Package ‘simexaft’

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Description Implement of the Simulation-Extrapolation (SIMEX) algorithm for the accelerated failure time (AFT) with covariates subject to measurement error.
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Description

Implementation of Simulation-Extrapolation (SIMEX) algorithm for the accelerated failure time (AFT) model with mismeasured covariates.

Details

Package: simexaft
Type: Package
Version: 1.0.7
Date: 2014-01-19
License: GPL
Imports: mvtnorm, survival
LazyLoad: yes

Author(s)

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References


Description

This dataset is a subset of the Busselton Health study. The Busselton Health study was a repeated cross-sectional survey that was conducted to the community of Busselton in Western Australian.
Usage
data(BHS)

Format
A data frame with 100 observations on the following 18 variables.
PAIR  spouse pair id number
AGE   age at survey
SEX   sex
SBP   systolic blood pressure
DBP   diastolic blood pressure
BMI   body mass index
CHOL  cholesterol level
DIABETES history of diabetes
RXHYPER on blood pressure treatment
CHID history of coronary heart disease
SMOKE smoking status
DRINKING alcohol consumption level
SURVTIME survival time from survey data to date last known alive
DTHCENS censoring indicator
CHDCENS indicator of the death from coronary heart disease
CVDNCENS indicator of the death from cardiovascular disease
SMOKE1 indicator of ex-smoker
SMOKE2 indicator of current smoker

Details
This dataset is a subset of the Busselton Health study. The Busselton Health study was a repeated cross-sectional survey that was conducted to the community of Busselton in Western Australian.

Source


See Also
simexaft
**linear extrapolation**  *Linear Extrapolation Method*

**Description**

Linear extrapolation step of SIMEX algorithm.

**Usage**

`linear extrapolation(A1, A2, A3, lambda)`

**Arguments**

- `A1`: estimates obtained from each level of lambda.
- `A2`: variances estimates obtained from each level of lambda.
- `A3`: scale estimates obtained from each level of lambda.
- `lambda`: vector of lambdas, the grids for the extrapolation step.

**Value**

- `reg1` : extrapolation back to lambda=-1 yield the SIMEX estimates
- `reg2` : extrapolation back to lambda=-1 yield the SIMEX estimates of variances
- `scalereg` : extrapolation back to lambda=-1 yield the SIMEX estimates of scale

**Author(s)**

Juan Xiong, Wenqing He and Grace Y. Yi

**References**


**See Also**

`quadratic extrapolation`
plotsimexaft

Description

A function to give the plot of the extrapolation curve for any covariates of the AFT model.

Usage

plotsimexaft(obj, var, extrapolation=c("linear","quadratic","both"), ylimit)

Arguments

obj       an object returned by the function "simexaft".
var       a character string of any covariate used in the AFT model.
extrapolation a character string giving the type of the extrapolation method, the default is set to be linear extrapolation.
ylimit    the y limits of the plot.

Details

The green points are the average of estimates of B iteration for each lambda.
The linear extrapolation curve is in blue, the corresponding SIMEX estimate is the solid red circle.
The quadratic extrapolation curve is in red, the corresponding SIMEX estimate is the solid blue circle.
The "both" option of the extrapolation method gives both linear and quadratic extrapolation curves.

Author(s)

Juan Xiong, Wenqing He and Grace Y. Yi

See Also

survreg

Examples

library("simexaft")
library("survival")
data("BHS")
dataset <- BHS
dataset$SBP <- log(dataset$SBP-50)

set.seed(120)
formula <- Surv(SURVTIME,DTHCENS)-SBP+CHOL+AGE+BMI+SMOKE1+SMOKE2
ind <- c("SBP", "CHOL")
err.mat <- diag(rep(0.5625, 2))

### fit an AFT model with quadratic extrapolation
out2 <- simexaft(formula = formula, data = dataset, SIMEXvariable = ind,
              repeated = FALSE, repind = list(), err.mat = err.mat, B = 50,
              lambda=seq(0, 2, 0.1), extrapolation="quadratic", dist="weibull")

summary(out2)

plotsimexaft(out2, "SBP", "both", ylim=c(-3,1))
quadraticextrapolation

Quadratic Extrapolation Method

Description

Quadratic extrapolation step of SIMEX algorithm.

Usage

quadraticextrapolation(A1, A2, A3, lambda)

Arguments

A1 estimates obtained from each level of lambda.
A2 variances estimates obtained from each level of lambda.
A3 scale estimates obtained from each level of lambda.
lambda vector of lambdas, the grids for the extrapolation step.

Value

reg1 extrapolation back to lambda=-1 yield the SIMEX estimates
reg2 extrapolation back to lambda=-1 yield the SIMEX estimates of variances
scalereg extrapolation back to lambda=-1 yield the SIMEX estimates of scale

Author(s)

Juan Xiong, Wenqing He and Grace Y. Yi

References

norm: Multivariate Normal and t Distributions. R package version 0.9-9991, URL http://CRAN.
R-project.org/package=mvtnorm.
He, W., Yi, G. Y. and Xiong, J. (2007). Accelerated Failure Time Models with Covariates Subject
to Measurement Error. Statistics in Medicine, 26, 4817-4832.
R package version 2.36-10, URL http://CRAN.R-project.org/package=survival.

See Also

linearextrapolation
**rhDNase Data Set**

**Description**

This is a dataset reported by Fuchs et al. (1994) for a double-blind randomized multicenter clinical trial designed to evaluate the effect of rhDNase, a recombinant deoxyribonuclease I enzyme, versus placebo on the occurrence of respiratory exacerbations among patients with cystic fibrosis. Data on the occurrence and resolution of all exacerbations were recorded for 645 patients in this trial. For more details about the dataset feature, see Cook and Lawless (2007). Here we only include the first record of the patients that have etype=1.

**Usage**

```r
data(rhDNase)
```

**Format**

A data frame with 641 observations on the following 11 variables.

- **id**: patient identifier
- **trt**: the treatment assignment, 1 if patient receive rhDNase and 0 if patient receive placebo
- **fev**: baseline measurement of forced expiratory volume
- **fev2**: baseline measurement of forced expiratory volume
- **time1**: the start of a period indicating when subjects become "at risk" for a transition
- **time2**: if etype=1 then time2 corresponds the onset of an exacerbation (or censoring) and if etype=2 then time2 corresponds to the time of a resolution of an exacerbation (or censoring)
- **status**: status equals 1 if time2 is a transition time and equals 0 if it is a censoring time
- **etype**: the indicator of the nature of the event time recorded in time2
- **enum**: the cumulative number of lines in the data frame for each individual
- **enum1**: the cumulative number of exacerbation-free periods
- **enum2**: a numeric vector

**Source**


**See Also**

`simexaft`
**SIMEX Algorithm for Accelerated Failure Time Model with Covariates Subject to Measurement Error**

**Description**

Implementation of the SIMEX algorithm for Accelerated Failure Time model with covariates subject to measurement error.

**Usage**

```r
simexaft(formula = formula(data), data = parent.frame(), SIMEXvariable, repeated = FALSE, repind = list(), err.mat = err.mat, B = 50, lambda = seq(0, 2, 0.1), extrapolation = "quadratic", dist = "weibull")
```

**Arguments**

- **formula**: specifies the model to be fitted, with the variables coming with data. This argument has the same format as the formula argument in the existing R function "survreg".
- **data**: optional data frame in which to interpret the variables occurring in the formula.
- **SIMEXvariable**: the index of the covariate variables that are subject to measurement error.
- **repeated**: set to TRUE or FALSE to indicate if there are repeated measurements for the mis-measured variables.
- **repind**: the index of the repeated measurement variables for each mis-measured variable. It has an R list form. If repeated = TRUE, repind must be specify.
- **err.mat**: specifies the variables with measurement error. If repeated = FALSE, err.mat must be specify.
- **B**: the number of simulated samples for the simulation step. The default is set to be 50.
- **lambda**: the vector of lambdas, the grids for the extrapolation step.
- **extrapolation**: specifies the function form for the extrapolation step. The options are linear, quadratic and both. The default is set to be quadratic.(first 4 letters are enough)
- **dist**: specifies a parametric distribution that is assumed in AFT model. This argument is the same as the dist option in the existing R function "survreg". These include "weibull", "exponential", "gaussian", "logistic", "lognormal", and "loglogistic".

**Details**

If the SIMEXvariable is repeated measured then you only need to use arguments repeated and repind without mention err.mat. The summary.simex will contain repind.
Value

- **coefficient**: the corrected coefficients of the AFT model
- **se**: the standard deviation of each coefficient
- **pvalue**: the p-value for the hypothesis of that coefficient equal zero
- **scalreg**: the estimate of the scale
- **theta**: the estimates for every B and lambda
- **lambda**: the vector of lambdas for which the simulation step should be done
- **B**: the number of simulated samples for the simulation step.
- **formula**: the model to be fitted in the survreg function
- **err.mat**: the covariance matrix of the variables with measurement error
- **repind**: the list contains the names of the repeat measurement variables
- **extrapolation**: the extrapolation method: linear, quadratic are implemented (first 4 letters are enough)
- **SIMEXvariable**: the vector contains the names of the variables with measurement error

Author(s)

Juan Xiong, Wenqing He and Grace Y. Yi

References


See Also

- `survreg`, `plotsimexaft`

Examples

```r
library("simexaft")
library("survival")
data("BHS")

dataset <- BHS
dataset$SBP <- log(dataset$SBP - 50)

# Naive AFT approach
formula <- Surv(SURVTIME,DTHCENS) ~ SBP + CHOL + AGE + BMI + SMOKE1 + SMOKE2
```
out1 <- survreg(formula = formula, data = dataset, dist = "weibull")

summary(out1)

### fit a AFT model with quadratic extrapolation
set.seed(120)
ind <- c("SBP", "CHOL")
err.mat <- diag(rep(0.5625, 2))
out2 <- simexaft(formula = formula, data = dataset, SIMEXvariable = ind,
                  repeated = FALSE, repind = list(), err.mat = err.mat, B = 50,
                  lambda = seq(0, 2, 0.1), extrapolation = "quadratic", dist = "weibull")

summary(out2)

#########################################################################
# repeated measurements
#########################################################################
data("rhDNase")

### true model
rhDNase$fev.ave <- (rhDNase$fev + rhDNase$fev2)/2
output1 <- survreg(Surv(time2, status) ~ trt + fev.ave, data = rhDNase,
                    dist = "weibull")

summary(output1)

### sensitive analysis
set.seed(120)
fev.error <- rhDNase$fev + rnorm(length(rhDNase$fev), mean = 0,
                                 sd = 0.15 * sd(rhDNase$fev))
fev.error2 <- rhDNase$fev2 + rnorm(length(rhDNase$fev2), mean = 0,
                                   sd = 0.15 * sd(rhDNase$fev2))
dataset2 <- cbind(rhDNase[, c("time2", "status", "trt")], fev.error, fev.error2)
formula <- Surv(time2, status) ~ trt + fev.error
ind <- "fev.error"

### naive model using the average FEV value

# Usage
out1 <- survreg(formula = formula, data = dataset, dist = "weibull")
summary(out1)

### fit a AFT model with quadratic extrapolation
set.seed(120)
ind <- c("SBP", "CHOL")
err.mat <- diag(rep(0.5625, 2))
out2 <- simexaft(formula = formula, data = dataset, SIMEXvariable = ind,
                  repeated = FALSE, repind = list(), err.mat = err.mat, B = 50,
                  lambda = seq(0, 2, 0.1), extrapolation = "quadratic", dist = "weibull")

summary(out2)
fev.error.c <- (fev.error + fev.error2)/2

output2 <- survreg(Surv(time2, status) ~ trt + fev.error.c, data = rhDNase, 
                  dist = "weibull")

summary(output2)

### use simexaft and apply the quadratic extrapolation###

formula <- Surv(time2, status) ~ trt + fev.error

output3 <- simexaft(formula = formula, data = dataset2, SIMEXvariable = ind, 
                     repeated=TRUE, repind=list(c("fev.error", "fev.error2")), err.mat=NULL, 
                     B=50, lambda=seq(0.2, 0.1), extrapolation="quadratic", dist="weibull")

summary(output3)

summary.simexaft

Summarizing Model fits for the AFT model by SIMEX method

Description

Summary method for the class SIMEXAFF.

Usage

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

Arguments

object object of class SIMEXAF

... further arguments.

Value

coefficients a p x 3 matrix with columns for the estimated coefficient its standard error, 
              corresponding(two-sided) p-value
scalereg estimate of the scale
extrapolation the extrapolation method
SIMEXvariable character vector of the SIMEXvariable

Author(s)

Juan Xiong, Wenqing He and Grace Y. Yi
References


See Also

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