, Appl Stats., 1989)

Maintainer Duane Currie <duane.currie@acadiau.ca>

Description Computes multivariate student and multivariate normal integrals, given a correlation matrix structure defined by a vector bpd, s.t. rho(i,j) = bpd(i) * bpd(j) (product correlation structure)

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Depends R (>= 2.1.0)

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Description

For a multivariate normal vector with correlation structure defined by RHO(I,J) = BPD(I)*BPD(J), computes the probability that the vector falls in a rectangle in N-space with error less than EPS

Usage

result <- mvnprd(A, B, BPD, INF, EPS = 1e-04, IERC = 1, HINC = 0)
Arguments

A  Upper limits of integration. Array of N dimensions
B  Lower limits of integration. Array of N dimensions
BPD Values defining correlation structure. Array of N dimensions
INF Determines where integration is done to infinity. Array of N dimensions. Valid values for INF(I): 0=(B(I), inf), 1=(-inf, A(I)), 2=(B(I),A(I))
EPS desired accuracy. Defaults to 1e-04
IERC error control. If set to 1, strict error control based on fourth derivative is used. If set to zero, error control based on halving intervals is used
HINC Interval width for Simpson’s rule. Value of zero caused a default .24 to be used

Value

Returns a list of values

PROB approximation to the N-variate probability
BOUND bound on error of the approximation
IFault a fault indicator. If 1, error in dimensions (N<1 or N>50). If 2, BPD<-1 or BPD>1. If 3, INF not 0, 1, or 2. If 4, INF(I)=2 and A(I)<= B(I). If 5, the number of terms computed exceeds the limit. If 6, a fault occurred in normal subroutines. If 7, subintervals are too narrow, or too many. If 8, BOUND exceeds EPS. If 0, no errors.

Note

Much of this help text was paraphrased and/or copied from Dunnett’s code, as presented with the paper listed in the references.

Author(s)

Fortran code by Charles W. Dunnett.
Ported to R by Duane Currie <duane.currie@acadiau.ca>, Acadia Centre for Mathematical Modeling and Computation, Acadia University

References


Examples

```r
library(mvtnormpcs)
N <- 3

rho <- 0.5
B <- rep(-5.0, length=N)
A <- rep(5.0, length=N)
INF <- rep(2, length=N)
BPD <- rep(sqrt(rho), length=N)

result <- mvnprd(A,B,BPD,INF)
result
```
mvstud

Multivariate Student Distribution with Product Correlation Structure

Description

Computes the multivariate student integral using mvnprd, subject to the constraint of a product correlation structure, s.t. RHO(I,J) = BPD(I)*BPD(J)

Usage

result <- mvstud(NDF, A, B, BPD, INF, D, EPS = 1e-04, IERC = 1, HINC = 0)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDF</td>
<td>Degrees of Freedom. Use 0 for infinite D.F.</td>
</tr>
<tr>
<td>A</td>
<td>Upper limits of integration. Array of N dimensions</td>
</tr>
<tr>
<td>B</td>
<td>Lower limits of integration. Array of N dimensions</td>
</tr>
<tr>
<td>BPD</td>
<td>Values defining correlation structure. Array of N dimensions</td>
</tr>
<tr>
<td>INF</td>
<td>Determines where integration is done to infinity. Array of N dimensions. Valid values for INF(I): 0=(B(I), inf), 1=(-inf, A(I)), 2=(B(I),A(I))</td>
</tr>
<tr>
<td>D</td>
<td>Non-Centrality Vector</td>
</tr>
<tr>
<td>EPS</td>
<td>desired accuracy. Defaults to 1e-04</td>
</tr>
<tr>
<td>IERC</td>
<td>error control. If set to 1, strict error control based on fourth derivative is used. If set to zero, error control based on halving intervals is used</td>
</tr>
<tr>
<td>HINC</td>
<td>Interval width for Simpson’s rule. Value of zero caused a default .24 to be used</td>
</tr>
</tbody>
</table>

Value

Returns a list of values

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<td>PROB</td>
<td>approximation to the N-variate probability</td>
</tr>
<tr>
<td>BOUND</td>
<td>bound on error of the approximation</td>
</tr>
<tr>
<td>IFAULT</td>
<td>a fault indicator. If 1, error in dimensions (N&lt;1 or N&gt;50). If 2, BPD&lt;-1 or BPD&gt;1. If 3, INF not 0, 1, or 2. If 4, INF(I)=2 and A(I)&lt;= B(I). If 5, the number of terms computed exceeds the limit. If 6, a fault occurred in normal subroutines. If 7, subintervals are too narrow, or too many. If 8, BOUND exceeds EPS. If 0, no errors.</td>
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Examples

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library(mvtnormpcs)
N <- 3

rho <- 0.5
B <- rep(-5.0, length=N)
A <- rep(5.0, length=N)
INF <- rep(2, length=N)
BPD <- rep(sqrt(rho), length=N)
D <- rep(0.0, length=N)

result <- mvstud(0,A,B,BPD,INF,D)
result
```
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*Topic multivariate
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