Package ‘jackknifeKME’

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Type Package

Title Jackknife Estimates of Kaplan-Meier Estimators or Integrals

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Description Computing the original and modified jackknife estimates of Kaplan-Meier estimators.

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`jackknifeKME-package` *Jackknife Estimates of Kaplan-Meier Estimators or Integrals*

Description

Computing the original and modified jackknife estimates of Kaplan-Meier estimators.

Details

For computing bias of Kaplan-Meier survival estimators the jackknifing (Stute and Wang, 1994) is a natural choice among the researchers because it reduces bias substantially. The package provides the original (Stute and Wang, 1994) and the modified (Khan and Shaw, 2015) jackknife estimates for Kaplan-Meier estimators and their corresponding variances. The package also compute bias corrected jackknife estimates for Kaplan-Meier estimators under both approaches.

Package:	jackknifeKME
Type:	Package
Version:	1.2
Date:	2015-10-23
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Depend:	imputeYn

Author(s)

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References

Khan and Shaw (2015) imputeYn: Imputing the last largest censored observation/observations under weighted least squares. R package version 1.3, https://cran.r-project.org/package=imputeYn.

Khan and Shaw. (2013). On Dealing with Censored Largest Observations under Weighted Least Squares. CRiSM working paper, Department of Statistics, University of Warwick, UK, No. 13-07. Also available in http://arxiv.org/abs/1312.2533.

Khan and Shaw. (2015). Robust bias estimation for Kaplan-Meier Survival Estimator with Jackknifing. Journal of Statistical Theory and Practice, (published online; DOI:10.1080/15598608.2015.1062833). Also available in http://arxiv.org/abs/1312.4058.

Stute, W. and Wang, J. (1994). The jackknife estimate of a Kaplan-Meier integral. Biometrika 81, 602-606.

Stute, W. (1993). Consistent estimation under random censorship when covariables are available. Journal of Multivariate Analysis, 45, 89-103.

Examples

```
#For full data typically used for AFT models (using imputeYn (2015) package).
#For mean lifetime estimator.
data1<-data(n=100, p=4, r=0, b1=c(2,2,3,3), sig=1, Cper=0)
kme1<-jackknifeKME(data1$x,data1$y, data1$delta, method="condMean",estimator = 1)
kme1
```

jackknifeKME — *Jackknife estimates of Kaplan-Meier estimators or integrals*

Description

This function computes the jackknife estimates of Kaplan-Meier estimators.

Usage

```
jackknifeKME(X, Y, delta, method = "PDQ", estimator = 1)
```

Arguments

`X`	covariate matrix under study, particularly for AFT modelling. The order of matrix covariate is typically n by p. If there is no covariates available then it can be ommitted under only the PDQ method. See last two examples. X must be a matrix of order at least n by 2 under the methods, RcondMean and RcondMedian.
`Y`	typically the logarithmic of the survival time under AFT models. Otherwise survival time.
`delta`	status. it includes value 1 for uncensored and value 0 for censored subject.
`method`	imputing methods for the last largest censored observations under right censoring. The methods satisfy the basic right censoring assumption and also the Efron's redistribution algorithm. For details see Khan and Shaw (2013). One of "condMean (conditional mean)", "condMedian" (conditional median), "RcondMean (resampling based conditional mean)", "RcondMedian (resampling based conditional median)", "PDQ (predicted difference quantity)". Default is "PDQ". Here only "PDQ" method works without covariate (X).
`estimator`	Kaplan-Meier estimator for the K-th F-moment. 1 for Kaplan-Meier mean lifetime estimator, 2 for Kaplan-Meier estimator for 2nd F-moment. Similarly, for higher order F-moment, value for estimator is used accordingly. Default is 1.

Details

This function computes the jackknife estimates of Kaplan-Meier estimators, the jackknife estimates of bias of Kaplan-Meier estimators, the bias corrected jackknife estimates of Kaplan-Meier estimators. This gives also modified jackknife estimates of bias of Kaplan-Meier estimators, the modified bias corrected jackknife estimates of Kaplan-Meier estimators.

The original jackknife estimate of bias for kaplan-Meier lifetime estimator is nonzero if and only if status of the last largest datum and second to the last largest datum are defined as `delta_(n)=1` and `delta_(n-1)=0` respectively (Stute and Wang, 1994) i.e., under pair (`delta_(n)=1`, `delta_(n-1)=0`). But the modified Kaplan-Meier estimate is nonzero if only `delta_(n-1)=0`. Furthermore, a modified Kaplan-Meier estimator and its jackknife estimate is developed when (`delta_(n)=0`, `delta_(n-1)=0`) (Khan and Shaw, 2015). There are different types of Kaplan-Meier lifetime estimators in practice. In Khan and Shaw (2015) only the mean lifetime estimator and one higher order (say, 2-nd) F-moment estimator are used for illustration purpose.

Value

A "jackknifeKME" object is returned. It includes

`km.est`	Kaplan-Meier estimate
`modkm.est`	modified Kaplan-Meier estimate
`Jbias.kme`	jackknife estimate of bias of Kaplan-Meier estimator
`Bcorr.Jkme`	bias corrected jackknife estimate of Kaplan-Meier estimator
`modJbias.kme`	modified jackknife estimate of bias of Kaplan-Meier estimator
`Bcorr.modJkme`	bias corrected modified jackknife estimate of Kaplan-Meier estimator

Author(s)

Hasinur Rahaman Khan and Ewart Shaw

References

Khan and Shaw (2015) imputeYn: Imputing the last largest censored observation/observations under weighted least squares. R package version 1.3, https://cran.r-project.org/package=imputeYn.

Khan and Shaw. (2013). On Dealing with Censored Largest Observations under Weighted Least Squares. CRiSM working paper, Department of Statistics, University of Warwick, UK, No. 13-07. Also available in http://arxiv.org/abs/1312.2533.

Khan and Shaw. (2015). Robust bias estimation for Kaplan-Meier Survival Estimator with Jackknifing. Journal of Statistical Theory and Practice, (published online; DOI:10.1080/15598608.2015.1062833). Also available in http://arxiv.org/abs/1312.4058.

Stute, W. and Wang, J. (1994). The jackknife estimate of a Kaplan-Meier integral. Biometrika 81, 602-606.

Examples

```
#For full data typically used for AFT models (using imputeYn (2015) package).
#For mean lifetime estimator.
data<-data(n=100, p=4, r=0, b1=c(2,2,3,3), sig=1, Cper=0)
kme1<-jackknifeKME(data$x,data$y, data$delta, method="condMean",estimator = 1)
kme1

#Estimates are for mean lifetime estimators.Data contain only status and survival time.
data2<-simdata(n = 100,lambda = 2.04)
data2$delta[length(data2$delta)]<-0
kme2<-jackknifeKME(, data2$Y, data2$delta, method="PDQ",estimator = 1)
kme2

#Estimates are for Kaplan-Meier 2nd order F-moment.
data3<-simdata(n = 100,lambda = 2.04)
data3$delta[length(data3$delta)]<-0
kme3<-jackknifeKME(, data3$Y, data3$delta, method="PDQ",estimator = 2)
kme3
```

kmweight *Compute Kaplan-Meier weights*

Description

Provide Kaplan-Meier weights for Stute's weighted least squares method.

Usage

```
kmweight(Y, delta)
```

Arguments

`Y`	survival time.
`delta`	status

Details

Kaplan-Meier weights are the mass attached to the uncensored observations. The weights are used to account for censoring into the calculation for many methods. For example, in the Stute's weighted least squares method (Stute and Wang, 1994)) that is applied for censored data.

Value

`kmwts`	Kaplan-Meier weights

Author(s)

Hasinur Rahaman Khan and Ewart Shaw

References

Stute, W. and Wang, J. (1994). The jackknife estimate of a Kaplan-Meier integral. Biometrika 81, 602-606.

Examples

```
#Using simdata function and considering censoring level at 50%.
data<-simdata(n = 100,lambda = 2.04)
kmw<-kmweight(data$Y, data$delta)
kmw
```

kmweight.corr — *Compute corrected Kaplan-Meier weights for jackknifing*

Description

Provide adjusted Kaplan-Meier weights for Stute's weighted least squares method.

Usage

```
kmweight.corr(Y, delta)
```

Arguments

`Y`	survival time.
`delta`	status.

Details

These are the adjusted Kaplan-Meier weights. The adjustment is made to the original Kaplan-Meier weights for being used in jackknifing to estimate Kaplan-Meier estimators. The adjustment is ocurred if and only if `delta_(n-1)=0` and `delta_(n)=1`. For details see Stute and Wang (1994), Khan and Shaw (2015).

Value

The corrected Kaplan-Meier weights are obtainable if the underlying censoring is the right censoring.

`kmwts`	corrected Kaplan-Meier weights

Author(s)

Hasinur Rahaman Khan and Ewart Shaw

References

Khan and Shaw. (2015). Robust bias estimation for Kaplan-Meier Survival Estimator with Jackknifing. Journal of Statistical Theory and Practice, (published online; DOI:10.1080/15598608.2015.1062833). Also available in http://arxiv.org/abs/1312.4058.

Stute, W. and Wang, J. (1994). The jackknife estimate of a Kaplan-Meier integral. Biometrika 81, 602-606.

Examples

```
#Using simdata function. Censoring level is 50%.
data1<-simdata(n = 100,lambda = 2.04)
kmwc<-kmweight.corr(data1$Y, data1$delta)
kmwc
```

simdata *Generating survival data*

Description

Generate survival data by keeping the second last largest subject as censored.

Usage

```
simdata(n, lambda)
```

Arguments

n	the sample size.
lambda	value of the parameter lambda for Uniform distribution. Different values of lambda are analytically computed to obtain specific censoring percentages. lambda takes values 7.53, 4.81, 3.48, 2.64, 2.04, 1.58, 1.20, 0.87, 0.55 for corresponding censoring percentages 10, 20, 30, 40, 50, 60, 70, 80, 90.

Details

Data are generated always keeping the second last largest subject as censored i.e. delta_(n-1)=0. The survival times and the censoring times are generated using log-normal(1.1, 1) and Uniform(lambda, 2xlambda) distribution respectively. This type of data is required to compute the actual and modified jackknife estimates of Kaplan-Meier estimators and their bias. This data is used in Khan and Shaw (2015).

Value

Y	survival times censored or uncensored i.e. min(t, c)
delta	status
Cper	censoring percentage. Different censoring percentages are obtained for different values of lambda of censoring time distribution

Author(s)

Hasinur Rahaman Khan and Ewart Shaw

References

Khan and Shaw. (2015). Robust bias estimation for Kaplan-Meier Survival Estimator with Jackknifing. Journal of Statistical Theory and Practice, (published online; DOI:10.1080/15598608.2015.1062833). Also available in http://arxiv.org/abs/1312.4058.

See Also

jackknifeKME

Examples

```
#For Cper = 30%.
data<-simdata(n = 100,lambda = 3.48)
data

#For Cper = 50%.
data2<-simdata(n = 100,lambda = 2.04)
data2

#For Cper = 80%.
data3<-simdata(n = 100,lambda = 0.87)
data3
```

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