Package ‘aftgee’

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Title Accelerated Failure Time Model with Generalized Estimating Equations

Version 1.1.3

Description A collection of methods for both the rank-based estimates and least-square estimates to the Accelerated Failure Time (AFT) model. For rank-based estimation, it provides approaches that include the computationally efficient Gehan’s weight and the general’s weight such as the logrank weight. Details of the rank-based estimation can be found in Chiou et al. (2014) <doi:10.1007/s11222-013-9388-2> and Chiou et al. (2015) <doi:10.1002/sim.6415>. For the least-square estimation, the estimating equation is solved with generalized estimating equations (GEE). Moreover, in multivariate cases, the dependence working correlation structure can be specified in GEE’s setting. Details on the least-squares estimation can be found in Chiou et al. (2014) <doi:10.1007/s10985-014-9292-x>.

Depends R (>= 3.4.0)

License GPL (>= 3)

URL http://github.com/stc04003/aftgee

BugReports http://github.com/stc04003/aftgee/issues

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LazyLoad yes

Suggests copula

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- aftgee-package

Description

A package that uses Generalized Estimating Equations (GEE) to estimate Multivariate Accelerated Failure Time Model (AFT). This package implements recently developed inference procedures for AFT models with both the rank-based approach and the least squares approach. For the rank-based approach, the package allows various weight choices and uses an induced smoothing procedure that leads to much more efficient computation than the linear programming method. With the rank-based estimator as an initial value, the generalized estimating equation approach is used as an extension of the least squares approach to the multivariate case. Additional sampling weights are incorporated to handle missing data needed as in case-cohort studies or general sampling schemes.

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References


See Also

Useful links:

- [http://github.com/stc04003/aftgee](http://github.com/stc04003/aftgee)

aftgee

*Least-Squares Approach for Accelerated Failure Time with Generalized Estimating Equation*

Description

Fits a semiparametric accelerated failure time (AFT) model with least-squares approach. Generalized estimating equation is generalized to multivariate AFT modeling to account for multivariate dependence through working correlation structures to improve efficiency.

Usage

```r
aftgee(formula, data, subset, id = NULL, contrasts = NULL, weights = NULL, margin = NULL, corstr = "independence", binit = "srrgehan", B = 100, control = aftgee.control())
```

Arguments

- `formula` a formula expression, of the form `response ~ predictors`. The response is a `Surv` object object with right censoring. In the case of no censoring, `aftgee` will return an ordinary least estimate when `corstr = "independence"`. See the documentation of `lm`, `coxph` and `formula` for details.
- `data` an optional data.frame in which to interpret the variables occurring in the formula.
- `subset` an optional vector specifying a subset of observations to be used in the fitting process.
- `id` an optional vector used to identify the clusters. If missing, then each individual row of data is presumed to represent a distinct subject. The length of `id` should be the same as the number of observations.
- `contrasts` an optional list.
- `weights` an optional vector of observation weights.
margin

corstr

binit

control

Value

An object of class "aftgee" representing the fit. The aftgee object is a list containing at least the following components:

- **coefficients** a vector of initial value and a vector of point estimates
- **coef.res** a vector of point estimates
- **var.res** estimated covariance matrix
- **coef.init** a vector of initial value
- **var.init.mat** estimated initial covariance matrix
- **binit** a character string specifying the initial estimator.
- **conv** An integer code indicating type of convergence after GEE iteration. 0 indicates successful convergence; 1 indicates that the iteration limit maxit has been reached
- **ini.conv** An integer code indicating type of convergence for initial value. 0 indicates successful convergence; 1 indicates that the iteration limit maxit has been reached
- **conv.step** An integer code indicating the step until convergence

References


Examples

```r
library(survival)
library(copula)
datgen <- function(n = 100, tau = 0.3, cen = 75.4, dim = 2) {
  kt <- iTau(claytonCopula(1), tau)
  copula <- claytonCopula(kt, dim = dim)
  id <- rep(1:n, rep(dim, n))
  x1 <- rbinom(dim * n, 1, 0.5)
  x2 <- rnorm(dim * n)
  ed <- mvdc(copula, rep("weibull", dim), rep(list(list(shape = 1)), dim))
  e <- c(t(rMvdc(n, ed)))
  T <- exp(2 + x1 + x2 + e)
  cstime <- runif(n, 0, cen)
  delta <- (T < cstime) * 1
  Y <- pmin(T, cstime)
  out <- data.frame(T = T, Y = Y, delta = delta, x1 = x1, x2 = x2, id = rep(1:n, each = dim))
  out
}
set.seed(1)
mydata <- datgen(n = 50, dim = 2)
summary(aftgee(Surv(Y, delta) ~ x1 + x2, data = mydata,
               id = id, corstr = "ind", B = 8))
summary(aftgee(Surv(Y, delta) ~ x1 + x2, data = mydata,
               id = id, corstr = "ex", B = 8))
```

aftgee.control

**Auxiliary for Controlling AFTGEE Fitting**

**Description**

Auxiliary function as user interface for `aftgee` and `aftsrr` fitting.

**Usage**

```r
aftgee.control(maxiter = 50, reltol = 0.001, trace = FALSE,
                seIni = FALSE, parallel = FALSE, parCl = parallel::detectCores()/2)
```

**Arguments**

- `maxiter` : max number of iteration.
- `reltol` : relative error tolerance.
- `trace` : a binary variable, determine whether to display output for each iteration.
- `seIni` : a logical value indicating whether a new rank-based initial value is computed for each resampling sample in variance estimation.
- `parallel` : an logical value indicating whether parallel computing is used for resampling and bootstrap.
- `parCl` : an integer value indicating the number of CPU cores used when `parallel = TRUE`. The default value is half the CPU cores on the current host.
Details

When `trace` is TRUE, output for each iteration is printed to the screen.

Value

A list with the arguments as components.

See Also

`aftgee`

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**aftsrr**  
*Accelerated Failure Time with Smooth Rank Regression*

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**Description**

Fits a semiparametric accelerated failure time (AFT) model with rank-based approach. General weights, additional sampling weights and fast sandwich variance estimations are also incorporated. Estimating equations are solved with Barzilar-Borwein spectral method implemented as `BBsolve` in package **BB**.

**Usage**

```r
aftsrr(formula, data, subset, id = NULL, contrasts = NULL, weights = NULL, 
  B = 100, rankWeights = c("gehan", "logrank", "pw", "gp", "userdefined"), 
  eqType = c("is", "ns", "mns", "mis"), se = c("NULL", "bootstrap", "MB", 
  "ZLCF", "ZLMB", "sHCF", "sHMB", "ISCF", "ISMB"), control = list())
```

**Arguments**

- `formula`  
  a formula expression, of the form `response ~ predictors`. The `response` is a `Surv` object with right censoring. See the documentation of `lm`, `coxph` and `formula` for details.

- `data`  
  an optional data frame in which to interpret the variables occurring in the `formula`.

- `subset`  
  an optional vector specifying a subset of observations to be used in the fitting process.

- `id`  
  an optional vector used to identify the clusters. If missing, then each individual row of `data` is presumed to represent a distinct subject. The length of `id` should be the same as the number of observation.

- `contrasts`  
  an optional list.

- `weights`  
  an optional vector of observation weights.

- `B`  
  a numeric value specifies the resampling number. When `B = 0`, only the beta estimate will be displayed.

- `rankWeights`  
  a character string specifying the type of general weights. The following are permitted:
eqType
a character string specifying the type of the estimating equation used to obtain the regression parameters. The following are permitted:

- **nonsm** Regression parameters are estimated by directly solving the nonsmooth estimating equations.
- **sm** Regression parameters are estimated by directly solving the induced-smoothing estimating equations.
- **monosm** Regression parameters are estimated by iterating the monotonic smoothed estimating equations. This is typical when `rankWeights = "PW"` and `rankWeights = "GP"`.

se
a character string specifying the estimating method for the variance-covariance matrix. The following are permitted:

- **bootstrap** nonparametric bootstrap.
- **MB** multiplier resampling.
- **ZLCF** Zeng and Lin’s approach with closed form Si.
- **ZLMB** Zeng and Lin’s approach with empirical Si.
- **SHCF** Huang’s approach with closed form Si.
- **SHMB** Huang’s approach with empirical Si.
- **JS** Johnson and Strawderman’s sandwich variance estimates with closed form Si.
- **JSMB** Johnson and Strawderman’s sandwich variance estimates with empirical Si.
- **JS** Johnson and Strawderman’s iterating approach.

control
controls equation solver, maxiter, tolerance, and resampling variance estimation. The available equation solvers are `BBsolve` and `dfsane` of the `BB` package. Instead of searching for the zero crossing, options including `BBoptim` and `optim` will return solution from maximizing the corresponding objective function.

Value

`aftsrr` returns an object of class "aftsrr" representing the fit. An object of class "aftsrr" is a list containing at least the following components:

- **beta** A vector of beta estimates
- **covmat** A list of covariance estimates
- **convergence** An integer code indicating type of convergence.
  - 0 indicates successful convergence.
  - 1 indicates that the iteration limit `maxit` has been reached.
  - 2 indicates failure due to stagnation.
  - 3 indicates error in function evaluation.
  - 4 is failure due to exceeding 100 step length reductions in line-search.
  - 5 indicates lack of improvement in objective function.
- **bhist** When `variance = "MB"`, `bhist` gives the bootstrap samples.
References


Examples

```r
## kidney data
library(survival)
data(kidney)
foo <- aftsrr(Surv(time, status) ~ age + sex, id = id, 
              data = kidney, se = c("ISMB", "ZLMB"), B = 10)
foo

## nwtco data
library(survival)
data(nwtco)
subinx <- sample(1:nrow(nwtco), 668, replace = FALSE)
nwtco$subcohort <- 0
nwtco$subcohort[subinx] <- 1
pn <- table(nwtco$subcohort)[[2]] / sum(table(nwtco$subcohort))
nwtco$hi <- nwtco$rel + (1 - nwtco$rel) * nwtco$subcohort / pn
nwtco$age1R <- nwtco$age / 12
nwtco$study <- nwtco$study - 3
nwtco$histol = nwtco$histol - 1
sub <- nwtco[subinx,]
fit <- aftsrr(Surv(edrel, rel) ~ histol + age12 + study, id = seqno, 
              weights = hi, data = sub, B = 10, se = c("ISMB", "ZLMB"), 
              subset = stage == 4)
summary(fit)
```
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