Package ‘BinNonNor’

October 12, 2022

Type Package

Title Data Generation with Binary and Continuous Non-Normal Components

Version 1.5.3

Date 2021-03-21

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Description Generation of multiple binary and continuous non-normal variables simultaneously given the marginal characteristics and association structure based on the methodology proposed by Demirtas et al. (2012) <DOI:10.1002/sim.5362>.

License GPL-2 | GPL-3

Depends BB, corpcor, mvtnorm, Matrix

NeedsCompilation no

Repository CRAN

Date/Publication 2021-03-22 05:40:32 UTC

R topics documented:

`BinNonNor-package` *Data Generation with Binary and Continuous Non-Normal Components*

Description

Provides R functions for generation of multiple binary and continuous non-normal variables simultaneously given the marginal characteristics and association structure based on the methodology proposed by Demirtas et al. (2012).

Details

Package:	BinNonNor
Type:	Package
Version:	1.5.3
Date:	2021-03-21
License:	GPL-2 | GPL-3

This package consists of eleven functions. The functions `validation.bin`, `validation.corr`, and `validation.skewness.kurtosis` validate the specified quantities to avoid obvious specification errors. The function `fleishman.coef` computes the coefficients of the third order Fleishman polynomials that are used to simulate the continuous non-normal variables. `correlation.limits` returns the lower and upper bounds of the pairwise correlation of binary and binary and binary and continuous non-normal, and continuous non-normal and continuous non-normal pairs given their marginal distributions, i.e. returns the range of feasible pairwise correlations. The function `correlation.bound.check` checks the validity of the values of pairwise correlations. The functions `Int.Corr.NN`, `Tetra.Corr.BB`, and `Biserial.Corr.BN` computes intermediate correlation matrix for continuous non-normal and continuous non-normal combinations, tetrachoric correlations for binary and binary combinations, and biserial correlations for binary and continuous non-normal combinations, respectively. The function `overall.corr.mat` assembles the final correlation matrix. The engine function `gen.Bin.NonNor` generates mixed data in accordance with the specified marginal and correlational quantities. Throughout the package, variables are supposed to be inputted in a certain order, namely, first binary variables, and then continuous variables should be placed.

Author(s)

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References

Demirtas, H., Hedeker, D., and Mermelstein, R.J. (2012). Simulation of massive public health data by power polynomials. Statistics in Medicine, 31(27), 3337-3346.

`Biserial.Corr.BN` *Computes the biserial correlation matrix for binary and continuous non-normal variables given the specified correlation matrix*

Description

This function computes the biserial correlation matrix for binary-continuous non-normal combinations as formulated in Demirtas et al. (2012).

Usage

```
Biserial.Corr.BN(n.BB, n.NN, prop.vec, corr.vec = NULL, corr.mat = NULL, coef.mat)
```

Arguments

`n.BB`	Number of binary variables.
`n.NN`	Number of continuous non-normal variables.
`prop.vec`	Probability vector for binary variables.
`corr.vec`	Vector of elements below the diagonal of correlation matrix ordered column-wise.
`corr.mat`	Specified correlation matrix.
`coef.mat`	Matrix of coefficients produced from `fleishman.coef`.

Value

A matrix of size n.BB*n.NN.

References

Demirtas, H., Hedeker, D., and Mermelstein, R.J. (2012). Simulation of massive public health data by power polynomials. Statistics in Medicine, 31(27), 3337-3346.

See Also

`fleishman.coef`, `Tetra.Corr.BB`, `Int.Corr.NN`, `overall.corr.mat`

Examples

```
n.BB=2
n.NN=4
prop.vec=c(0.4,0.7)
corr.vec=NULL
corr.mat=matrix(c(1.0,-0.3,-0.3,-0.3,-0.3,-0.3,
-0.3,1.0,-0.3,-0.3,-0.3,-0.3,
-0.3,-0.3,1.0,0.4,0.5,0.6,
-0.3,-0.3,0.4,1.0,0.7,0.8,
-0.3,-0.3,0.5,0.7,1.0,0.9,
-0.3,-0.3,0.6,0.8,0.9,1.0),6,byrow=TRUE)

coef.mat=matrix(c(
 -0.31375,  0.00000,  0.10045, -0.10448,
  0.82632,  1.08574,  1.10502,  0.98085,
  0.31375,  0.00000, -0.10045,  0.10448,
  0.02271, -0.02945, -0.04001,  0.00272),4,byrow=TRUE)

bicor.mat=Biserial.Corr.BN(n.BB,n.NN,prop.vec,corr.vec=NULL,corr.mat,coef.mat)

n.BB=1
n.NN=1
prop.vec=0.6
corr.vec=NULL
corr.mat=matrix(c(1,-0.3,-0.3,1),2,2)
coef.mat=matrix(c(-0.31375,0.82632,0.31375,0.02271),4,1)
bicor.mat=Biserial.Corr.BN(n.BB,n.NN,prop.vec,corr.vec=NULL,corr.mat,coef.mat)
```

`correlation.bound.check` *Checks if the pairwise correlation among variables are within the feasible range*

Description

This function checks if there are range violations among correlation of binary-binary, binary-continuous, and continuous-continuous combinations.

Usage

```
correlation.bound.check(n.BB, n.NN, prop.vec = NULL, corr.vec = NULL,
        corr.mat = NULL, coef.mat = NULL)
```

Arguments

`n.BB`	Number of binary variables.
`n.NN`	Number of continuous non-normal variables.
`prop.vec`	Probability vector for binary variables.
`corr.vec`	Specified correlation vector.
`corr.mat`	Specified correlation matrix.
`coef.mat`	Matrix of coefficients produced from `fleishman.coef`.

Value

The function returns TRUE if no specification problem is encountered. Otherwise, it returns an error message.

References

Demirtas, H. and Hedeker, D. (2011). A practical way for computing approximate lower and upper correlation bounds. The American Statistician, 65(2), 104-109.

Demirtas, H., Hedeker, D., and Mermelstein, R.J. (2012). Simulation of massive public health data by power polynomials. Statistics in Medicine, 31(27), 3337-3346.

See Also

`fleishman.coef`, `correlation.limits`, `validation.corr`

Examples

```
prop.vec=c(0.4,0.7)
n.BB=2
n.NN=4
corr.vec=NULL
corr.mat=matrix(c(1.0,-0.3,-0.3,-0.3,-0.3,-0.3,
-0.3,1.0,-0.3,-0.3,-0.3,-0.3,
-0.3,-0.3,1.0,0.4,0.5,0.6,
-0.3,-0.3,0.4,1.0,0.7,0.8,
-0.3,-0.3,0.5,0.7,1.0,0.9,
-0.3,-0.3,0.6,0.8,0.9,1.0),6,byrow=TRUE)

coef.mat=matrix(c(
 -0.31375,  0.00000,  0.10045, -0.10448,
  0.82632,  1.08574,  1.10502,  0.98085,
  0.31375,  0.00000, -0.10045,  0.10448,
  0.02271, -0.02945, -0.04001,  0.00272),4,byrow=TRUE)

correlation.bound.check(n.BB,n.NN,prop.vec,corr.vec=NULL,corr.mat,coef.mat)

cor.mat.BB=corr.mat[1:2,1:2]
correlation.bound.check(n.BB,n.NN=0,prop.vec,corr.vec=NULL,corr.mat=cor.mat.BB,
coef.mat=NULL)

cor.mat.NN=corr.mat[3:6,3:6]
correlation.bound.check(n.BB=0,n.NN,prop.vec=NULL,corr.vec=NULL,corr.mat=cor.mat.NN,
coef.mat)

n.BB=1
prop.vec=0.5
corr.mat=diag(n.BB)
correlation.bound.check(n.BB,n.NN=0,prop.vec,corr.vec=NULL,corr.mat=corr.mat,
coef.mat=NULL)

## Not run:
cor.mat.NNnew=cor.mat.NN
cor.mat.NNnew[1,2]=0.92
cor.mat.NNnew[2,1]=0.92
correlation.bound.check(n.BB=0,n.NN,prop.vec=NULL,corr.vec=NULL,corr.mat=cor.mat.NNnew,
coef.mat)
```

```
## End(Not run)
```

`correlation.limits` *Computes lower and upper correlation bounds for each pair of variables*

Description

This function computes lower and upper limits for pairwise correlation of binary-binary, binary-continuous non-normal, and continuous non-normal-continuous non-normal combinations.

Usage

```
correlation.limits(n.BB, n.NN, prop.vec = NULL, coef.mat = NULL)
```

Arguments

`n.BB`	Number of binar variables.
`n.NN`	Number of continuous non-normal variables.
`prop.vec`	Probability vector for binary variables.
`coef.mat`	Matrix of coefficients produced from `fleishman.coef`.

Details

While the function computes the exact lower and upper bounds for pairwise correlations among binary-binary variables as formulated in Demirtas et al. (2012), it computes approximate lower and upper bounds for pairwise correlations among binary-continuous non-normal and continuous non-normal-continuous non-normal variables through the method suggested by Demirtas and Hedeker (2011).

Value

The function returns a matrix of size (n.BB + n.NN)*(n.BB + n.NN), where the lower triangular part of the matrix contains the lower bounds and the upper triangular part of the matrix contains the upper bounds of the feasible correlations.

References

Demirtas, H. and Hedeker, D. (2011). A practical way for computing approximate lower and upper correlation bounds. The American Statistician, 65(2), 104-109.

Demirtas, H., Hedeker, D., and Mermelstein, R.J. (2012). Simulation of massive public health data by power polynomials. Statistics in Medicine, 31(27), 3337-3346.

See Also

`fleishman.coef`, `correlation.bound.check`

Examples

```
n.BB=2
n.NN=4
prop.vec=c(0.4,0.7)
coef.mat=matrix(c(
 -0.31375,  0.00000,  0.10045, -0.10448,
  0.82632,  1.08574,  1.10502,  0.98085,
  0.31375,  0.00000, -0.10045,  0.10448,
  0.02271, -0.02945, -0.04001,  0.00272),4,byrow=TRUE)

limits=correlation.limits(n.BB,n.NN,prop.vec,coef.mat)
limits.bin=correlation.limits(n.BB,n.NN=0,prop.vec,coef.mat=NULL)
limits.nonnor=correlation.limits(n.BB=0,n.NN,prop.vec=NULL,coef.mat)

## Not run:
n.BB=1
prop.vec=0.5
limits=correlation.limits(n.BB,n.NN,prop.vec,coef.mat=NULL)

## End(Not run)
```

`fleishman.coef` *Computes the coefficients of Fleishman third order polynomials*

Description

Computes the coefficients of Fleishman third order polynomials given the marginal skewness and kurtosis parameters of continuous variables.

Usage

```
fleishman.coef(n.NN, skewness.vec = NULL, kurtosis.vec = NULL)
```

Arguments

`n.NN`	Number of continuous non-normal variables.
`skewness.vec`	Skewness vector for continuous non-normal variables.
`kurtosis.vec`	Kurtosis vector for continuous non-normal variables.

Details

The execution of the function may take some time since it uses multiple starting points to solve the system of nonlinear equations based on the third order Fleishman polynomials. However, since users need to run it only once for a given set of specifications, it does not constitute a problem.

Value

A matrix of coefficients. The columns represent the variables and rows represent the corresponding a,b,c, and d coefficients.

References

Demirtas, H., Hedeker, D., and Mermelstein, R.J. (2012). Simulation of massive public health data by power polynomials. Statistics in Medicine, 31(27), 3337-3346.

Fleishman, A.I. (1978). A method for simulating non-normal distributions. Psychometrika, 43(4), 521-532.

See Also

`validation.skewness.kurtosis`

Examples

```
## Not run:
#Consider four nonnormal continuous variables, which come from
#Exp(1),Beta(4,4),Beta(4,2) and Gamma(10,10), respectively.
#Skewness and kurtosis values of these variables are as follows:
n.NN=4
skewness.vec=c(2,0,-0.4677,0.6325)
kurtosis.vec=c(6,-0.5455,-0.3750,0.6)
coef.mat=fleishman.coef(n.NN,skewness.vec,kurtosis.vec)

n.NN=1
skewness.vec=c(0)
kurtosis.vec=c(-1.2)
coef.mat=fleishman.coef(n.NN,skewness.vec,kurtosis.vec)

n.NN=1
skewness.vec1=c(3)
kurtosis.vec1=c(5)
coef.mat=fleishman.coef(n.NN,skewness.vec1,kurtosis.vec1)

## End(Not run)
```

`gen.Bin.NonNor` *Simulates a sample of size n from a set of multivariate binary and continuous non-normal variables*

Description

This function simulates a multivariate data set with binary and continuous components with pre-specified marginals and a correlation matrix. Setting n.NN=0 and quantities that are pertinent to the continuous part to NULL results in simulation of a sample of size n from a set of multivariate binary variables. Similarly, setting n.BB=0 and prop.vec=NULL results in simulation of a sample of size n from a set of multivariate continuous non-normal variables.

Usage

```
gen.Bin.NonNor(n, n.BB, n.NN, prop.vec = NULL, mean.vec = NULL, variance.vec = NULL,
skewness.vec = NULL, kurtosis.vec = NULL, final.corr.mat, coef.mat = NULL)
```

Arguments

`n`	Number of variates.
`n.BB`	Number of binary variables.
`n.NN`	Number of continuous non-normal variables.
`prop.vec`	Probability vector for binary variables.
`mean.vec`	Mean vector for continuous non-normal variables.
`variance.vec`	Variance vector for continuous non-normal variables.
`skewness.vec`	Skewness vector for continuous non-normal variables.
`kurtosis.vec`	Kurtosis vector for continuous non-normal variables.
`final.corr.mat`	Final correlation matrix produced from `overall.corr.mat`.
`coef.mat`	Matrix of coefficients produced from `fleishman.coef`.

Value

A matrix of size n*(n.BB + n.NN) of which the first n.BB columns are binary variables and the last n.NN columns are continuous variables.

References

Demirtas, H., Hedeker, D., and Mermelstein, R.J. (2012). Simulation of massive public health data by power polynomials. Statistics in Medicine, 31(27), 3337-3346.

Vale, C.D. and Maurelli, V.A. (1983). Simulating multivariate nonnormal distributions. Psychometrika, 48(3), 465-471.

See Also

`validation.bin`, `validation.skewness.kurtosis`,`overall.corr.mat`, `fleishman.coef`

Examples

```
## Not run:
n=1
n.BB=2
n.NN=4
prop.vec=c(0.4,0.7)
mean.vec=c(1,0.5,4/6,100)
variance.vec=c(1,0.02777778,0.03174603,1000)
skewness.vec=c(2,0,-0.4677,0.6325)
kurtosis.vec=c(6,-0.5455,-0.3750,0.6)
corr.mat=matrix(c(1.0,-0.3,-0.3,-0.3,-0.3,-0.3,
-0.3,1.0,-0.3,-0.3,-0.3,-0.3,
-0.3,-0.3,1.0,0.4,0.5,0.6,
-0.3,-0.3,0.4,1.0,0.7,0.8,
-0.3,-0.3,0.5,0.7,1.0,0.9,
-0.3,-0.3,0.6,0.8,0.9,1.0),6,byrow=TRUE)

coef.mat=fleishman.coef(n.NN,skewness.vec,kurtosis.vec)

coef.mat=matrix(c(
 -0.31375,  0.00000,  0.10045, -0.10448,
  0.82632,  1.08574,  1.10502,  0.98085,
  0.31375,  0.00000, -0.10045,  0.10448,
  0.02271, -0.02945, -0.04001,  0.00272),4,byrow=TRUE)

intcor.mat=Int.Corr.NN(n.NN,corr.vec=NULL,corr.mat,coef.mat)

intcor.mat=matrix(c(
1.0000000, 0.4487800, 0.5940672, 0.6471184,
0.4487800, 1.0000000, 0.7099443, 0.8112701,
0.5940672, 0.7099443, 1.0000000, 0.9436195,
0.6471184, 0.8112701, 0.9436195, 1.0000000),4,byrow=TRUE)

tetcor.mat=Tetra.Corr.BB(n.BB,prop.vec,corr.vec=NULL,corr.mat)
tetcor.mat=matrix(c(
 1.0000000, -0.4713861,
-0.4713861,  1.0000000),2,byrow=TRUE)

bicor.mat=Biserial.Corr.BN(n.BB,n.NN,prop.vec,corr.vec=NULL,corr.mat,coef.mat)
bicor.mat=matrix(c(
-0.4253059, -0.3814058, -0.3862068, -0.3846430,
-0.4420613, -0.3964317, -0.4014219, -0.3997964),2,byrow=TRUE)

final.corr.mat=overall.corr.mat(n.BB,n.NN,prop.vec,corr.vec=NULL,corr.mat,coef.mat)

final.corr.mat=matrix(c(
  1.0000000, -0.4713861, -0.4253059, -0.3814058, -0.3862068, -0.3846430,
 -0.4713861,  1.0000000, -0.4420613, -0.3964317, -0.4014219, -0.3997964,
 -0.4253059, -0.4420613,  1.0000000,  0.4487800,  0.5940672,  0.6471184,
 -0.3814058, -0.3964317,  0.4487800,  1.0000000,  0.7099443,  0.8112701,
 -0.3862068, -0.4014219,  0.5940672,  0.7099443,  1.0000000,  0.9436195,
 -0.3846430, -0.3997964,  0.6471184,  0.8112701,  0.9436195,  1.0000000),6, byrow=TRUE)
```

```
data=gen.Bin.NonNor(n,n.BB,n.NN,prop.vec,mean.vec,variance.vec,skewness.vec,
kurtosis.vec,final.corr.mat,coef.mat)

amat=final.corr.mat[1:2,1:2]
multibin=gen.Bin.NonNor(n=1000,n.BB,n.NN=0,prop.vec,mean.vec=NULL,variance.vec=NULL,
skewness.vec=NULL,kurtosis.vec=NULL,final.corr.mat=amat,coef.mat=NULL)

apply(multibin,2,mean)

bmat=final.corr.mat[3:6,3:6]
multinonnor=gen.Bin.NonNor(n=100,n.BB=0,n.NN,prop.vec=NULL,mean.vec,variance.vec,
skewness.vec,kurtosis.vec,final.corr.mat=bmat,coef.mat)
apply(multinonnor,2,mean)
apply(multinonnor,2,var)


n=1000
n.BB=1
n.NN=1
prop.vec=0.6
mean.vec=1
variance.vec=1
skewness.vec=2
kurtosis.vec=6
corr.vec=NULL
corr.mat=matrix(c(1,-0.3,-0.3,1),2,2)
coef.mat=matrix(c(-0.31375,0.82632,0.31375,0.02271),4,1)
final.corr.mat=overall.corr.mat(n.BB,n.NN,prop.vec,corr.vec=NULL,corr.mat,coef.mat)
data=gen.Bin.NonNor(n,n.BB,n.NN,prop.vec,mean.vec,variance.vec,skewness.vec,
kurtosis.vec,final.corr.mat,coef.mat)


n=1000
n.BB=1
n.NN=0
prop.vec=0.6
mean.vec=1
variance.vec=NULL
skewness.vec=NULL
kurtosis.vec=NULL
corr.vec=NULL
corr.mat=diag(1)
coef.mat=NULL

final.corr.mat=overall.corr.mat(n.BB,n.NN,prop.vec,corr.vec=NULL,corr.mat,coef.mat)

data=gen.Bin.NonNor(n,n.BB,n.NN,prop.vec,mean.vec,variance.vec,skewness.vec,
kurtosis.vec,final.corr.mat,coef.mat)

## End(Not run)
```

Int.Corr.NN — *Computes an intermediate correlation matrix for continuous non-normal variables given the specified correlation matrix*

Description

This function computes the intermediate correlation matrix for continuous non-normal-continuous non-normal combinations as formulated in Demirtas et al. (2012).

Usage

```
Int.Corr.NN(n.NN, corr.vec = NULL, corr.mat = NULL, coef.mat)
```

Arguments

n.NN	Number of continuous non-normal variables.
corr.vec	Vector of elements below the diagonal of correlation matrix ordered column-wise.
corr.mat	Specified correlation matrix.
coef.mat	Matrix of coefficients produced from fleishman.coef.

Value

A correlation matrix of size n.NN*n.NN.

References

Demirtas, H., Hedeker, D., and Mermelstein, R.J. (2012). Simulation of massive public health data by power polynomials. Statistics in Medicine, 31(27), 3337-3346.

See Also

fleishman.coef, Tetra.Corr.BB, Biserial.Corr.BN, overall.corr.mat

Examples

```
n.NN=4
corr.vec=NULL
corr.mat=matrix(c(1.0,-0.3,-0.3,-0.3,-0.3,-0.3,
-0.3,1.0,-0.3,-0.3,-0.3,-0.3,
-0.3,-0.3,1.0,0.4,0.5,0.6,
-0.3,-0.3,0.4,1.0,0.7,0.8,
-0.3,-0.3,0.5,0.7,1.0,0.9,
-0.3,-0.3,0.6,0.8,0.9,1.0),6,byrow=TRUE)

coef.mat=matrix(c(
 -0.31375,  0.00000,  0.10045, -0.10448,
  0.82632,  1.08574,  1.10502,  0.98085,
   0.31375,  0.00000, -0.10045,  0.10448,
   0.02271, -0.02945, -0.04001,  0.00272),4,byrow=TRUE)

intcor.mat=Int.Corr.NN(n.NN,corr.vec=NULL,corr.mat,coef.mat)
```

`overall.corr.mat` *Computes the final correlation matrix*

Description

This function computes the final correlation matrix by combining tetrachoric correlation for binary-binary combinations, biserial correlations for binary-continuous combinations, and intermediate correlation matrix for continuous-continuous combinations.

Usage

```
overall.corr.mat(n.BB, n.NN, prop.vec = NULL, corr.vec = NULL, corr.mat = NULL,
coef.mat = NULL)
```

Arguments

`n.BB`	Number of binary variables.
`n.NN`	Number of continuous non-normal variables.
`prop.vec`	Probability vector for binary variables.
`corr.vec`	Vector of elements below the diagonal of correlation matrix ordered column-wise.
`corr.mat`	Specified correlation matrix.
`coef.mat`	Matrix of coefficients produced from `fleishman.coef`.

Value

A matrix of size (n.BB+n.NN)*(n.BB+n.NN).

References

Demirtas, H., Hedeker, D., and Mermelstein, R.J. (2012). Simulation of massive public health data by power polynomials. Statistics in Medicine, 31(27), 3337-3346.

See Also

`fleishman.coef`, `Tetra.Corr.BB`, `Int.Corr.NN`, `Biserial.Corr.BN`

Examples

```
n.BB=2
n.NN=4
prop.vec=c(0.4,0.7)
corr.vec=NULL
corr.mat=matrix(c(1.0,-0.3,-0.3,-0.3,-0.3,-0.3,
-0.3,1.0,-0.3,-0.3,-0.3,-0.3,
-0.3,-0.3,1.0,0.4,0.5,0.6,
-0.3,-0.3,0.4,1.0,0.7,0.8,
-0.3,-0.3,0.5,0.7,1.0,0.9,
-0.3,-0.3,0.6,0.8,0.9,1.0),6,byrow=TRUE)

coef.mat=matrix(c(
 -0.31375,  0.00000,  0.10045, -0.10448,
  0.82632,  1.08574,  1.10502,  0.98085,
  0.31375,  0.00000, -0.10045,  0.10448,
  0.02271, -0.02945, -0.04001,  0.00272),4,byrow=TRUE)

final.corr.mat=overall.corr.mat(n.BB,n.NN,prop.vec,corr.vec=NULL,corr.mat,
coef.mat)

corr.mat.BB=corr.mat[1:2,1:2]
final.corr.mat=overall.corr.mat(n.BB,n.NN=0,prop.vec,corr.vec=NULL,
corr.mat=corr.mat.BB,coef.mat=NULL)

corr.mat.NN=corr.mat[3:6,3:6]
final.corr.mat=overall.corr.mat(n.BB=0,n.NN,prop.vec=NULL,corr.vec=NULL,
corr.mat=corr.mat.NN,coef.mat)


n.BB=1
n.NN=1
prop.vec=0.6
corr.vec=NULL
corr.mat=matrix(c(1,-0.3,-0.3,1),2,2)
coef.mat=matrix(c(-0.31375,0.82632,0.31375,0.02271),4,1)
final.corr.mat=overall.corr.mat(n.BB,n.NN,prop.vec,corr.vec=NULL,corr.mat,
coef.mat)
```

`Tetra.Corr.BB` *Computes the tetrachoric correlation matrix for binary variables given the specified correlation matrix*

Description

This function computes the tetrachoric correlation matrix for binary-binary combinations as formulated in Demirtas et al. (2012).

Usage

```
Tetra.Corr.BB(n.BB, prop.vec, corr.vec = NULL, corr.mat = NULL)
```

Arguments

`n.BB`	Number of binary variables.
`prop.vec`	Probability vector for binary variables.
`corr.vec`	Vector of elements below the diagonal of correlation matrix ordered column-wise.
`corr.mat`	Specified correlation matrix.

Value

A correlation matrix of size n.BB*n.BB.

References

Demirtas, H., Hedeker, D., and Mermelstein, R.J. (2012). Simulation of massive public health data by power polynomials. Statistics in Medicine, 31(27), 3337-3346.

See Also

`Tetra.Corr.BB`, `Biserial.Corr.BN`, `overall.corr.mat`

Examples

```
n.BB=2
prop.vec=c(0.4,0.7)
corr.vec=NULL
corr.mat=matrix(c(1.0,-0.3,-0.3,-0.3,-0.3,-0.3,
-0.3,1.0,-0.3,-0.3,-0.3,-0.3,
-0.3,-0.3,1.0,0.4,0.5,0.6,
-0.3,-0.3,0.4,1.0,0.7,0.8,
-0.3,-0.3,0.5,0.7,1.0,0.9,
-0.3,-0.3,0.6,0.8,0.9,1.0),6,by=TRUE)

tetcor.mat=Tetra.Corr.BB(n.BB,prop.vec,corr.vec=NULL,corr.mat)
```

`validation.bin` *Validates the marginal specification of the binary variables*

Description

Checks whether the marginal specification of the binary part is valid and consistent.

Usage

```
validation.bin(n.BB, prop.vec = NULL)
```

Arguments

n.BB	Number of binary variables.
prop.vec	Probability vector for binary variables.

Value

The function returns TRUE if no specification problem is encountered. Otherwise, it returns an error message.

Examples

```
n.B<-2
prop.vec=c(0.5,0.6)
validation.bin(n.B,prop.vec)

## Not run:
n.B<-3
prop.vec=c(0.5,0.6)
validation.bin(n.B,prop.vec)

n.B<-3
prop.vec=c(0.5,0.6)
validation.bin(n.B)

n.B<-0
prop.vec=c(0.5,0.6)
validation.bin(n.B,prop.vec)

n.B<-3
prop.vec=c(0.5,0.6)
validation.bin(n.B,prop.vec)

n.B<-3
prop.vec=NULL
validation.bin(n.B,prop.vec)

n.B<-3
prop.vec=c(1,1.5,-1.5)
validation.bin(n.B,prop.vec)

## End(Not run)
```

---

validation.corr *Validates the specified correlation matrix*

Description

This function validates the specified correlation vector and/or matrix for appropriate dimension, symmetry, range, and positive definiteness. If both correlation matrix and correlation vector are supplied, it checks whether the matrix and vector are conformable.

Usage

```
validation.corr(n.BB, n.NN, corr.vec = NULL, corr.mat = NULL)
```

Arguments

`n.BB`	Number of binary variables.
`n.NN`	Number of continuous non-normal variables.
`corr.vec`	Vector of elements below the diagonal of correlation matrix ordered column-wise.
`corr.mat`	Specified correlation matrix.

Value

The function returns TRUE if no specification problem is encountered. Otherwise, it returns an error message.

See Also

`correlation.limits`, `correlation.bound.check`

Examples

```
n.BB=2
n.NN=4
corr.vec=NULL
corr.mat=matrix(c(1.0,-0.3,-0.3,-0.3,-0.3,-0.3,
-0.3,1.0,-0.3,-0.3,-0.3,-0.3,
-0.3,-0.3,1.0,0.4,0.5,0.6,
-0.3,-0.3,0.4,1.0,0.7,0.8,
-0.3,-0.3,0.5,0.7,1.0,0.9,
-0.3,-0.3,0.6,0.8,0.9,1.0),6,byrow=TRUE)

validation.corr(n.BB,n.NN,corr.vec=NULL,corr.mat)

n.BB=2
n.NN=4
corr.vec=c(-0.3,-0.3,-0.3,-0.3,-0.3,-0.3,-0.3,-0.3,-0.3,0.4,0.5,0.6,0.7,0.8,0.9)
validation.corr(n.BB,n.NN,corr.vec,corr.mat=NULL)

## Not run:
n.BB=0
n.NN=4
validation.corr(n.BB,n.NN,corr.vec=NULL,corr.mat)

n.BB=2
n.NN=0
validation.corr(n.BB,n.NN=0,corr.vec=NULL,corr.mat)

corr.matc=corr.mat[3:6,3:6]
validation.corr(n.BB=0,n.NN=4,corr.vec=NULL,corr.mat=corr.matc)
```

```
corr.mat[2,1]=0.5
validation.corr(n.BB,n.NN,corr.vec=NULL,corr.mat)

corr.mat[1,2]=0.5
corr.mat[3,1]=1.5
corr.mat[1,3]=1.5
validation.corr(n.BB,n.NN,corr.vec=NULL,corr.mat)

npd<-matrix(c(1,     0.477, 0.644, 0.478, 0.651, 0.826,
               0.477, 1,     0.516, 0.233, 0.682, 0.75,
               0.644, 0.516, 1,     0.599, 0.581, 0.742,
               0.478, 0.233, 0.599, 1,     0.741, 0.8,
               0.651, 0.682, 0.581, 0.741, 1,     0.798,
               0.826, 0.75,  0.742, 0.8,   0.798, 1),
               nrow = 6, ncol = 6)

validation.corr(n.BB,n.NN,corr.vec=NULL,corr.mat=npd)

n.BB=1
n.NN=0
corr.mat<-diag(1)
validation.corr(n.BB,n.NN,corr.vec=NULL,corr.mat)


## End(Not run)
```

validation.skewness.kurtosis

Validates the marginal specification of the continuous non-normal variables

Description

Checks whether the marginal specification of the continuous non-normal part is valid and consistent.

Usage

```
validation.skewness.kurtosis(n.NN, skewness.vec = NULL, kurtosis.vec = NULL)
```

Arguments

n.NN	Number of continuous non-normal variables.
skewness.vec	Skewness vector for continuous non-normal variables.
kurtosis.vec	Kurtosis vector for continuous non-normal variables.

Value

The function returns TRUE if no specification problem is encountered. Otherwise, it returns an error message.

References

Demirtas, H., Hedeker, D., and Mermelstein, R.J. (2012). Simulation of massive public health data by power polynomials. Statistics in Medicine, 31(27), 3337-3346.

Examples

```
n.NN<-3
skewness.vec=c(0,2,3)
kurtosis.vec=c(-1.2,6,8)
validation.skewness.kurtosis(n.NN,skewness.vec,kurtosis.vec)

## Not run:
n.NN<--1
skewness.vec=c(0)
kurtosis.vec=c(-1.2)
validation.skewness.kurtosis(n.NN,skewness.vec,kurtosis.vec)

n.NN<-3
skewness.vec=c(0,2,3)
kurtosis.vec=c(-1.2,6,5)
validation.skewness.kurtosis(3)

n.NN<-3
skewness.vec=c(0,2,3)
kurtosis.vec=c(-1.2,6,5)
validation.skewness.kurtosis(n.NN,skewness.vec)
validation.skewness.kurtosis(n.NN,kurtosis.vec)

n.NN<-0
skewness.vec=c(0,2,3)
kurtosis.vec=c(-1.2,6,8)
validation.skewness.kurtosis(n.NN,skewness.vec,kurtosis.vec)

n.NN<-2
skewness.vec=c(0,2,3)
kurtosis.vec=c(-1.2,6,8)
validation.skewness.kurtosis(n.NN,skewness.vec,kurtosis.vec)

n.NN<-2
skewness.vec=c(0,2,3)
kurtosis.vec=c(-1.2,6)
validation.skewness.kurtosis(n.NN,skewness.vec,kurtosis.vec)

skewness.vec=c(2,3)
kurtosis.vec=c(1,5)
validation.skewness.kurtosis(n.NN,skewness.vec,kurtosis.vec)

## End(Not run)
```

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