Package 'BSA'

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Type Package

Title Calculating broad sense agreement coefficient between ordinal and continuous variables

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Description Calculating broad sense agreement coefficient for ordinal and continuous variables with one time point or longitudinal settings.

Depends R (>= 3.0.1),survival

License GPL-2

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`BSA-package` *Calculating broad sense agreement coefficient between ordinal and continuous variables*

Description

Calculating broad sense agreement coefficient for ordinal and continuous variables with one time point or longitudinal settings.

Details

Package:	BSA
Type:	Package
Version:	1.0
Depends:	R (>= 3.0.1)
	survival
Date:	2020-03-06
License:	GPL-2

Major functions include *bsa*, *bsa.fast*, *lbsa* and *lvar*. *bsa* and *bsa.fast* are used for one time point. *bsa* is based on stratified sampling method. *bsa.fast* is based on empricial survival function. *lbsa* and *lvar* are used for longitudinal data.

Author(s)

Qingpo Cai and Bo Wei

Maintainer: Bo Wei <bwei8@emory.edu>

References

Peng, L., Li, R., Guo, Y., and Manatunga, A. A Framework for Assessing Broad Sense Agreement Between Ordinal and Continuous Measurements Journal of the American Statistical Association, 106: 1592–1601, 2011.

Wei, B., Dai, T., Peng, L., Guo, Y. and Manatunga, A., 2020. A new functional representation of broad sense agreement. Statistics & Probability Letters, 158, p.108619.

Examples

```
N=40
x.level<-1:3
x=sample(1:3,N,replace=TRUE)
y=rnorm(N,sd=0.8)+x

bsa(x,y,x.level)
bsa.fast(cbind(x,y),rep(1,N),x.level)

x1<-sample(1:3,N,replace=TRUE)
y1<-rnorm(N,sd=1)+x1
x2<-cbind(x,x1)
y2<-cbind(y,y1)
lbsa(x2,y2,x.level)
lvar(x2,y2,x.level)
```

`bsa` *Calculating broad sense agreement coefficient the jackknife standard deviation for one time point based on stratified sampling method*

Description

This function is used for calculating broad sense agreement coefficient between an ordinal variable and a continuous variable with one time point, and its jackknife standard deviation based on stratified sampling method.

Usage

```
bsa(x,y,x.level)
```

Arguments

x	A vector of an ordinal variable.
y	A vector of a continuous variable.
x.level	A numeric vector indicating the levels of ordinal variable x.

Value

bsa returns a list containing the following components:

bsa	the estimated broad sense agreement coefficient.
sd	the jackknife standard deviation.
flag	0 means no data for at least one level of x and bsa and sd are both NA. flag=1 means every level has data.

Author(s)

Qingpo Cai

References

Peng, L., Li, R., Guo, Y., and Manatunga, A. A Framework for Assessing Broad Sense Agreement Between Ordinal and Continuous Measurements Journal of the American Statistical Association, 106: 1592–1601, 2011.

Examples

```
N=40
x=sample(1:3,N,replace=TRUE)
y=rnorm(N,sd=0.8)+x
x.level<-1:3
bsa(x,y,x.level)
```

`bsa.fast` *Calculating broad sense agreement coefficient the jackknife standard deviation for one time point based on empricial survival function*

Description

This function is used for calculating broad sense agreement coefficient between an ordinal variable and a continuous variable with one time point, and its jackknife standard deviation based on empricial survival function.

Usage

```
bsa.fast(data,status,x.level)
```

Arguments

`data`	A matrix or data.frame with 2 columns. The first column is a vector of the ordinal variable x. The second column is a vector of the continuous variable y.
`status`	A vector of indicator of censored status of y. 1 indicates y is observed, and 0 indicates y is censored.
`x.level`	A numeric vector indicating the levels of ordinal variable x.

Value

bsa returns a list containing the following components:

`bsa`	the estimated broad sense agreement coefficient.
`sd`	the jackknife standard deviation.
`flag`	0 means no data for at least one level of x and bsa and sd are both NA. flag=1 means every level has data.

Author(s)

Bo Wei

References

Wei, B., Dai, T., Peng, L., Guo, Y. and Manatunga, A., 2020. A new functional representation of broad sense agreement. Statistics & Probability Letters, 158, p.108619.

Examples

```
N=40
x=sample(1:3,N,replace=TRUE)
y=rnorm(N,sd=0.8)+x
x.level<-1:3
bsa.fast(cbind(x,y),rep(1,N),x.level)
```

lbsa *Calculating broad sense agreement coefficient for longitudinal data*

Description

This function is used for calculating broad sense agreement coefficient between ordinal variable and continuous variable with longitudinal settings.

Usage

```
lbsa(x,y,x.level)
```

Arguments

x	A matrix or data.frame indicating the ordinal variable, with at least 2 columns.
y	A matrix or data.frame indicating the continuous variable, with at least 2 columns.
x.level	A numeric vector indicating the levels of ordinal variable x.

Value

lbsa returns a list containing the following components:

est.bsa	the estimated BSA.
Dn.ori	Dn.ori=sqrt(n)*t(p_2-p_1,...,p_m-p_1), where n is sample size, t() means transpose of a vector, p_i means the estimated BSA at time i and m is the number of time point.
Dn.fisher	Dn.fisher=sqrt(n)*t(f(p_2)-f(p_1),...,f(p_m)-f(p_1)), where n is sample size, t() means transpose of a vector, f is a transformation function with f(x)=0.5*log((1+x)/(1-x)),p_i means the estimated BSA at time point i and m is the number of time point.
var.ori	var.ori is the jackknife estimator of Dn.ori.
var.jack.fisher	var.jack.fisher is the estimated covariance matrix of Dn.fisher.
T	the value of test statistic.
indx	the number of estimated BSA equals 1 or -1.

You could see the definition of the above on the reference paper part 2.5. Dn.ori is Rn in the paper. Dn.fisher is Dn in the paper. var.ori is Vn in the paper. var.jack.fisher is the Sigma_n in the paper.

Author(s)

Qingpo Cai

References

Peng, L., Li, R., Guo, Y., and Manatunga, A. A Framework for Assessing Broad Sense Agreement Between Ordinal and Continuous Measurements Journal of the American Statistical Association, 106: 1592–1601, 2011.

Examples

```
N=40
x=sample(1:3,N,replace=TRUE)
y=rnorm(N,sd=0.8)+x
x1<-sample(1:3,N,replace=TRUE)
y1<-rnorm(N,sd=1)+x1
x2<-cbind(x,x1)
y2<-cbind(y,y1)
x.level=1:3
lbsa(x2,y2,x.level)
```

`lvar` *Jackknife variance estimator of BSA for longitudinal data*

Description

Using jackknife method to calculate the variance estimator of broad sense agreement coefficient for longitudinal settings.

Usage

```
lvar(x,y,x.level)
```

Arguments

`x`	A matrix or data.frame indicating the ordinal variable, with at least 2 columns.
`y`	A matrix or data.frame indicating the continuous variable, with at least 2 columns.
`x.level`	A numeric vector indicating the levels of ordinal variable x.

Value

Return value is a matrix.

Author(s)

Qingpo Cai

References

Peng, L., Li, R., Guo, Y., and Manatunga, A. A Framework for Assessing Broad Sense Agreement Between Ordinal and Continuous Measurements Journal of the American Statistical Association, 106: 1592–1601, 2011.

Examples

```
N=40
x=sample(1:3,N,replace=TRUE)
y=rnorm(N,sd=0.8)+x
x1<-sample(1:3,N,replace=TRUE)
y1<-rnorm(N,sd=1)+x1
x2<-cbind(x,x1)
y2<-cbind(y,y1)
x.level<-1:3
lvar(x2,y2,x.level)
```

`negative_pseudo.func` *Inserting pseudo data when BSA is -1*

Description

Inserting pseudo data at all time points to recalculate BSA and the test statistic if the estimated BSA at any time point equals -1.

Usage

```
negative_pseudo.func(x, y)
```

Arguments

x	A numeric vector indicating the ordinal variable
y	A numeric vector indicating the continuous variable

Value

negative_pseudo.func returns a list containing the following components:

a	An ordinal data after inserting pseudo data
b	A continuous data after inserting pseudo data

Author(s)

Qingpo Cai

References

Peng, L., Li, R., Guo, Y., and Manatunga, A. A Framework for Assessing Broad Sense Agreement Between Ordinal and Continuous Measurements Journal of the American Statistical Association, 106: 1592–1601, 2011.

Examples

```
N=40
x=sample(1:3,N,replace=TRUE)
y=rnorm(N,sd=0.8)+x
negative_pseudo.func(x,y)
```

`positive_pseudo.func` *inserting pseudo data when BSA is 1*

Description

Inserting pseudo data at all time points to recalculate BSA and the test statistic if the estimated BSA at any time point equals 1.

Usage

```
positive_pseudo.func(x, y)
```

Arguments

`x`	A numeric vector indicating the ordinal variable
`y`	A numeric vector indicating the continuous variable

Value

negative_pseudo.func returns a list containing the following components:

`a`	An ordinal data after inserting pseudo data
`b`	A continuous data after inserting pseudo data

Author(s)

Qingpo Cai

References

Peng, L., Li, R., Guo, Y., and Manatunga, A. A Framework for Assessing Broad Sense Agreement Between Ordinal and Continuous Measurements Journal of the American Statistical Association, 106: 1592–1601, 2011.

Examples

```
N=40
x=sample(1:3,N,replace=TRUE)
y=rnorm(N,sd=0.8)+x
positive_pseudo.func(x,y)
```

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