Package ‘CorrToolBox’

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Description Modeling the correlation transitions under specified distributional assumptions within the realm of discretization in the context of the latency and threshold concepts. The details of the method are explained in Demirtas, H. and Vardar-Acar, C. (2017) <DOI:10.1007/978-981-10-3307-0_4>.
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CorrToolBox-package

**Description**

This package implements the computational algorithms for modeling the correlation transitions under specified distributional assumptions within the realm of discretization in the context of the latency and threshold concepts. Functions that compute the correlational magnitude changes in both directions (identification of the pre-discretization correlation value in order to attain a specified post-discretization magnitude, and the other way around) are provided.

This package consists of eight main functions. Computing the tetrachoric correlation from the phi coefficient and vice versa are done in \texttt{phi2tet} and \texttt{tet2phi}, respectively. Computing the polychoric correlation from the ordinal phi coefficient and vice versa are done in \texttt{ophi2poly} and \texttt{poly2ophi}, respectively. Computing the biserial correlation from the point-biserial correlation and vice versa are done in \texttt{pbs2bs} and \texttt{bs2pbs}, respectively. Computing the polyserial correlation from the point-polyserial correlation and vice versa are done in \texttt{pps2ps} and \texttt{ps2pps}, respectively.

Auxiliary functions are also provided. \texttt{corrY2corrZ}, \texttt{corrZ2corrY}, \texttt{corrZ2ophi}, \texttt{corrZ2phi}, and \texttt{ophi2corrZ} are intermediate functions utilized within the main functions but can be used as stand-alone functions. \texttt{ordY} discretizes a continuous variable, and \texttt{mps2cps} provides cumulative probabilities for each set of marginal probabilities in a list. Additional intermediate functions from imported packages include \texttt{phi2tetra} from the \texttt{psych} package, \texttt{ordcont} and \texttt{contord} from the \texttt{GenOrd} package, \texttt{skewness} and \texttt{kurtosis} from the \texttt{moments} package, \texttt{validation.skewness.kurtosis} from the \texttt{BinNonNor} package, and \texttt{pmvnorm} from the \texttt{mvtnorm} package.

Within each correlation transition function, the correlation boundaries for the given marginal distributions are compared to the specified input correlation to ensure there are no violations according to Demirtas and Hedeker (2011). The function \texttt{valid.limits.BinOrdNN} in the package \texttt{BinOrdNonNor} is utilized for this step. Additionally, \texttt{Fleishman.coef.NN} in the package \texttt{BinOrdNonNor} is used wherever Fleishman coefficients need to be calculated for a continuous variable.

**Details**

- **Package:** CorrToolBox
- **Type:** Package
- **Version:** 1.6.2
- **Date:** 2020-03-21
- **License:** GPL-2 | GPL-3
## Author(s)

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## References


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| bs2pbs | Computation of the Point-Biserial Correlation from the Biserial Correlation |

## Description

This function computes the point-biserial correlation between two variables after one of the variables is dichotomized given the correlation before dichotomization (biserial correlation) as seen in Demirtas and Hedeker (2016). Before computation of the point-biserial correlation, the specified biserial correlation is compared to the lower and upper correlation bounds of the two continuous variables using the generate, sort and correlate (GSC) algorithm in Demirtas and Hedeker (2011).
Usage

bs2pbs(bs, bin.var, cont.var, p=NULL, cutpoint=NULL)

Arguments

bs The biserial correlation.
bin.var A numeric vector of the continuous variable before dichotomization.
cont.var A numeric vector of the continuous variable that is not transformed.
p The expected value of the numeric vector bin.var after dichotomization. Either
   p or cutpoint should be specified.
cutpoint The value at which the numeric vector bin.var should be dichotomized. Either
   p or cutpoint should be specified.

Value

The point-biserial correlation.

References


continuous distribution. Communications in Statistics-Simulation and Computation, 45(8),
2744-2751.

Examples

set.seed(123)
y1<-rweibull(n=100000, scale=1, shape=1.2)

gaussmix <- function(n,m1,m2,s1,s2,pi) {
  I <- runif(n)<pi
  rnorm(n,mean=ifelse(I,m1,m2),sd=ifelse(I,s1,s2))
}
y2<-gaussmix(n=100000, m1=0, s1=1, m2=3, s2=1, pi=0.6)

bs2pbs(bs=0.6, bin.var=y1, cont.var=y2, p=0.55)
bs2pbs(bs=0.6, bin.var=y1, cont.var=y2, cutpoint=0.65484)

---

corrY2corrZ Computation of the Correlation of Bivariate Standard Normal Variables from the Correlation of Bivariate Nonnormal Variables
Description

This is an intermediate function that computes the correlation of bivariate standard normal variables from the correlation of continuous nonnormal variables. Fleishman coefficients for each nonnormal variable with the specified skewness and excess kurtosis are found. The Fleishman coefficients and correlation of nonnormal variables are used to find the correlation of the two respective standard normal variables as seen in Demirtas, Hedeker, and Mermelstein (2012).

Usage

corrY2corrZ(corrY, skew.vec, kurto.vec)

Arguments

corrY          The correlation of two continuous nonnormal variables.
skew.vec       The skewness vector for continuous variables.
kurto.vec      The kurtosis vector for continuous variables.

Value

The correlation of the two respective standard normal variables.

References


See Also

tet2phi, poly2phi

Examples

set.seed(987)
library(moments)
y1<-rweibull(n=100000, scale=1, shape=1)
y1.skew<-round(skewness(y1), 5)
y1.exkurt<-round(kurtosis(y1)-3, 5)
gaussmix <- function(n,m1,m2,s1,s2,pi) {
  I <- runif(n)<pi
  rnorm(n,mean=ifelse(I,m1,m2),sd=ifelse(I,s1,s2))
}
y2<-gaussmix(n=100000, m1=0, s1=1, m2=3, s2=1, pi=0.5)
y2.skew<-round(skewness(y2), 5)
y2.exkurt<-round(kurtosis(y2)-3, 5)
corrY2corrZ(corrY=-0.4, skew.vec=c(y1.skew, y2.skew), kurto.vec=c(y1.exkurt, y2.exkurt))


\textbf{corrZ2corrY} \quad \textit{Computation of the Correlation of Bivariate Nonnormal Variables from the Correlation of Bivariate Standard Normal Variables}

\textbf{Description}

Fleishman coefficients for each nonnormal continuous variable with the specified skewness and excess kurtosis are found. The Fleishman coefficients and correlation of two standard normal variables are used to find the correlation of the two nonnormal variables as described in Demirtas, Hedeker, and Mermelstein (2012).

\textbf{Usage}

\begin{verbatim}
corrZ2corrY(corrZ, skew.vec, kurto.vec)
\end{verbatim}

\textbf{Arguments}

\begin{itemize}
\item \texttt{corrZ}  The correlation of two standard normal variables.
\item \texttt{skew.vec}  The skewness vector for continuous variables.
\item \texttt{kurto.vec}  The kurtosis vector for continuous variables.
\end{itemize}

\textbf{Value}

The correlation of two continuous nonnormal variables as defined by the skewness and excess kurtosis vectors.

\textbf{References}


\textbf{See Also}

\begin{verbatim}
phi2tet
\end{verbatim}

\textbf{Examples}

\begin{verbatim}
set.seed(987)
library(moments)
y1<-rweibull(n=100000, scale=1, shape=1)
y1.skew<-round(skewness(y1), 5)
y1.exkurt<-round(kurtosis(y1)-3, 5)
gaussmix <- function(n,m1,m2,s1,s2,pi) {
  I <- runif(n)<pi
gaussmix <- function(n,m1,m2,s1,s2,pi) {
  I <- runif(n)<pi
  }
}
\end{verbatim}
computation of the ordinal phi coefficient from the correlation of bivariate standard normal variables

description
this is an intermediate function that utilizes mps2cps to transform the specified marginal probabilities into cumulative probabilities and uses the contord function in the genord package to compute the ordinal phi coefficient derived from discretizing bivariate standard normal variables.

usage

corrZ2ophi(corrZ, p1, p2)

arguments

corrZ The correlation of two standard normal variables.
p1 A numeric vector containing marginal probabilities defining categories for the first ordinal variable.
p2 A numeric vector containing marginal probabilities defining categories for the second ordinal variable.

value

the ordinal phi coefficient.

references

demirtas, h., ahmadian, r., atis, s., can, f.e., and ercan, i. (2016). a nonnormal look at polychoric correlations: modeling the change in correlations before and after discretization. computational statistics, 31(4), 1385-1401.


see also

mps2cps, poly2ophi
Examples

set.seed(567)
library(moments)

y1<-rweibull(n=100000, scale=1, shape=3.6)
y1.skew<-round(skewness(y1), 5)
y1.exkurt<-round(kurtosis(y1)-3, 5)

gaussmix <- function(n,m1,m2,s1,s2,pi) {
  I <- runif(n)<pi
  rnorm(n,mean=ifelse(I,m1,m2),sd=ifelse(I,s1,s2))
}
y2<-gaussmix(n=100000, m1=0, s1=1, m2=2, s2=1, pi=0.3)
y2.skew<-round(skewness(y2), 5)
y2.exkurt<-round(kurtosis(y2)-3, 5)
corrZ2phi(corrZ=0.502, p1=c(0.4, 0.3, 0.2, 0.1), p2=c(0.2, 0.2, 0.6))

---

corrZ2phi

Computation of the Phi Coefficient from the Correlation of Bivariate
Standard Normal Variables

Description

This function computes the phi coefficient derived from dichotomizing bivariate standard normal
variables.

Usage

corrZ2phi(corrZ, p1, p2)

Arguments

corrZ The correlation of two standard normal variables.
p1 The expected value of the first variable after dichotomization.
p2 The expected value of the second variable after dichotomization.

Value

The phi coefficient.

References


See Also

tet2phi
Examples

```r
set.seed(987)
library(moments)

y1 <- rweibull(n=100000, scale=1, shape=1)
y1.skew <- round(skewness(y1), 5)
y1.exkurt <- round(kurtosis(y1)-3, 5)

gaussmix <- function(n, m1, m2, s1, s2, pi) {
  I <- runif(n)<pi
  rnorm(n, mean=ifelse(I, m1, m2), sd=ifelse(I, s1, s2))
}
y2 <- gaussmix(n=100000, m1=0, s1=1, m2=3, s2=1, pi=0.5)
y2.skew <- round(skewness(y2), 5)
y2.exkurt <- round(kurtosis(y2)-3, 5)

corrZ2phi(corrZ=-0.456, p1=0.85, p2=0.15)
```

---

**mps2cps**  
*Computation of Cumulative Probabilities Given a Set of Marginal Probabilities*

**Description**

This function computes cumulative probabilities for each ordinal variable as defined by marginal probabilities provided in a list.

**Usage**

```r
mps2cps(mps)
```

**Arguments**

- `mps`  
  A list of marginal probability vectors corresponding to each ordinal variable. Each vector within the list `mps` must sum to 1.

**Value**

A list of vectors containing cumulative probabilities for each set of marginal probabilities specified in `mps`. The i-th element of the list is a vector of the cumulative probabilities defining the marginal distribution of the i-th element of `mps`. If the i-th variable has k categories, the i-th vector in the output will contain (k-1) probability values. The k-th element is implicitly 1.

**Examples**

```r
mps2cps(list(c(0.4, 0.3, 0.2, 0.1), c(0.2, 0.2, 0.6)))
```
ophi2corrZ | Computation of the Correlation of Bivariate Standard Normal Variables from the Ordinal Phi Coefficient

Description
This is an intermediate function that transforms marginal probabilities into cumulative probabilities and uses the ordcont function in the GenOrd package to compute the correlation of bivariate standard normal variables from the ordinal phi coefficient.

Usage
ophi2corrZ(ophi, p1, p2)

Arguments
- ophi: The ordinal phi coefficient.
- p1: A numeric vector containing marginal probabilities defining categories for the first ordinal variable.
- p2: A numeric vector containing marginal probabilities defining categories for the second ordinal variable.

Value
The correlation of standard normal variables.

References

See Also
- mps2cps, ophi2poly

Examples
```r
set.seed(567)
library(moments)
y1<-rweibull(n=100000, scale=1, shape=3.6)
y1.skew<-round(skewness(y1), 5)
y1.exkurt<-round(kurtosis(y1)-3, 5)
```
gammix <- function(n, m1, m2, s1, s2, pi) {
  I <- runif(n) < pi
  rnorm(n, mean = ifelse(I, m1, m2), sd = ifelse(I, s1, s2))
}
y2 <- gammix(n = 100000, m1 = 0, s1 = 1, m2 = 2, s2 = 1, pi = 0.3)
y2.skew <- round(skewness(y2), 5)
y2.exkurt <- round(kurtosis(y2) - 3, 5)
ophi2corrZ(ophi = -0.7, p1 = c(0.4, 0.3, 0.2, 0.1), p2 = c(0.2, 0.2, 0.6))

### ophi2poly

**Computation of the Polychoric Correlation from the Ordinal Phi Coefficient**

**Description**

This function computes the polychoric correlation between two continuous variables given the correlation after ordinalization of both variables (ordinal phi coefficient) as seen in Demirtas et al. (2016). Before computation of the polychoric correlation, the specified ordinal phi coefficient is compared to the lower and upper correlation bounds of the two ordinal variables using the generate, sort and correlate (GSC) algorithm in Demirtas and Hedeker (2011).

**Usage**

ophi2poly(ophicoef, dist1, dist2)

**Arguments**

- **ophicoef**
  - The ordinal phi coefficient.

- **dist1**
  - A list of length 3 containing the skewness, excess kurtosis, and a numeric vector of marginal probabilities after dichotomization for the first continuous variable with names skewness, exkurtosis, and p, respectively.

- **dist2**
  - A list of length 3 containing the skewness, excess kurtosis, and a numeric vector of marginal probabilities after dichotomization for the second continuous variable with names skewness, exkurtosis, and p, respectively.

**Value**

The polychoric correlation.

**References**


See Also
corrZ2corrY, ophi2corrZ, mps2cps

Examples

```r
set.seed(567)
library(moments)

y1 <- rweibull(n=100000, scale=1, shape=3.6)
y1.skew <- round(skewness(y1), 5)
y1.exkurt <- round(kurtosis(y1)-3, 5)

gaussmix <- function(n,m1,m2,s1,s2,pi) {
  I <- runif(n)<pi
  rnorm(n,mean=ifelse(I,m1,m2),sd=ifelse(I,s1,s2))
}
y2 <- gaussmix(n=100000, m1=0, s1=1, m2=2, s2=1, pi=0.3)
y2.skew <- round(skewness(y2), 5)
y2.exkurt <- round(kurtosis(y2)-3, 5)

ophi2poly(ophicoef=-0.7,
  dist1=list(skewness=y1.skew, exkurtosis=y1.exkurt, p=c(0.4, 0.3, 0.2, 0.1)),
  dist2=list(skewness=y2.skew, exkurtosis=y2.exkurt, p=c(0.2, 0.2, 0.6)))

ophi2poly(ophicoef=0.2,
  dist1=list(skewness=y1.skew, exkurtosis=y1.exkurt, p=c(0.1, 0.1, 0.1, 0.7)),
  dist2=list(skewness=y2.skew, exkurtosis=y2.exkurt, p=c(0.8, 0.1, 0.1)))
```

---

**ordY**

*Ordinalization of a Continuous Variable*

**Description**

This function creates an ordinalized form of a continuous variable.

**Usage**

`ordY(mp, cat, y)`

**Arguments**

- `mp` A vector of marginal probabilities defining the ordinalized variable.
- `cat` A numeric vector containing the categories for each respective marginal probability in `mp`.
- `y` A continuous variable to be ordinalized into categories in `cat` as defined by `mp`.
Computation of the Biserial Correlation from the Point-Biserial Correlation

Description

This function computes the biserial correlation between two continuous variables given the correlation after dichotomization of one of the variables (point-biserial correlation) as seen in Demirtas and Hedeker (2016). Before computation of the biserial correlation, the specified point-biserial correlation is compared to the lower and upper correlation bounds of the continuous variable and binary variable using the generate, sort and correlate (GSC) algorithm in Demirtas and Hedeker (2011).

Usage

\[
\text{pbs2bs}(\text{pbs}, \text{bin.var}, \text{cont.var}, \text{p=NULL}, \text{cutpoint=NULL})
\]

Arguments

- **pbs**: The point-biserial correlation.
- **bin.var**: A numeric vector of the continuous variable before dichotomization.
- **cont.var**: A numeric vector of the the continuous variable that is not transformed.
- **p**: The expected value of the numeric vector `bin.var` after dichotomization. Either `p` or `cutpoint` should be specified.
- **cutpoint**: The value at which the vector `bin.var` should be dichotomized. Either `p` or `cutpoint` should be specified.

Value

The biserial correlation.
phi2tet

References


Examples

```r
set.seed(123)
y1<-rweibull(n=100000, scale=1, shape=1.2)

gaussmix <- function(n,m1,m2,s1,s2,pi) {
  I <- runif(n)<pi
  rnorm(n,mean=ifelse(I,m1,m2),sd=ifelse(I,s1,s2))
}
y2<-gaussmix(n=100000, m1=0, s1=1, m2=3, s2=1, pi=0.6)
pbs2bs(pbs=0.25, bin.var=y1, cont.var=y2, p=0.55)
pbs2bs(pbs=0.25, bin.var=y1, cont.var=y2, cutpoint=0.65484)
```

---

**phi2tet**

*Computation of the Tetrachoric Correlation from the Phi Coefficient*

**Description**

This function computes the tetrachoric correlation between two continuous variables given the correlation after dichotomization of both variables (phi coefficient) as seen in Demirtas (2016). Before computation of the tetrachoric correlation, the specified phi coefficient is compared to the lower and upper correlation bounds for the two binary variables using the generate, sort and correlate (GSC) algorithm in Demirtas and Hedeker (2011).

**Usage**

```r
phi2tet(phicoef, dist1, dist2)
```

**Arguments**

- `phicoef` The phi coefficient.
- `dist1` A list of length 3 containing the skewness, excess kurtosis, and expected value after dichotomization for the first continuous variable with names skewness, exkurtosis, and p, respectively.
- `dist2` A list of length 3 containing the skewness, excess kurtosis, and expected value after dichotomization for the second continuous variable with names skewness, exkurtosis, and p, respectively.
**Value**

The tetrachoric correlation.

**References**


**See Also**

corrZ2corrY

**Examples**

```r
set.seed(987)
library(moments)

y1<-rweibull(n=100000, scale=1, shape=1)
y1.skew<-round(skewness(y1), 5)
y1.exkurt<-round(kurtosis(y1)-3, 5)

gaussmix <- function(n,m1,m2,s1,s2,pi) {
  I <- runif(n)<pi
  rnorm(n,mean=ifelse(I,m1,m2),sd=ifelse(I,s1,s2))
}
y2<-gaussmix(n=100000, m1=0, s1=1, m2=3, s2=1, pi=0.5)
y2.skew<-round(skewness(y2), 5)
y2.exkurt<-round(kurtosis(y2)-3, 5)

phi2tet(phicoef=0.1,
  dist1=list(skewness=y1.skew, exkurtosis=y1.exkurt, p=0.85),
  dist2=list(skewness=y2.skew, exkurtosis=y2.exkurt, p=0.15))

phi2tet(phicoef=0.5,
  dist1=list(skewness=y1.skew, exkurtosis=y1.exkurt, p=0.10),
  dist2=list(skewness=y2.skew, exkurtosis=y2.exkurt, p=0.30))
```

---

**poly2ophi**

*Computation of the Ordinal Phi Coefficient from the Polychoric Correlation*

**Description**

This function computes the ordinal phi coefficient between two variables after both of the variables are ordinalized given the correlation before ordinalization (polychoric correlation) as seen in Demirtas et al. (2016). Before computation of the ordinal phi coefficient, the specified polychoric correlation is transformed into an approximate standard normal correlation using the method described in Demirtas and Hedeker (2011) and Demirtas (2016).
correlation is compared to the lower and upper correlation bounds of the two continuous variables as defined by the respective skewness and excess kurtosis using the generate, sort and correlate (GSC) algorithm in Demirtas and Hedeker (2011).

Usage

poly2ophi(polycorr, dist1, dist2)

Arguments

polycorr The polychoric correlation.
dist1 A list of length 3 containing the skewness, excess kurtosis, and a numeric vector of marginal probabilities for the first continuous variable with names skewness, exkurtosis, and p, respectively.
dist2 A list of length 3 containing the skewness, excess kurtosis, and a numeric vector of marginal probabilities for the second continuous variable with names skewness, exkurtosis, and p, respectively.

Value

The ordinal phi coefficient.

References


See Also
corrY2corrZ, corrZ2ophi, mps2cps

Examples

set.seed(567)
library(moments)
y1<-rweibull(n=100000, scale=1, shape=3.6)
y1.skew<-round(skewness(y1), 5)
y1.exkurt<-round(kurtosis(y1)-3, 5)

gaussmix <- function(n,m1,m2,s1,s2,pi) {
  I <- runif(n)<pi
  rnorm(n,mean=ifelse(I,m1,m2),sd=ifelse(I,s1,s2))
}

...
Computation of the Polyserial Correlation from the Point-Polyserial Correlation

Description

This function computes the polyserial correlation between two continuous variables given the correlation after ordinalization of one of the variables (point-polyserial correlation) as seen in Demirtas and Hedeker (2016). Before computation of the polyserial correlation, the specified point-polyserial correlation is compared to the lower and upper correlation bounds of the continuous variable and ordinalized variable using the generate, sort and correlate (GSC) algorithm in Demirtas and Hedeker (2011).

Usage

```r
pps2ps(pps, ord.var, cont.var, cats, p=NULL, cutpoint=NULL)
```

Arguments

- `pps`: The point-polyserial correlation.
- `ord.var`: A numeric vector of the continuous variable before ordinalization.
- `cont.var`: A numeric vector of the continuous variable that is not transformed.
- `cats`: A numeric vector of the categories in the ordinalization of `ord.var`.
- `p`: A numeric vector of the marginal probabilities corresponding to each category in `cats`. The marginal probabilities must sum to 1. Either `p` or `cutpoint` should be specified.
- `cutpoint`: A numeric vector of the cutpoints used to define the categories `cats`. Either `p` or `cutpoint` should be specified.

Value

The polyserial correlation.
References


See Also

ordY, mps2cps

Examples

```r
set.seed(234)
y1<-rweibull(n=100000, scale=1, shape=25)

gaussmix <- function(n,m1,m2,s1,s2,pi) {
  I <- runif(n)<pi
  rnorm(n,mean=ifelse(I,m1,m2),sd=ifelse(I,s1,s2))
}
y2<-gaussmix(n=100000, m1=0, s1=1, m2=2, s2=1, pi=0.5)

pps2ps(pps=0.3, ord.var=y1, cont.var=y2, cats=c(1,2,3,4), p=c(0.4, 0.3, 0.2, 0.1))
pps2ps(pps=0.3, ord.var=y1, cont.var=y2, cats=c(1,2,3,4), cutpoint=c(0.97341, 1.00750, 1.03421))
```

---

**ps2pps**  
*Computation of the Point-Polyserial Correlation from the Polyserial Correlation*

Description

This function computes the point-polyserial correlation between two variables after one of the variables is ordinalized given the correlation before ordinalization (polyserial correlation) as seen in Demirtas and Hedeker (2016). Before computation of the point-polyserial correlation, the specified polyserial correlation is compared to the lower and upper correlation bounds of the two continuous variables using the generate, sort and correlate (GSC) algorithm in Demirtas and Hedeker (2011).

Usage

```r
ps2pps(ps, ord.var, cont.var, cats, p=NULL, cutpoint=NULL)
```

Arguments

- **ps**  
The polyserial correlation.
- **ord.var**  
A numeric vector of the continuous variable before ordinalization.
- **cont.var**  
A numeric vector of the continuous variable that is not transformed.
- **cats**  
A numeric vector of the categories in the ordinalization of ord.var.
**tet2phi**

A numeric vector of the marginal probabilities corresponding to each category in cats. The marginal probabilities must sum to 1. Either p or cutpoint should be specified.

cutpoint

A numeric vector of the cutpoints used to define the categories in cats. Either p or cutpoint should be specified.

**Value**

The point-polyserial correlation.

**References**


**See Also**

ordY, mps2cps

**Examples**

```r
gaussmix <- function(n, m1, m2, s1, s2, pi) {
  I <- runif(n)<pi
  rnorm(n, mean=ifelse(I, m1, m2), sd=ifelse(I, s1, s2))
}
y1 <- gaussmix(n=100000, m1=0, m2=2, s1=1, s2=1, pi=0.5)
y2 <- gaussmix(n=100000, m1=0, m2=2, s1=1, s2=1, pi=0.5)

ps2pps(ps=0.6, ord.var=y1, cont.var=y2, cats=c(1,2,3,4), p=c(0.4, 0.3, 0.2, 0.1))
ps2pps(ps=0.6, ord.var=y1, cont.var=y2, cats=c(1,2,3,4), cutpoint=c(0.97341, 1.00750, 1.03421))
```

**Description**

This function computes the phi coefficient between two variables after both of the variables are dichotomized given the correlation before dichotomization (tetrachoric correlation) as seen in Demirtas (2016). Before computation of the phi coefficient, the specified tetrachoric correlation is compared to the lower and upper correlation bounds of the two continuous variables as defined by the respective skewness and excess kurtosis using the generate, sort and correlate (GSC) algorithm in Demirtas and Hedeker (2011).
**Usage**

tet2phi(tetcorr, dist1, dist2)

**Arguments**

tetcorr The tetrachoric correlation.
dist1 A list of length 3 containing the skewness, excess kurtosis, and expected value after dichotomization for the first continuous variable with names skewness, exkurtosis, and p, respectively.
dist2 A list of length 3 containing the skewness, excess kurtosis, and expected value after dichotomization for the second continuous variable with names skewness, exkurtosis, and p, respectively.

**Value**
The phi coefficient.

**References**


**See Also**
corrY2corrZ, corrZ2phi

**Examples**

```r
set.seed(987)
library(moments)
y1<-rweibull(n=100000, scale=1, shape=1)
y1.skew<-round(skewness(y1), 5)
y1.exkurt<-round(kurtosis(y1)-3, 5)

gaussmix <- function(n,m1,m2,s1,s2,pi) {
  I <- runif(n)<pi
  rnorm(n,mean=ifelse(I,m1,m2),sd=ifelse(I,s1,s2))
}
y2<-gaussmix(n=100000, m1=0, s1=1, m2=3, s2=1, pi=0.5)
y2.skew<-round(skewness(y2), 5)
y2.exkurt<-round(kurtosis(y2)-3, 5)

tet2phi(tetcorr=-0.4,
        dist1=list(skewness=y1.skew, exkurtosis=y1.exkurt, p=0.85),
        dist2=list(skewness=y2.skew, exkurtosis=y2.exkurt, p=0.15))

tet2phi(tetcorr=0.7,
```
dist1=list(skewness=y1.skew, exkurtosis=y1.exkurt, p=0.10),
dist2=list(skewness=y2.skew, exkurtosis=y2.exkurt, p=0.30)
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