Package ‘YPmodel’

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Type Package
Title The Short-Term and Long-Term Hazard Ratio Model for Survival Data
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Description Inference procedures accommodate a flexible range of hazard ratio patterns with a two-sample semi-parametric model. This model contains the proportional hazards model and the proportional odds model as sub-models, and accommodates non-proportional hazards situations to the extreme of having crossing hazards and crossing survivor functions. Overall, this package has four major functions: 1) the parameter estimation, namely short-term and long-term hazard ratio parameters; 2) 95 percent and 90 percent point-wise confidence intervals and simultaneous confidence bands for the hazard ratio function; 3) p-value of the adaptive weighted log-rank test; 4) p-values of two lack-of-fit tests for the model. See the included ``read_me_first.pdf'' for brief instructions. In this version (1.1), there is no need to sort the data before applying this package.

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This package has four major functions related to the short-term and long-term hazard ratio model (Yang and Prentice, 2005): 1) \texttt{YPmodel.estimate} estimates short-term and long-term hazard ratio parameters and their confidence intervals, and the odds function of the control group; 2) \texttt{YPmodel.IntervalBands} provides 95\% pointwise confidence intervals and 95\% and 90\% simultaneous confidence bands for the hazard ratio function; 3) \texttt{YPmodel.adlgrk} estimates p-value of the adaptive weighted log-rank test, to test for treatment effects with time to event data; 4) \texttt{YPmodel.lackfittest} estimates p-values of two lack-of-fit tests for the model, to test for checking this semi-parametric model. See the included "read_me_first.pdf" for brief instructions.

### Details

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### Author(s)

Junlong Sun and Song Yang

### References


### See Also

YPmodel
Examples

```r
library(YPmodel)
data(gastric)
YPmodel(gastric, repNum=100)
browseVignettes(package="YPmodel")
```

---

gastric

Data from Gastrointestinal Tumor Study Group

Description

A sample data set from the Gastrointestinal Tumor Study Group (1982), on comparing chemotherapy with combined chemotherapy and radiation therapy, in the treatment of locally unresectable gastric cancer. Each treatment arm had 45 patients, with two observations of the chemotherapy group and six of the combination group censored. Kaplan-Meier plots of the two estimated survival curves cross at around 1000 days.

Usage

```r
data(gastric)
```

Format

A dataframe with 90 observations on the following 3 variables.

V1 Lifetime vector (unite: year), where $X = \min(T, C)$ and $T$ is the pooled lifetimes of the two groups.

V2 Censor indicator vector, where $\delta = I(T \leq C)$ and $I(\cdot)$ is the indicator function.

V3 Group indicator vector, where $Z = I(i > n_1), i = 1, ..., n$ and $n_1 < n$ is the size of the control group.

References


See Also

YPmodel

Examples

```r
library(YPmodel)
data(gastric)
```
YPmodel

A main function of package of model of short-term and long-term hazard ratio for survival data

Description

The main function to perform parameter estimation and hypothesis testing. The corresponding S4 functions, plot.YPmodel and print.YPmodel, are also included to demonstrate the results.

Usage

YPmodel(...)  

## Default S3 method:  
YPmodel(data, startPoint, nm, maxIter1, maxIter2, repNum, ...)  

## S3 method for class 'YPmodel'  
print(x, ...)  

## S3 method for class 'YPmodel'  
summary(object, ...)  

## S3 method for class 'YPmodel'  
plot(x, ...)

Arguments

... For S4 method only.
data A properly qualified filename where text data is to be saved, or a dataframe of input data set with three vectors: the event / censoring time (unite: year), the censoring indicator, and the group membership indicator. See the structure of sample data set gastric for instance.

startPoint Start point for estimating $\hat{\beta}$.

nm Parameter for parameter estimation, to define the upper boundary for the absolute value of $\hat{\beta}$.

maxIter1 Parameter of out-cycle iteration numbers.

maxIter2 Parameter of inner-cycle iteration numbers.

repNum Number of iterations, to be used in the two lack-of-fit tests.

x A dataframe of results from an YPmodel default process.

object A dataframe of results from an YPmodel default process, equally to x (different symbol for S4 method only).

Value

An object of class YPmodel, basically a list including elements

Data A dataframe of source data, generated from input data by YPmodel.inputData.
Estimate A dataframe of estimation results, including 1) estimation of $\hat{\beta}$, 2) its confidential intervals and 3) the odds function of the control group $\hat{R}(t, \hat{\beta})$, generated by `YPmodel.estimate`.

IntervalBands A dataframe of hazard ratios and related confidential intervals and bands, generated by `YPmodel.IntervalBands`.

LackFitTest A dataframe of the two lack-of-fit tests for the semi-parametric model, generated by `YPmodel.lackfittest`.

Adlgrk A dataframe of the two lack-of-fit tests, to test the hypothesis of equal distribution function in the two groups, generated by `YPmodel.adlgrk`.

Author(s)
Junlong Sun and Song Yang

References

See Also
`YPmodel.estimate`, `YPmodel.IntervalBands`, `YPmodel.lackfittest`, `YPmodel.adlgrk`

Examples
```r
library(YPmodel)
data(gastric)
result <- YPmodel(gastric, repNum=100)
summary(result)
plot(result)
```

Description
Internal functions for the YPmodel package.

Author(s)
Junlong Sun and Song Yang

See Also
`YPmodel`
Description

A function to calculate p-value of the adaptive weighted logrank test.

Usage

```r
## S3 method for class 'adlgrk'
YPmodel(data, Estimate, ...)
## S3 method for class 'YPmodel.adlgrk'
summary(object, ...)
```

Arguments

- `data`: A properly qualified filename where text data is to be saved, or a dataframe of input data set with three vectors: the event / censoring time (unit: year), the censoring indicator, and the group membership indicator. See the structure of sample data set `gastric` for instance.
- `Estimate`: A dataframe of estimation results, including 1) estimation of $\hat{\beta}$, 2) its confidential intervals and 3) the odds function of the control group $R(t, \hat{\beta})$, generated by `YPmodel.estimate`.
- `object`: A dataframe of the two lack-of-fit tests, to test the hypothesis of equal distribution function in the two groups, generated by `YPmodel.adlgrk`.

Value

An object of class `YPmodel.adlgrk`, basically a list including elements

- `pval`: p-value from adaptively weighted logrank test.

Author(s)

Junlong Sun and Song Yang

References


See Also

`YPmodel`, `YPmodel.estimate`. 
YPmodel.estimate

Examples

library(YPmodel)
data(gastric)
Adlgrk <- YPmodel.adlgrk(data=gastric)
summary(Adlgrk)

Estimate <- YPmodel.estimate(data=gastric, interval=0)
Adlgrk <- YPmodel.adlgrk(data=gastric, Estimate=Estimate)

YPmodel.estimate  YPmodel Estimate Parameters.

Description

The main function to fit the short-term and long-term hazard ratio model.

Usage

## S3 method for class 'estimate'
YPmodel(data, startPoint, nm, maxIter1, maxIter2, interval, Internal, ...)
## S3 method for class 'YPmodel.estimate'
summary(object,...)
## S3 method for class 'YPmodel.survivor'
plot(x, Internal, ...)

Arguments

... For S4 method only.
data A properly qualified filename where text data is to be saved, or a dataframe of
input data set with three vectors: the event / censoring time (unite: year), the
censoring indicator, and the group membership indicator. See the structure of
sample data set gastric for instance.
startPoint Start point for estimating \( \hat{\beta} \).
nm The upper boundary for the absolute value of \( \hat{\beta} \), and the default value is \( \log(100) \).
maxIter1 Parameter of out-cycle iteration numbers.
maxIter2 Parameter of inner-cycle iteration numbers.
interval A binary parameter to control whether or not to perform interval estimation of
\( \hat{\beta} \), when it is set as 1, the interval estimation will be performed.
Internal A dataframe of internal parameters, used only to perform hypothesis tests and
plot (and to accelerate the speed).
x A dataframe of estimation results, including estimation of \( \hat{\beta} \) and and its confi-
dential intervals and \( \hat{R}(t, \hat{\beta}) \), generated by YPmodel.estimate.
object A dataframe of estimation results, including estimation of \( \hat{\beta} \) and and its con-
fidential intervals and \( \hat{R}(t, \hat{\beta}) \), generated by YPmodel.estimate, equally to x
(different symbol for S4 method only).
Value

- beta: Value of \( \hat{\beta} \).
- r: Value of \( \tilde{R}(t, \hat{\beta}) \).
- variance.beta1: Variance of the first variable of \( \hat{\beta} \).
- variance.beta2: Variance of the second variable of \( \hat{\beta} \).

Author(s)

Junlong Sun and Song Yang

References

hazard ratios with two-sample survival data. Biometrika 92, 1-17.

See Also

YPmodel

Examples

```r
library(YPmodel)
data(gastric)
Estimate <- ypmodel.estimate(data=gastric, interval=1)

Estimate <- ypmodel.estimate(data=gastric, startPoint=c(0,0), \(\text{run}=\log(100)\))

Estimate <- ypmodel.estimate(data=gastric, maxIter1=50, maxIter2=20)

summary(Estimate)

plot(Estimate)
```

---

YPmodel.IntervalBands  Beta confidential intervals & bands

Description

A function to calculate the confidential intervals and bands of the hazard ratio function.

Usage

```r
## S3 method for class 'IntervalBands'
YPmodel(data, interval, Estimate, ...)

## S3 method for class 'YPmodel.IntervalBands'
summary(object, interval, ...)
```
## Arguments

... For S4 method only.

data A properly qualified filename where text data is to be saved, or a dataframe of input data set with three vectors: the event / censoring time (unit: year), the censoring indicator, and the group membership indicator. See the structure of sample data set `gastric` for instance.

Internal A dataframe of internal parameters, used only to perform hypothesis tests and plot (and to accelerate the speed).

Estimate A dataframe of estimation results, including 1) estimation of $\hat{\beta}$, 2) its confidential intervals and 3) the odds function of the control group $R(t, \hat{\beta})$, generated by `YPmodel.estimate`.

x A dataframe of hazard ratios and related confidential intervals and bands, generated by `YPmodel.IntervalBands`.

object A dataframe of hazard ratios and related confidential intervals and bands, generated by `YPmodel.IntervalBands`, equally to x (different symbol for S4 method only).

## Value

hr Estimation of the hazard ratio function.

ld2 Lower bound of the time frame.

ud2 Upper bound of the time frame.

uPp3 Upper bounds for the 95% point-wise confidence intervals of the hazard ratio function.

low3 Lower bounds for the 95% point-wise confidence intervals of the hazard ratio function.

up22 Upper bounds for the 95% simultaneous confidence bands of the hazard ratio function.

low22 Lower bounds for the 95% simultaneous confidence bands of the hazard ratio function.

uPp90 Upper bounds for the 90% simultaneous confidence bands of the hazard ratio function.

low90 Lower bounds for the 90% simultaneous confidence bands of the hazard ratio function.

## Author(s)

Junlong Sun and Song Yang
References


See Also

YPmodel, YPmodel.estimate

Examples

library(YPmodel)
data(gastric)
IntervalBands <- YPmodel.IntervalBands(data=gastric)
summary(IntervalBands)
plot(IntervalBands)

Estimate <- YPmodel.estimate(data=gastric, interval=0)
IntervalBands <- YPmodel.IntervalBands(data=gastric, Estimate=Estimate)

YPmodel.lackfittest 

Martingale residual-based & contrast-based lack-of-fit tests

Description

Four functions to perform the two lack-of-fit tests (martingale residual-based & contrast-based), to print results, and to draw randomly selected realizations of the process.

Usage

## S3 method for class 'lackfittest'
YPmodel(data, repNum, Internal, ...)
## S3 method for class 'YPmodel.lackfittest'
summary(object, ...)
## S3 method for class 'YPmodel.martint'
plot(x, Internal, ...)
## S3 method for class 'YPmodel.survf'
plot(x, Internal, ...)

Arguments

... For S4 method only.

data A properly qualified filename where text data is to be saved, or a dataframe of input data set with three vectors: the event / censoring time (unit: year), the censoring indicator, and the group membership indicator. See the structure of sample data set gastric for instance.
YPmodel.lackfittest

repNum  Number of times the resampling simulations are done.

Internal  A dataframe of internal parameters, used only to perform hypothesis tests and
plot (and to accelerate the speed).

x  A dataframe of the two lack-of-fit tests, generated by YPmodel.lackfittest.

object  A dataframe of the two lack-of-fit tests, generated by YPmodel.lackfittest,
equally to x (different symbol for S4 method only).

Value

newBest  Value of \( \hat{\beta} \) used in the two tests.

pvalu1  p-value from martingale residual-based test.

pvalu2  p-value from contrast-based test.

mobs1  Parameter used in plotting martingale residual-based test.

mobs2  Parameter used in plotting contrast-based test.

obs  Parameter used in plotting martingale residual-based test.

obs2  Parameter used in plotting contrast-based test.

wtildcount1  Parameter used in plotting martingale residual-based test.

linecount1  Parameter used in plotting martingale residual-based test.

wtildcount2  Parameter used in plotting contrast-based test.

linecount2  Parameter used in plotting contrast-based test.

Author(s)

Junlong Sun and Song Yang

References

YANG, S. AND ZHAO, Y. (2012). Checking the Short-Term and Long-Term Hazard Ratio Model

See Also

YPmodel, YPmodel.setRandom

Examples

library(YPmodel)
data(gastric)
LackFitTest <- YPmodel.lackfittest(data=gastric, repNum=100)
summary.YPmodel.lackfittest(LackFitTest)
plot(LackFitTest)

plot.YPmodel.martint(LackFitTest)
plot.YPmodel.survf(LackFitTest)
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