R documentation

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R topics documented:

`rpsftm-package` *rpsftm: a package to fit Rank Preserving Structural Failure Time Model*

Description

This implements the method of Robins JM, Tsiatis AA. The key function is `rpsftm`, which provides estimates of the causal parameter of interest.

Details

rpfstm: a package to fit Rank Preserving Structural Failure Time Model

References

Robins JM, Tsiatis AA. Correcting for non-compliance in randomized trials using rank preserving structural failure time models. Communications in Statistics–Theory and Methods 1991; 20: 2609–2631

See Also

survdiff

coxph

survreg

EstEqn *Estimating Equations for* rpsftm()

Description

Calculates the Estimating Equation to be solved in RPSFTM models

Usage

```
EstEqn(phi, data, formula, target = 0, test = "survdiff", Recensor,
  Autoswitch, ...)
```

Arguments

phi	the parameter that measures how more rapidly the lifetime is expended under treatment
data	the data set that contains the variables. Must contain columns named: time, censor_time,rx, arm. Optionally a column named: treat_weight
formula	a forumula object of covariates to adjust for: ~strata(A)+B*C
target	the value to subtract off from the z-statistic
test	the survival regression function to calculate the z-statistic: survdiff, coxph, survreg
Recensor	a logical to use recensoring if set to TRUE. Default is TRUE.
Autoswitch	a logical to autodetect cases of no switching. Default is TRUE
...	arguments to supply to the test function.

Value

A scalar value of the estimating equation: the z-statistics from a test minus a target value

Author(s)

Simon Bond

See Also

recensor

`ExtractZ` *Extracting the z-statistic from a survival object*

Description

Generic S3 methods to extract the z-statistic from a set of survival fit objects

Usage

```
ExtractZ(x, ...)

## S3 method for class 'survdiff'
ExtractZ(fit, ...)

## S3 method for class 'coxph'
ExtractZ(fit, arm, ...)

## S3 method for class 'survreg'
ExtractZ(fit, arm, ...)
```

Arguments

`x`	an R object
`...`	extendible arguments to the S3 method
`fit`	a fitted survival object : survdiff, coxph, survreg
`arm`	a character vector giving the name of the covariate representing the treatment arm.

Value

a numeric value, the z statistic for the independence test of the treatment arm

Methods (by class)

- `survdiff`: Method for survdiff
- `coxph`: Method for coxph objects
- `survreg`: Method for survreg objects

Author(s)

Simon Bond

immdef *immdef*

Description

Simulated data to use with the `rpsftm` function.

Usage

```
immdef
```

Format

A data frame with 13 variables and 1000 observations represent a study where participants were randomly assigned to receive treatment immediately or deferred. Participants in the deferred arm could crossover and receive treatment. The primary endpoint was time to disease progression:

id participant ID number

def indicator that the participant was assigned to the Deferred treatment arm

imm indicator that the participant was assigned to the Immediate treatment arm

censyrs a real, or theoretical censoring time, corresponding to the close of study

xo an indicator that crossover occured

xoyrs the time at which crossover happened, or 0 for participants in the Immediate arm

prog an indicator of disease progression (1), or censoring (0)

progyrs time of disease progression or censoring

entry Not sure what this is maybe a baseline Covariate

X_st a constant of value 1. Maybe we should drop this?

X_d equal to prog. Maybe we should drop this?

X_t equal to progyrs. Maybe we shoudl drop this?

X_t0 a constnat value of 0. Maybe we should drop this?

Instr *Special Functions to use in the rpsftm() formula*

Description

A couple of functions that are defined to be used in the formula argument, and identifed as specials in the terms() object

Usage

```
Instr(arm, rx)

ReCen(time, censor_time)
```

Arguments

arm	the randomised treatment arm. a factor with 2 levels, or numeric variable with values 0/1.
rx	the proportion of time on active treatment (arm=1 or the non-reference level of the factor)
time	the observed failure or censoring time
censor_time	the time at which censoring would, or has occurred. This is provided for all observations unlike standard Kaplan-Meier or Cox regression where it is only given for censored observations

Value

matrix with two columns named either time and censor_time, or, arm and rx. These can be used in the formula argument to rpsftm()

Functions

- Instr: Instr function
- ReCen: ReCen function

Author(s)

Simon Bond

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plot.rpsftm *Plot Method*

Description

Function used to plot the KM curves of the treatment-free transformed times

Usage

```
## S3 method for class 'rpsftm'
plot(x)
```

Arguments

x	an object returned from the rpsftm function

Value

a ggplot plot of the fitted KM curves

Author(s)

Simon Bond

print.rpsftm *Print Method*

Description

Function used to print of the underlying test object at the point estimate of a rpsftm object

Usage

```
## S3 method for class 'rpsftm'
print(x)
```

Arguments

x	an object returned from the rpsftm function

Value

a print of the underlying test object at the point estimate

Author(s)

Simon Bond

recensor *Recensoring*

Description

Applies the Recensoring method using a given parameter value and returns a Surv() object

Usage

```
recensor(phi, time, censor_time, rx, arm, Recensor, Autoswitch)
```

Arguments

phi	the parameter that measures how more rapidly the lifetime is expended under treatment
time	the observed failure or censoring time.
censor_time	the theoretical censoring time, either observed or set after time.
rx	the proportion of time spent on treatment
arm	the randomised arm. Either a numerical indicator, with 0 as the placebo, or a factor with the lowest level as placebo.
Recensor	a logical to use recensoring if set to TRUE. Default is TRUE.
Autoswitch	a logical to autodetect cases of no switching. Default is TRUE

Value

A Surv() object with the recensoring applied

Author(s)

Simon Bond

`rpsftm` *Rank Preserving Structural Failure Time Model*

Description

Main Function used for estmating causal parameters under the Rank Preserving Structural Failure Time Model

Usage

```
rpsftm(formula, data, test = survdiff, lowphi = -10, hiphi = 10,
  alpha = 0.05, treat_weight = 1, Recensor = TRUE, Autoswitch = TRUE,
  ...)
```

Arguments

`formula`	a formula with a minimal structure of `ReCen(time, censor_time)~Instr(arm,rx)`. Further terms can be added to the right hand side to adjust for covariates and use strata or cluster arguments.
`data`	an optional data frame that contains variables
`test`	the survival regression function to calculate the z-statistic: survdiff, coxph, survreg
`lowphi`	the lower limit of the range to search for the causal parameter
`hiphi`	the upper limit of the range to search for the causal paramater
`alpha`	the significance level used to calculate confidence intervals
`treat_weight`	an optional parameter that phi is multiplied by on an individual observation level to give differing impact to treatment. The values are transformed by `abs(.)/max(abs(.))` to ensure 1 is the largest weight.
`Recensor`	a logical to use recensoring if set to TRUE. Default is TRUE.
`Autoswitch`	a logical to autodetect cases of no switching. Default is TRUE
`...`	arguments to supply to the test function.

Details

the formula object `ReCen(time, censor_time)~Instr(arm,rx)`, identifies particular meaning to the four sets of arguments. `ReCen()` stands for ReCensoring. `Instr()` stands for Instrument.

- time: the observed failure or censoring time
- censor_time: the time at which censoring would, or has occurred. This is provided for all observations unlike standard Kaplan-Meier or Cox regression where it is only given for censored observations
- arm: the randomised treatment arm. a factor with 2 levels, or numeric variable with values 0/1.
- rx: the proportion of time on active treatment (arm=1 or the non-reference level of the factor)

Further adjustment terms can be added on the right hand side of the formula if desired, included `strata()` or `cluster()` terms.

Value

a rpsftm method object that is a list of the following:

- phi: the estimated parameter
- fit: a survdiff object to produce Kaplan-Meier curves of the estimated counterfactual untreated failure times for each treatment arm
- formula: a formula representing any adjustments, strata or clusters- used for the `update()` function
- regression: the survival regression object at the estimated value of phi
- Sstar: the recensored `Surv()` data using the estimate value of phi to give counterfactual untreated failure times.
- ans: the object returned from `uniroot` used to solve the estimating equation
- CI: a vector of the confidence interval around phi
- call: the R call object

Author(s)

Simon Bond

Examples

```
library(rpsftm)
?immdef
fit <- rpsftm(ReCen(progyrs, censyrs)~Instr(imm,1-xoyrs/progyrs),immdef)
print(fit)
summary(fit)
plot(fit)
```

summary.rpsftm *summary Method*

Description

Function used to summarise the fitted model to an rpsftm object

Usage

```
## S3 method for class 'rpsftm'
summary(x)
```

Arguments

x	an object returned from the `rpsftm()` function

Value

a summary of the fitted regression model

Author(s)

Simon Bond

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