

Package ‘ccostr’

July 22, 2025

Type Package

Title Estimation of Mean Costs in Censored Data

Version 0.1.0

Description Implementation of estimators for inferring
the mean of censored cost data. Including the estimators
BT from Bang and Tsiatis (2000) <[doi:10.1093/biomet/87.2.329](https://doi.org/10.1093/biomet/87.2.329)> and
ZT from Zhao and Tian (2001) <[doi:10.1111/j.0006-341X.2001.01002.x](https://doi.org/10.1111/j.0006-341X.2001.01002.x)>.

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Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

Suggests rmarkdown, parallel, testthat (>= 2.1.0)

VignetteBuilder knitr

Imports ggplot2, dplyr, tibble, knitr, msm, forcats, rlang,
data.table, survival, Rdpack

Depends R (>= 3.5.0)

RdMacros Rdpack

NeedsCompilation no

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ccmean	<i>Calculates estimates of the mean cost with censored data</i>
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Description

This function calculates the mean cost for right-censored cost data over a period of L time units (days, months, years,...)

Usage

```
ccmean(x, L = max(x$surv), addInterPol = 0)
```

Arguments

x	A dataframe with columns: id, cost, delta and surv. If Cost history is available it can be specified by: start and stop,
L	Limit. Mean cost is calculated up till L, if not specified L = max(surv)
addInterPol	This parameter affects the interpolation of cost between two observed times. Defaults to zero.

Details

The function returns four estimates. The first two are simple and biased downwards, and included for comparison. The estimates are:

- AS: "Available Sample estimator" - The simple sample mean
- CC: "Complete Case estimator" - The mean of fully observed cases
- BT: "Weighted Complete Case estimator" - Bang and Tsiatis's estimator
- ZT: "Weighted Available estimator" - Zhao and Tian's estimator

The function needs the following in a dataframe:

- id: The id separating each individual
- cost: The total cost, or if start and stop provided the specific cost
- start: Start of cost
- stop: End of cost, if one time cost then start = stop
- delta: Event variable, 1 = event, 0 = no event
- surv: Survival

Value

An object of class "ccobject".

References

Bang H, Tsiatis AA (2000). “Estimating medical costs with censored data.” *Biometrika*, **87**(2), 329–343. ISSN 00063444, doi: [10.1093/biomet/87.2.329](https://doi.org/10.1093/biomet/87.2.329).

Zhao H, Tian L (2001). “On Estimating Medical Cost and Incremental Cost-Effectiveness Ratios with Censored Data.” *Biometrics*, **57**(4), 1002–1008. ISSN 0006341X, doi: [10.1111/j.0006-341X.2001.01002.x](https://doi.org/10.1111/j.0006-341X.2001.01002.x).

Examples

```
hcost
ccmean(hcost, L = 1461, addInterPol = 1)
```

hcost

Simulated data from the stata hcost package

Description

Simulated data from the stata hcost package

Usage

```
data(hcost)
```

Format

A data frame with 9882 rows and 7 variables:

id id separating individuals
start start of specified cost
stop end of specified cost
cost cost in given period
trt treatment variable
delta event variable, 0 = censored
surv survival period

Source

[Blog](#)

References

Chen S, Rolfes J, Zhao H (2015). “Estimation of Mean Health Care Costs and Incremental Cost-effectiveness Ratios with Possibly Censored Data.” *The Stata Journal: Promoting communications on statistics and Stata*, **15**(3), 698–711. ISSN 1536-867X, doi: [10.1177/1536867X1501500305](https://doi.org/10.1177/1536867X1501500305), The Stata Journal.

Examples

```
data(hcost)
```

plot.ccobject	<i>Adding to the generic plot function</i>
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Description

Adding to the generic plot function

Usage

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

Arguments

x	The ccobject
...	passthrough

Value

a plot

print.ccobject	<i>Adding to the generic print function</i>
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Description

Adding to the generic print function

Usage

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

Arguments

x	The ccobject
...	passthrough

Value

a plot

simCostData	<i>Simulates censored cost data</i>
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Description

This function can be used to demonstrate the bias and coverage of the estimators in the ccmean function

Usage

```
simCostData(n = 100, dist = "unif", censor = "light",  
            cdist = "exp", L = 10)
```

Arguments

n	Number of individuals to simulate
dist	Survival distribution either "unif" = $\text{unif}(0,10)$ or "exp" = $\text{exp}(1/6)$
censor	Censoring "light" ~ 25% or "heavy" ~ 40%, changes a bit depending on cdist
cdist	Distribution used to censor, "exp" exponential or "unif" uniform
L	Number of years to summarize over

Details

The function simulates survival times from either an uniform distribution or an exponential distribution, and a cost history. There are two options for censoring, heavy (~40 light (~25

Value

Simulation of censored cost

References

Lin DY, Feuer EJ, Etzioni R, Wax Y (1997). "Estimating Medical Costs from Incomplete Follow-Up Data." *Biometrics*, **53**(2), 419. ISSN 0006341X, doi: [10.2307/2533947](https://doi.org/10.2307/2533947).

Examples

```
# The simulated data can be used to show how the estimators perform  
  
simCostData(n = 100, dist = "unif", censor = "light", cdist = "exp", L = 10)
```

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