Package: ExactCIdiff (via r-universe)

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Title Inductive Confidence Intervals for the Difference Between Two Proportions

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Depends R (>= 1.8.0)

Description This is a package for exact Confidence Intervals for the difference between two independent or dependent proportions.

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Description

Three exact confidence intervals (two-sided, smallest lower one-sided and smallest upper one-sided) of level 1-alpha are constructed for p1-p2, the difference of two dependent proportions.

A random vector (n11,n12,n21,n22) follows multinomial(N, p11,p12,p21,p22) where N=n11+n12+n21+n22, and p1-p2=(p11+p12)-(p11+p21)=p12-p21. Let t=n11+n22. Intervals [L(n12,t,n21),1], [-1,U(n12,t,n21)] and [L(n12,t,n21),U(n12,t,n21)] are of interest.

This package can be used to calculate these intervals using an inductive method developed by Wang (2012).

Usage

```
PairedCI(n12,t,n21,conf.level,CItype,precision,grid.one,grid.two)
```

Arguments

n12	the number of subjects in the paired study who have success from the treatment and failure from the control
t	the number of subjects in the paired study who have the same results from the treatment and control, t=n11+n22
n21	the number of subjects in the paired study who have success from the contol and failure from the treatment
conf.level	Confience level, 95% is the default value.
CItype	c("Lower","Upper","Two.sided"), lower one-sided confidence interval [L,1], upper one-sided confidence interval [-1,U], two-sided confidence interval [L,U], "Two.sided" is the default value
precision	Precision of the confidence interval, default is 0.00001 rounded to 5 decimals
grid.one	two-step grid search algorithm is used. grid.one is the number of points for searching the global maximum of the tail probability in the first step. 30 is the default value
grid.two	grid.two is the number of points for searching the global maximum of the tail probability in the second step. 20 is the default value

Details

An inductive construction is carried out to obtain one-sided interval. At each step we rank sample point by its potential confidence interval and then select the one with the shortest interval. The difference of the two proportions is the parameter of interest. There is a nuisance parameter in the

tail probability (Eq (8) in Wang 2012). The nuisance parameter is eliminated by the maximization originally proposed by Buehler (1957). A two-step grid search algorithm is applied to find the maximum. The first step is to roughly identify a neighbor area of the global maximization of the tail probability, more points used more accurate results achieved. We recommend to use grid.one at least 30 to have accurate confidence intervals. The second step is to search for maximum within that smaller neighbor area, and grid.two should be at least 20. We find that this two-step grid search algorithm works much more accurate and efficient than the traditional one-step grid search algorithm. 1-alpha two-sided interval is equal to the intersection of two 1-alpha/2 one-sided intervals.

Details and more examples see: http://www.wright.edu/~weizhen.wang/software/ExactTwoProp/examples.pdf

Value

PairedCI gives the estimate of (p1-p2), which is (n12/-n21)/(n12+t+n21), and the exact confidence interval.

References

Wang, W. (2012). An inductive order construction for the difference of two dependent proportions. Statistical and Probability Letters, 82, 1623–1628.

Buehler, R. (1957). Confidence intervals for the porduct of two binomial parameters. JASA, 52, 482–493.

Examples

```
#lower one-sided confidence intervals in Table 1 of Wang 2012
PairedCI(3,1,0,conf.level=0.95,CItype="Lower")
PairedCI(2,0,2,conf.level=0.95,CItype="Lower")

#Upper one-sided confidence intervals for the difference of two dependent proportions
PairedCI(3,1,0,CItype="Upper",conf.level=0.95)
PairedCI(1,1,2,CItype="Upper",conf.level=0.9,grid.one=40,grid.two=25)

#Two-sided 90% confidence intervals
PairedCI(3,1,0,CItype='Two.sided',conf.level=0.9)
```

Exact   one-sided   and   two-sided   1-alpha   confidence   interval   two independent proportions

Inductive confidence intervals for the Difference Between Two Proportions

Description

Three exact confidence intervals (two-sided, smallest lower one-sided and smallest upper one-sided) of level 1-alpha are constructed for p1-p2, the difference of two independent proportions.

X follows Binomial(n1,p1), Y follows Binomial(n2,p2) and X and Y are independent. Intervals [L(X,Y),1], [-1,U(X,Y)] and [L(X,Y),U(X,Y)] are of interest.

This package can be used to calculate these intervals using an inductive method developed by Wang (2010).

Usage

```
BinomCI(n1,n2,x,y,conf.level,CItype,precision,grid.one,grid.two)
```

Arguments

n1	the number of trials in the first group in the parallel two-arm study
n2	the number of trials in the second group in the parallel two-arm study
x	the number of successes from the first group in the parallel two-arm study
y	the number of successes from the second group in the parallel two-arm study
conf.level	Confience level, 95% is the default value.
CItype	c("Lower","Upper","Two.sided"), lower one-sided confidence interval [L,1], upper one-sided confidence interval [-1,U], two-sided confidence interval [L,U], "Two.sided" is the default value
precision	Precision of the confidence interval, default is 0.00001 rounded to 5 decimals
grid.one	two-step grid search algorithm is used. grid.one is the number of points for searching the global maximum of the tail probability in the first step. 30 is the default value
grid.two	grid.two is the number of points for searching the global maximum of the tail probability in the second step. 20 is the default value

Details

An inductive construction is carried out to obtain one-sided interval. At each step we rank sample point by its potential confidence interval and then select the one with the shortest interval. The difference of the two proportions is the parameter of interest. There is a nuisance parameter in the tail probability (Eq (6) in Wang 2010). The nuisance parameter is eliminated by the maximization originally proposed by Buehler (1957). A two-step grid search algorithm is applied to find the maximum. The first step is to roughly identify a neighbor area of the global maximization of the tail probability, more points used more accurate results achieved. We recommend to use grid.one at least 30 to have accurate confidence intervals. The second step is to search for maximum within that smaller neighbor area, and grid.two should be at least 20. We find that this two-step grid search algorithm works much more accurate and efficient than the traditional one-step grid search algorithm. 1-alpha two-sided interval is equal to the intersection of two 1-alpha/2 one-sided intervals.

Details and more examples see: http://www.wright.edu/~weizhen.wang/software/ExactTwoProp/examples.pdf

Value

BinomCI gives the estimate of (p1-p2), which is x/n1-y/n2, and the exact confidence interval.

References

Wang, W. (2010). On construction of the smallest one-sided confidence interval for the difference of two proportions. The Annals of Statistics, 38, 1227–1243.

Buehler, R. (1957). Confidence intervals for the porduct of two binomial parameters. JASA, 52, 482–493.

Examples

```
#lower one-sided confidence interval with n1=4,n2=1,x=2,and y=0 in Wang 2010
BinomCI(4,1,2,0,CItype="Lower")

#Upper one-sided confidence interval with n1=4,n2=1,x=2,and y=0.
BinomCI(4,1,2,0,CItype="Upper")


#Two-sided 90% confidence intervals
BinomCI(5,5,4,2,conf.level=0.9,CItype='Two.sided')
```

Exact one-sided and two-sided 1-alpha confidence interval, main
functions

*Inductive confidence intervals for the difference between two propor-
tions*

Description

The function BinomialCIone and PairedCIone are the called functions for the main function BinomCI and PairedCI, respectively.

Arguments

n12	the number of subjects in the paired study who have success from the treatment and failure from the control
t	the number of subjects in the paired study who have the same results from the treatment and control, t=n11+n22
n21	the number of subjects in the paired study who have success from the contol and failure from the treatment
conf.level	Confience level, 95% is the default value.
CItype	c("Lower","Upper","Two.sided"), lower one-sided confidence interval [L,1], upper one-sided confidence interval [-1,U], two-sided confidence interval [L,U], "Two.sided" is the default value

precision	Precision of the confidence interval, default is 0.00001 rounded to 5 decimals
grid.one	two-step grid search algorithm is used. grid.one is the number of points for searching the global maximum of the tail probability in the first step. 30 is the default value
grid.two	grid.two is the number of points for searching the global maximum of the tail probability in the second step. 20 is the default value

Value

PairedCI gives the estimate of (p1-p2), which is (n12/-n21)/(n12+t+n21), and the exact confidence interval.

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