Package 'ComparisonCR'

June 4, 2020

Type Package

Title Comparison of Cumulative Incidence Between Two Groups Under Competing Risks

Version 1.0.4

Date 2020-05-23

Description Statistical methods for competing risks data in comparing cumulative incidence function curves between two groups, including overall hypothesis tests and arbitrary tests in Lyu et al. (2020) <doi:10.1002/pst.2028>, and the fixed-point tests in Chen et al. (2018) <doi:10.1080/03610918.2018.1476697>.

Depends R (>= 4.0.0), stats, graphics

Imports boot, CIFsmry, cmprsk

License GPL-2

Encoding UTF-8

Author Jingjing Lyu [aut],
Zheng Chen [cre],
Jinbao Chen [ctb],
Yawen Hou [ctb]

Maintainer Zheng Chen <zheng-chen@hotmail.com>

NeedsCompilation no

Repository CRAN

Date/Publication 2020-06-04 12:30:02 UTC

R topics documented:

ABC *Area between the CIF curves for competing risk data*

Description

Statistical inference of area between the CIF curves (ABC) test for competing risk data.

Usage

```
ABC(time, status, group, t0=0, tau=NULL)
```

Arguments

time	The followed up time for testing data.
status	The status indicator, should be coded as 0= censored, 1= event of interest, 2= all other competing events.
group	The group indicator for comparison, and the elements of this vector should take either 0 or 1. Normally, 0= control group, 1= treatment group.
t0	The start time point for testing, the default is set as t0=0 for overall test.
tau	The truncation time point for testing, which needs to be smaller than or equal to the minimum of the largest observed time in each of the two groups. When tau=NULL, the default value is used. See details in reference.

Value

t0	The start time point for testing.
tau	The truncation time point for testing.
delta	The alsolute difference of two cumulative incidence functions.
var(delta)	The variance of delta based on Aalen's method.
statistic	The statistic of this test.
Pvalue	The P value of this test.

References

Lyu J, Chen J, Hou Y, Chen Z. Comparison of two treatments in the presence of competing risks. Pharmaceutical Statistics, 2020. DOI: 10.1002/pst.2028.

Examples

```
#get dataset from package
data(crossdata)
#
#overall test
ABC(crossdata$time, crossdata$status, crossdata$group)
#arbitary test for detecting difference after 2 years
ABC(crossdata$time, crossdata$status, crossdata$group, t0=2, tau=NULL)
#arbitary test for detecting difference between 2 years and 4 years
ABC(crossdata$time, crossdata$status, crossdata$group, t0=2, tau=4)
```

`ABC.comb` *The combined test of the Li's test and area between the CIF curves test*

Description

Statistical inference of combined test with combination of the Li's test and area between the CIF curves(ABC) test.

Usage

```
ABC.comb(time, status, group, nboot=1000, seed=12345)
```

Arguments

`time`	The followed up time for testing data.
`status`	The status indicator, should be coded as 0= censored, 1= event of interest, 2= all other competing events.
`group`	The group indicator for comparison, and the elements of this vector should take either 0 or 1. Normally, 0= control group, 1= treatment group.
`nboot`	The times of bootstrap resamplings, with default as nboot=1000.
`seed`	The seed number, with default seed=12345.

Value

`method`	Three test results are involved, the Li's test, ABC test, and their combined test.
`statistic`	The statistic of the Li's test, ABC test, and combined test.
`Pvalue`	The P value of the Li's test, ABC test, and combined test.

References

[1] Li JN, Rademacher JL, Zhang MJ. Weighted comparison of two cumulative incidence functions with R-CIFsmry package. Computer Methods and Programs in Biomedicine, 2014, 116(3): 205-214.

[2] Lyu J, Chen J, Hou Y, Chen Z. Comparison of two treatments in the presence of competing risks. Pharmaceutical Statistics, 2020. DOI: 10.1002/pst.2028.

Examples

```
#get dataset from package
data(crossdata)
#just for an example, we set resampling times at 10
#combined test
ABC.comb(crossdata$time, crossdata$status, crossdata$group, nboot=10)
```

ABC.perm *The permutation test of area between the CIF curves for competing risk data*

Description

Statistical inference of area between the CIF curves (ABC) test with a permutation procedure for competing risk data.

Usage

```
ABC.perm(time, status, group, t0=0, tau=NULL, nperm=1000, seed=12345, bias=FALSE)
```

Arguments

time	The followed up time for testing data.
status	The status indicator, should be coded as 0= censored, 1= event of interest, 2= all other competing events.
group	The group indicator for comparison, and the elements of this vector should take either 0 or 1. Normally, 0= control group, 1= treatment group.
t0	The start time point for testing, the default is set as t0=0 for overall test.
tau	The truncation time point for testing, which needs to be smaller than or equal to the minimum of the largest observed time in each of the two groups. When tau=NULL, the default value is used. See details in reference.
nperm	The times of permutation, with default nperm=1000.
seed	The seed number, with default seed=12345.
bias	If bias=TRUE, the results will print the mean difference for delta of simulated datasets and original data. The default is bias=FALSE

Value

t0	The start time point for testing.
tau	The truncation time point for testing.
delta	The alsolute difference of two cumulative incidence functions.
var(delta)	The variance for delta of simulated datasets.
bias	The mean difference for delta of simulated datasets and original data.
Pvalue	The P value of this test.

References

Lyu J, Chen J, Hou Y, Chen Z. Comparison of two treatments in the presence of competing risks. Pharmaceutical Statistics, 2020. DOI: 10.1002/pst.2028.

Examples

```
#get dataset from package
data(crossdata)
#just for an example, we set resampling times at 10
#overall test
ABC.perm(crossdata$time, crossdata$status, crossdata$group, nperm=10)
#arbitary test for detecting difference after 2 years
ABC.perm(crossdata$time, crossdata$status, crossdata$group, t0=2, tau=NULL, nperm=10)
#arbitary test for detecting difference between 2 years and 4 years
ABC.perm(crossdata$time, crossdata$status, crossdata$group, t0=2, tau=4, nperm=10)
```

ABC.plot *Plot for area between the CIF curves*

Description

A function used to plot the area between the CIF curves.

Usage

```
ABC.plot(time, status, group, tau=NULL, max.x=NULL, max.y=NULL, col=c(1,1,8),lwd=c(3,3)
      , lty=c(1,2), lab.x="Time", lab.y="CIF", cex.main=1.5, cex.lab=1.5, cex.axis=1.5)
```

Arguments

time	The followed up time for testing data.
status	The status indicator, should be coded as 0= censored, 1= event of interest, 2= all other competing events.
group	The group indicator for comparison, and the elements of this vector should take either 0 or 1. Normally, 0= control group, 1= treatment group.
tau	The truncation time point for shading lines, which needs to be smaller than or equal to the maximum of time. When tau=NULL, the default value is used. See details in reference.
max.x	The maximum of x-axis. When the default NULL is used, the max.x is set to the max velue of time.
max.y	The maximum of y-axis. When the default NULL is used, the max.y is set to 1.
col	A vector of integers specifying colors for control group, treatment group, and shading lines, respectively. The default value is c("black","black","gray90").
lwd	A vector of numeric values of line widths for control group, treatment group, and shading lines, respectively.. The default value is c(3,3).

lty	A vector of integers specifying line types for control group, treatment group, and shading lines, respectively. The default value is c(1,2).
lab.x	Label given to the x-axis.
lab.y	Label given to the y-axis.
cex.axis	The magnification to be used for axis annotation relative to the current setting of cex.
cex.lab	The magnification to be used for x and y labels relative to the current setting of cex.
cex.main	The magnification to be used for main titles relative to the current setting of cex.

Value

None

Note

ABC.plot is based on plot function and polygon function.

References

Lyu J, Chen J, Hou Y, Chen Z. Comparison of two treatments in the presence of competing risks. Pharmaceutical Statistics, 2020. DOI: 10.1002/pst.2028.

See Also

ABC

Examples

```
#get dataset from package
data(crossdata)
#
#get plot for ABC
ABC.plot(crossdata$time, crossdata$status, crossdata$group, col=c(1,1,"gray90"))
legend(0,1.02,c("group0","group1"), col=c(1,1), lty=c(1,2), lwd=c(3,3), cex=1.2, bty="n")
```

ABC.ts *The two-stage test of the Li's test and area between the CIF curves test*

Description

Statistical inference of two-stage test. Stage I is the Li's test, and stage II is area between the CIF curves(ABC) test.

Usage

```
ABC.ts(time, status, group, nboot=1000, alpha=0.05, seed=12345)
```

Arguments

time	The followed up time for testing data.
status	The status indicator, should be coded as 0= censored, 1= event of interest, 2= all other competing events.
group	The group indicator for comparison, and the elements of this vector should take either 0 or 1. Normally, 0= control group, 1= treatment group.
nboot	The times of bootstrap resamplings, with default as nboot=1000.
alpha	The overall significance level, with default as alpha=0.05.
seed	The seed number, with default seed=12345.

Value

method	Three test results are involved, the Li's test, ABC test, and the two-stage test.
statistic	The statistic of the Li's test, ABC test, and the two-stage test.
Pvalue	The P value of the Li's test, ABC test, and the two-stage test.

References

[1] Li JN, Rademacher JL, Zhang MJ. Weighted comparison of two cumulative incidence functions with R-CIFsmry package. Computer Methods and Programs in Biomedicine, 2014, 116(3): 205-214.

[2] Lyu J, Chen J, Hou Y, Chen Z. Comparison of two treatments in the presence of competing risks. Pharmaceutical Statistics, 2020. DOI: 10.1002/pst.2028.

Examples

```
#get dataset from package
data(crossdata)
#just for an example, we set resampling times at 10
#two-stage test
ABC.ts(crossdata$time, crossdata$status, crossdata$group, alpha=0.05, nboot=10)
```

ComparisonCR *Comparison of two treatments in the presence of competing risks*

Description

Functions for comparison of two treatments in the presence of competing risks, including statistical inference for overall tests and arbitrary tests based on the area between the CIF curves (Lyu, 2020), and for tesing at a fixed point (Chen, 2020).

Author(s)

Jingjing Lyu, Zheng Chen, Jinbao Chen, Yawen Hou. maintainer: Zheng Chen <zheng-chen@hotmail.com>

References

[1] Lyu J, Chen J, Hou Y, Chen Z. Comparison of two treatments in the presence of competing risks. Pharmaceutical Statistics, 2020. DOI: 10.1002/pst.2028.

[2] Chen J, Hou Y, Chen Z. Statistical inference methods for cumulative incidence function curves at a fixed point in time. Communications in Statistics - Simulation and Computation, 2020, 49(1): 79-94.

`crossdata` *The simulated dataset with cumulative incidence function curves of event of interest crossed*

Description

A dataset constructed by simulation with 200 observations on the following 3 variables.

time The followed up time of patients.

status The status indicator, 0= censored, 1= event of interest, 2= competing risks.

group The group indicator for comparison, 0= control group, 1= treatment group.

Usage

```
data(crossdata)
```

Format

A data frame.

`fixpoint` *Statistical inference methods for cumulative incidence functions at a fixed time point*

Description

A function used to produce the results of three type of statistical inference methods for testing cumulative incidence functions at fixed time point.

Usage

```
fixpoint(time, status, group, timepoint, type=1)
```

Arguments

time	The followed up time for testing data.
status	The status indicator, should be coded as 0= censored, 1= event of interest, 2= all other competing events.
group	The group indicator for comparison, and the elements of this vector should take either 0 or 1. Normally, 0= control group, 1= treatment group.
timepoint	The fixed time point for testing.
type	Four type of statistical inference methods. "1" is related to Gaynor variance, "2" is related to Aalen variance. The default is set to type=1.

Value

method	Containing 5 transformation of statistical inference methods: line, log, cloglog, arcsin-square, and logist. See more details in references.
est0	The estimation of survival rates at the fixed timepoint for control group.
var0	The estimation of variances at the fixed timepoint for control group.
est1	The estimation of survival rates at the fixed timepoint for treatment group.
var1	The estimation of variances at the fixed timepoint for treatment group.
statistic	The statistics of corresponding methods.
Pvalue	The test P value of corresponding methods.

References

Chen J, Hou Y, Chen Z. Statistical inference methods for cumulative incidence function curves at a fixed point in time. Communications in Statistics - Simulation and Computation, 2020, 49(1): 79-94.

Examples

```
#get dataset from package
data(crossdata)
#
#if there exist differences at 1 year or 3 years
  #Gaynor
fixpoint(crossdata$time, crossdata$status, crossdata$group, timepoint=1, type=1)
  #Aalen
fixpoint(crossdata$time, crossdata$status, crossdata$group, timepoint=3, type=2)
```

Index