

# Package ‘MonotoneHazardRatio’

October 22, 2024

**Type** Package

**Title** Nonparametric Estimation and Inference of a Monotone Hazard Ratio Function

**Version** 0.2.0

**Description** Nonparametric estimation and inference of a non-decreasing monotone hazard ratio from a right censored survival dataset. The estimator is based on a generalized Grenander typed estimator, and the inference procedure relies on direct plugin estimation of a first order derivative. More details please refer to the paper “Nonparametric inference under a monotone hazard ratio order” by Y. Wu and T. Westling (2023) <[doi:10.1214/23-EJS2173](https://doi.org/10.1214/23-EJS2173)>.

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**Imports** fdrtool, KernSmooth, survival

**Encoding** UTF-8

**LazyData** true

**Depends** R (>= 2.10)

**Suggests** testthat (>= 3.0.0)

**Config/testthat/edition** 3

**RoxygenNote** 7.3.2

**URL** <https://github.com/Yujian-Wu/MonotoneHazardRatio>

**BugReports** <https://github.com/Yujian-Wu/MonotoneHazardRatio/issues>

**NeedsCompilation** no

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**Repository** CRAN

**Date/Publication** 2024-10-22 13:30:17 UTC

## Contents

chernoff_realizations . . . . .	2
gcm.unique . . . . .	2
monotoneHR . . . . .	3
NA.est . . . . .	4
survData . . . . .	4

<b>Index</b>	<b>5</b>
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chernoff\_realizations *A dataframe containing computed chernoff distribution*

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### Description

A dataframe containing computed chernoff distribution

### Usage

chernoff\_realizations

### Format

A data frame with 201 rows and 3 variables:

**xcoord** domain on which chernoff distribution if computed

**DF** Distribution function of the Chernoff distribution

**density** Density of the Chernoff distribution

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gcm.unique	<i>A function used to remove the repeated numbers for the computation of gcm/lcm.</i>
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### Description

A function used to remove the repeated numbers for the computation of gcm/lcm.

### Usage

gcm.unique(x, y)

### Arguments

x A vector corresponds to the independent variable.

y A vector corresponds to the dependent variable.

### Value

logcm GCM of the curve  $y \sim x$ .

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monotoneHR	<i>Estimate a non-decreasing hazard ratio function, together with a 100(1-<math>\alpha</math>)% confidence interval</i>
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### Description

Estimate a non-decreasing hazard ratio function, together with a 100(1- $\alpha$ )% confidence interval

### Usage

```
monotoneHR(time.grid, S.data, T.data, ci.lvl = 0.05)
```

### Arguments

time.grid	A vector on which the hazard ratio function to be evaluated
S.data	A dataframe containing observed survival time and censoring, it corresponds to the hazard function on the numerator
T.data	A dataframe containing observed survival time and censoring, it corresponds to the hazard function on the demoninator
ci.lvl	A number that specify the confidence level $\alpha$ . Default is 0.05.

### Value

hr The estimated hazard ratio

tau The estimated scaled parameter of the limiting Chernoff distribution

ci.upper and ci.lower are the upper bound and lower bound of the estimated confidence interval

### Examples

```
# load the example data
data(survData)
# load the computed Chernoff distribution
data("chernoff_realizations")
# split the data into two groups S and T, make sure that the column of survival time
# is named as "time", and the column of censoring named as "status" (0 as being censored)
s.data <- survData[survData$group == 'S',]
t.data <- survData[survData$group == 'T',]
# define the evaluation grid on which the hazard ratio function is to be computed
t.grid <- seq(0, 10, 1)
# estimation and inference of the non-decreasing hazard ratio (defined as
#  $\frac{\lambda_S}{\lambda_T}$ , where  $\lambda$  is the hazard function) function
theta <- monotoneHR(t.grid, s.data, t.data)
```

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NA.est	<i>A function used to construct the Nelson-Aalen estimator.</i>
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**Description**

A function used to construct the Nelson-Aalen estimator.

**Usage**

```
NA.est(surv.data)
```

**Arguments**

`surv.data` A dataframe containing right-censored survival time and censor status.

**Value**

`est` The Nelson-Aalen object.

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survData	<i>A right-censored example data</i>
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**Description**

A dataset containing the right-censored survival time and censor status for two groups of objects

**Usage**

```
survData
```

**Format**

A data frame with 1217 rows and 3 variables:

**time** right-censored time

**status** object censored or not, with status=0 implies being censored.

**group** Treatment group of the objects. By default, for a non-decreasing hazard ratio, S is the group on the numerator and T is the group on the denominator.

# Index

## \* datasets

chernoff\_realizations, [2](#)  
survData, [4](#)

chernoff\_realizations, [2](#)

gcm.unique, [2](#)

monotoneHR, [3](#)

NA.est, [4](#)

survData, [4](#)