

# Package ‘YPmodel’

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**Type** Package

**Title** The Short-Term and Long-Term Hazard Ratio Model for Survival Data

**Version** 1.4

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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.

**License** GPL (>= 3)

**Depends** R (>= 3.5.0)

**NeedsCompilation** no

**Repository** CRAN

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YPmodel-package

*The short-term and long-term hazard ratio model for survival data***Description**

This package has four major functions related to the short-term and long-term hazard ratio model (Yang and Prentice, 2005): 1) `YPmodel.estimate` estimates short-term and long-term hazard ratio parameters and their confidence intervals, and the odds function of the control group; 2) `YPmodel.IntervalBands` provides 95% pointwise confidence intervals and 95% and 90% simultaneous confidence bands for the hazard ratio function; 3) `YPmodel.adlgrk` estimates p-value of the adaptive weighted log-rank test, to test for treatment effects with time to event data; 4) `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**

Package: YPmodel  
 Type: Package  
 Version: 1.2  
 Date: 2015-09-20  
 License: GPL (>= 3)

**Author(s)**

Junlong Sun and Song Yang

**References**

1) YANG, S. AND PRENTICE, R. L. (2011). Estimation of the 2-sample hazard ratio function using a semiparametric model. *Biostatistics* 12, 354-368. 2) YANG, S. AND PRENTICE, R. L. (2010). Improved Logrank-Type Tests for Survival Data Using Adaptive Weights. *Biometrics* 66, 30-38. 3) YANG, S. AND PRENTICE, R. L. (2005). Semiparametric analysis of short-term and long-term hazard ratios with two-sample survival data. *Biometrika* 92, 1-17. 4) YANG, S. AND ZHAO, Y. (2012). Checking the Short-Term and Long-Term Hazard Ratio Model for Survival Data. *Scandinavian Journal of Statistics*. 5) GASTROINTESTINAL TUMOR STUDY GROUP (1982). A comparison of combination chemotherapy and combined modality therapy for locally advanced gastric carcinoma. *Cancer*.

**See Also**

[YPmodel](#)

**Examples**

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

---

gastric

*Data from Gastrointestinal Tumor Study Group*

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**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**

```
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  $Z = I(i > n_1)$ ,  $i = 1, \dots, n$  and  $n_1 < n$  is the size of the control group.

**References**

GASTROINTESTINAL TUMOR STUDY GROUP (1982). A comparison of combination chemotherapy and combined modality therapy for locally advanced gastric carcinoma. *Cancer*.

**See Also**

[YPmodel](#)

**Examples**

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

---

YPmodel	<i>A main function of package of model of short-term and long-term hazard ratio for survival data</i>
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## 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 <a href="#">gastric</a> 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 <code>YPmodel.inputData</code> .
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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 <a href="#">Ypmodel.estimate</a> .
IntervalBands	A dataframe of hazard ratios and related confidential intervals and bands, generated by <a href="#">Ypmodel.IntervalBands</a> .
LackFitTest	A dataframe of the two lack-of-fit tests for the semi-parametric model, generated by <a href="#">Ypmodel.lackfittest</a> .
Adlgrk	A dataframe of the two lack-of-fit tests, to test the hypothesis of equal distribution function in the two groups, generated by <a href="#">Ypmodel.adlgrk</a> .

**Author(s)**

Junlong Sun and Song Yang

**References**

1) YANG, S. AND PRENTICE, R. L. (2010). Improved Logrank-Type Tests for Survival Data Using Adaptive Weights. *Biometrics* 66, 30-38. 2) YANG, S. AND PRENTICE, R. L. (2005). Semiparametric analysis of short-term and long-term hazard ratios with two-sample survival data. *Biometrika* 92, 1-17. 3) YANG, S. AND ZHAO, Y. (2012). Checking the Short-Term and Long-Term Hazard Ratio Model for Survival Data. *Scandinavian Journal of Statistics*.

**See Also**

[Ypmodel.estimate](#), [Ypmodel.IntervalBands](#), [Ypmodel.lackfittest](#), [Ypmodel.adlgrk](#)

**Examples**

```
library(Ypmodel)
data(gastric)
result <- Ypmodel(gastric, repNum=100)
summary(result)
plot(result)
```

---

Ypmodel-internal      *Internal functions for Model of short-term and long-term hazard ratio for survival data*

---

**Description**

Internal functions for the Ypmodel package.

**Author(s)**

Junlong Sun and Song Yang

**See Also**

[Ypmodel](#)

---

Ypmodel.adlgrk      *Adaptively weighted logrank test*

---

### Description

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

### Usage

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

### 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 <a href="#">gastric</a> 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 $\hat{R}(t, \hat{\beta})$ , generated by <a href="#">Ypmodel.estimate</a> .
object	A dataframe of the two lack-of-fit tests, to test the hypothesis of equal distribution function in the two groups, generated by <a href="#">Ypmodel.adlgrk</a> .

### 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

YANG, S. AND PRENTICE, R. L. (2010). Improved Logrank-Type Tests for Survival Data Using Adaptive Weights. *Biometrics* 66, 30-38.

### See Also

[Ypmodel](#), [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 ration 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 <a href="#">gastric</a> 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 confidential intervals and $\hat{R}(t, \hat{\beta})$ , generated by <a href="#">YPmodel.estimate</a> .
object	A dataframe of estimation results, including estimation of $\hat{\beta}$ and and its confidential intervals and $\hat{R}(t, \hat{\beta})$ , generated by <a href="#">YPmodel.estimate</a> , equally to x (different symbol for S4 method only).

**Value**

beta	Value of $\hat{\beta}$ .
r	Value of $\hat{R}(t, \hat{\beta})$ .
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**

YANG, S. AND PRENTICE, R. L. (2005). Semiparametric analysis of short-term and long-term hazard ratios with two-sample survival data. *Biometrika* 92, 1-17.

**See Also**

[YPmodel](#)

**Examples**

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

Estimate <- YPmodel.estimate(data=gastric, startPoint=c(0,0), nm=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**

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



```
## S3 method for class 'Ypmodel.IntervalBands'
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 <a href="#">gastric</a> 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 $\hat{R}(t, \hat{\beta})$ , generated by <a href="#">Ypmodel.estimate</a> .
x	A dataframe of hazard ratios and related confidential intervals and bands, generated by <a href="#">Ypmodel.IntervalBands</a> .
object	A dataframe of hazard ratios and related confidential intervals and bands, generated by <a href="#">Ypmodel.IntervalBands</a> , 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.
upp22	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**

YANG, S. AND PRENTICE, R. L. (2011). Estimation of the 2-sample hazard ratio function using a semiparametric model. *Biostatistics* 12, 354-368.

**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.surv'
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 <a href="#">gastric</a> for instance.

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 <a href="#">YPmodel.lackfittest</a> .
object	A dataframe of the two lack-of-fit tests, generated by <a href="#">YPmodel.lackfittest</a> , 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 for Survival Data. Scandinavian Journal of Statistics.

**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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