Package 'Rwtdttt'

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Type Package

Title Parametric Waiting Time Distribution estimation

Version 0.1.0

Author Sabrina Giometto, Malcolm Gillies, Henrik Støvring

Maintainer Henrik Støvring <hstov@health.sdu.dk>

Description Estimation of prescription durations and treatment
probability based on the parametric Waiting Time Distribution.
Pharmacoepidemiologic databases contains information on medication
dispensings at pharmacies. Studies using such data typically require
some estimate of duration of treatment after a dispensing (known as
the prescription duration), which can be estimated using the
parametric Waiting Time Distribution.

License GPL (>= 3)

Roxygen list(markdown = TRUE)

Imports bbmle,
class,
data.table,
dplyr,
haven,
methods,
graphics,
stats,
numDeriv

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

Encoding UTF-8

LazyData true

RoxygenNote 7.2.3

Collate 'Rwtdttt-package.R'
'dfunctions.R'
'wtd-class.R'
'plot.R'
'pred_dur_prob.R'
'wtdttt.R'
'ranwtdttt.R'
'sandwich.R'

R topics documented:

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dexp *The Exponential distribution*

Description

The Exponential distribution

Usage

```
dexp(x, logitp, lnbeta, delta = 1, log = FALSE)
```

Arguments

x	vector of prescription redemption times
logitp	log-odds of being a prevalent user
lnbeta	log of beta (scale)
delta	XXXX
log	logical; if TRUE, probabilities p are given as log(p)

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dlnorm *The Lognormal distribution*

Description

The Lognormal distribution

Usage

```
dlnorm(x, logitp, mu, lnsigma, delta = 1, log = FALSE)
```

Arguments

x	vector of prescription redemption times
logitp	log-odds of being a prevalent user
mu	mean on log-scale
lnsigma	log of standard deviation on log-scale
delta	XXXX
log	logical; if TRUE, probabilities p are given as log(p).

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dweib *The Weibull distribution*

Description

The Weibull distribution

Usage

```
dweib(x, logitp, lnalpha, lnbeta, delta = 1, log = FALSE)
```

Arguments

x   vector of prescription redemption times

logitp   log-odds of being a prevalent user

lnalpha   log of alpha (shape)

lnbeta   log of beta (scale)

delta   XXXX

log   logical; if TRUE, probabilities p are given as log(p)

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plot,wtd,ANY-method *Make WTD diagnostic plots*

Description

Make diagnostic plots showing the fit of an estimated parametric Waiting Time Distribution (WTD) with respect to the observed histogram of prescription redemptions. HS 240108: I think this needs to incorporate information on time period of observations (start and end specified in call to wtdttt)

Usage

```
## S4 method for signature 'wtd,ANY'
plot(object, x, y, ...)
```

Arguments

wtd   wtd object, typically result of wtdttt

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predict,wtd-method   *Make WTD predictions*

Description

Make predictions based on an estimated parametric Waiting Time Distribution (WTD) model, either the probability of a person still being in treatment or the duration of observed prescription redemptions.

Usage

```
## S4 method for signature 'wtd'
predict(
  object,
  newdata = NULL,
  type = "dur",
  distrx = NULL,
  quantile = 0.8,
  se.fit = FALSE,
  na.action = na.pass,
  ...
)
```

Arguments

wtd   a fitted object of class inheriting from "wtd"

Value

A vector of predictions

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ranwtdttt   *Fit Waiting Time Distribution with random index times*

Description

ranwtdttt() estimates maximum likelihood estimates for parametric Waiting Time Distribution (WTD) based on observed prescription redemptions with adjustment for covariates using one or more random index times for each individual. Reports estimates of prevalence fraction and specified percentile of inter-arrival density together with regression coefficients.

Usage

```
ranwtdttt(
  form,
  parameters = NULL,
  data,
  id,
  start,
  end,
```

```
    reverse = F,
    nsamp = 4,
    subset,
    na.action = na.pass,
    init,
    control = NULL,
    ...
)
```

Arguments

form	an object of class "formula" (or one that can be coered to that class): a symbolic description of the model to be fitted. The details of the model specification are given under 'Details'
parameters	model formulae for distribution parameters
data	an optional data frame, list or environment (or object coercible by as.data.frame to a data frame) containing the variables in the model. If not found in data, the variables are taken from environment(formula), typically the environment from which wtdttt is called.
id	the name of the variable that identifies distinct individuals
start	start of observation window
end	end of observation window
reverse	logical; Fit the reverse waiting time distribution.
nsamp	number of samples to take.
subset	an optional vector specifying a subset of observations to be used in the fitting process.
na.action	a function which indicates what should happen when the data contain NAs. The default is set by the na.action setting of options, and is na.fail if that is unset. The 'factory-fresh' default is na.omit. Another possible value is NULL, no action. Value na.exclude can be useful.
init	starting values for the parameters.
control	a list of parameters for controlling the fitting process.
...	further arguments passed to other methods.

Value

wtdttt returns an object of class "wtd" inheriting from "mle".

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sand_vcov	*Calculate a robust variance-covariance matrix using the sandwich estimator*

Description

Calculate a robust variance-covariance matrix using the sandwich estimator

Usage

```
sand_vcov(fit)
```

Arguments

fit   an object of class "wtd" returned by ranwtdttt()

Value

sand_vcov returns a matrix

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wtdttt   *Fit Waiting Time Distribution*

Description

Estimates the maximum likelihood estimate for a parametric Waiting Time Distribution (WTD) based on observed prescription redemptions with adjustment for covariates. Reports estimates of prevalence fraction and specified percentile of inter-arrival density together with regression coefficients.

Usage

```
wtdttt(
  data,
  form,
  parameters = NULL,
  start = NA,
  end = NA,
  reverse = F,
  id = NA,
  subset = NA,
  na.action = na.pass,
  init = NULL,
  control = NULL,
  ...
)
```

Arguments

data   an optional data frame, list or environment (or object coercible by as.data.frame to a data frame) containing the variables in the model. If not found in data, the variables are taken from environment(formula), typically the environment from which wtdttt is called.

form   an object of class "formula" (or one that can be coered to that class): a symbolic description of the model to be fitted. The details of the model specification are given under 'Details'

parameters   optional model formulae for distribution parameters

start   start of observation window (date or real number)

end   end of observation window (date or real number)

reverse   logical; Fit the reverse waiting time distribution (default F).

id   name of the id variable (optional)

subset	an optional vector specifying a subset of observations to be used in the fitting process.
na.action	a function which indicates what should happen when the data contain NAs. The default is set by the na.action setting of options, and is na.fail if that is unset. The 'factory-fresh' default is na.omit. Another possible value is NULL, no action. Value na.exclude can be useful.
init	starting values for the parameters.
control	a list of parameters for controlling the fitting process.
...	further arguments passed to other methods.

Value

wtdttt returns an object of class "wtd" inheriting from "mle".

Model formula

The model formula `form` follows the pattern `obstime ~ dist(alpha, beta, gamma)` with

- `obstime`: the redemption time variable (date or real number)
- `dist`: the parametric distribution for the forward or backward recurrence density (FRD/BRD), which must be `dexp()`, `dweib()` or `dlnorm()` i.e named after their corresponding interarrival density (IAD).

Data format

The WTD is fit to the first prescription redemption of each individual within an observation window (ordinary WTD), or the last (reverse WTD), respectively.

You may prepare the data to this format, or optionally specify the name of an `id` variable to select the first or last redemption automatically.

If the redemption time data are of type date, a continuity correction will be applied automatically.

Index