The mvtnormpcs Package

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Type Package

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

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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)

R topics documented:

`mvnprd` *Multivariate Normal Distribution with Product Correlation Structure*

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.

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References

Dunnett, Charles, Algorithm AS 251, Multivariate Normal Probability Integrals with Product Correlation Structure, Applied Statistics, 1989

Examples

```
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

NDF	Degrees of Freedom. Use 0 for infinite D.F.
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))
D	Non-Centrality Vector
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

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References

Dunnett, Charles, Algorithm AS 251, Multivariate Normal Probability Integrals with Product Correlation Structure, Applied Statistics, 1989

Examples

```
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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