Package 'peppm'

October 14, 2022

Type Package

Title Piecewise Exponential Distribution with Random Time Grids

Version 0.0.1

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Description Fits the Piecewise Exponential distribution with random time grids using the clustering structure of the Product Partition Models. Details of the implemented model can be found in Demarqui et al. (2008) <doi:10.1007/s10985-008-9086-0>.

License GPL (>= 2)

URL https://github.com/fndemarqui/peppm

BugReports https://github.com/fndemarqui/peppm/issues

Depends R (>= 3.2.0)

Imports Rcpp (>= 1.0.1)

LinkingTo Rcpp

RoxygenNote 7.1.0

Suggests testthat

NeedsCompilation yes

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Repository CRAN

Date/Publication 2020-06-25 08:50:02 UTC

R topics documented:

findInt *Function to identify the times' intervals*

Description

Function to identify the times' intervals

Usage

```
findInt(time, tgrid)
```

Arguments

time	vector of times.
tgrid	time grid of the PE distribution.

Value

indicator of times's intervals

Examples

```
data(telecom)
tgrid <- with(telecom, timeGrid(time, status))
tgrid
findInt(telecom$time, tgrid)
```

getGrid *Computes the time grid from the auxiliary vector U.*

Description

Computes the time grid from the auxiliary vector U.

Usage

```
getGrid(U, ftgrid)
```

Arguments

U	vector of change point indicators
ftgrid	vector with the finest time grid (distinct observed failure times)

Value

the time grid associated with the auxiliary vector U.

gibbs *Runs the Gibbs sampler*

Description

Runs the Gibbs sampler

Usage

```
gibbs(
  U0,
  ftgrid,
  time,
  status,
  a_rates,
  b_rates,
  cohesion,
  a_beta,
  b_beta,
  npost,
  nburnin,
  nlag
)
```

Arguments

U0	vector of change point indicators
ftgrid	vector of indexes of distinct failure times
time	vector of observed failure times.
status	vector of failure indicators
a_rates	shape parameter of the gamma distribution (prior for failure rates).
b_rates	scale parameter of the gamma distribution (prior for failure rates).
cohesion	type of prior cohesion (1 to 4).
a_beta	shape1 parameter of the beta distribution (prior for p - cohesion 4).
b_beta	shape2 parameter of the beta distribution (prior for p - cohesion 4).
npost	desired posterior sample size
nburnin	number of iterations to be discarded.
nlag	number of jumps to eliminate autocorrelation of the chain.

Value

posterior sample

pehaz *Hazard and cumulative hazard functions of the PE distribution*

Description

Hazard and cumulative hazard functions of the PE distribution

Usage

```
hpexp(x, tgrid, rates)

Hpexp(x, tgrid, rates)
```

Arguments

x	vector of time points.
tgrid	vector of time grid knots.
rates	vector of failure rates.

Value

hpexp gives the hazard function and Hpexp gives the cumulative hazard function of the PE distribution.

peppm *Piecewise Exponential Product Partition Model*

Description

Piecewise Exponential Product Partition Model

Usage

```
peppm(
  time,
  status,
  a_rates = 1,
  b_rates = 1,
  cohesion = 1,
  a_beta = 1,
  b_beta = 1,
  nburnin = 10000,
  npost = 20000,
  nlag = 10
)
```

Arguments

time	vector of observed failure times.
status	vector of failure indicators
a_rates	shape parameter of the gamma distribution (prior for failure rates).
b_rates	scale parameter of the gamma distribution (prior for failure rates).
cohesion	type of prior cohesion (1 to 4).
a_beta	shape1 parameter of the beta distribution (prior for p - cohesion 4).
b_beta	shape2 parameter of the beta distribution (prior for p - cohesion 4).
nburnin	number of iterations to be discarded.
npost	desired posterior sample size
nlag	number of jumps to eliminate autocorrelation of the chain.

Value

Posterior sample of the number of intervals, failure rates, the auxiliary vector U, and the logarithm of the prior predictive distribution (log data factor).

Examples

```
# Small chain used here due to time constraints.
data(telecom)

# Prior cohesion 1:
fit1 <- with(telecom, peppm(time, status, cohesion=1, nburnin = 0, nlag = 1, npost = 100))
# Prior cohesion 2:
fit2 <- with(telecom, peppm(time, status, cohesion=2, nburnin = 0, nlag = 1, npost = 100))
# Prior cohesion 3:
fit3 <- with(telecom, peppm(time, status, cohesion=3, nburnin = 0, nlag = 1, npost = 100))
# Prior cohesion 4:
fit4 <- with(telecom, peppm(time, status, cohesion=4, nburnin = 0, nlag = 1, npost = 100))
```

PExp *Probability function, distribution function, quantile function and random generation for the Piecewise Exponential (PE) distribution.*

Description

Probability function, distribution function, quantile function and random generation for the Piecewise Exponential (PE) distribution.

Usage

```
dpexp(x, tgrid, rates, log = FALSE)

ppexp(q, tgrid, rates, lower.tail = TRUE, log.p = FALSE)

qpexp(p, tgrid, rates, lower.tail = TRUE, log.p = FALSE)

rpexp(n, tgrid, rates)
```

Arguments

x	vector of time points.
tgrid	vector of time grid knots.
rates	vector of failure rates.
log, log.p	logical; if TRUE, probabilities p are given as log(p).
q	vector of quantiles.
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$; otherwise, $P[X > x]$.
p	vector of probabilities.
n	number of random values to return.

Value

dpexp gives the (log) probability function, ppexp gives the (log) distribution function, qpexp gives the quantile function, and rpexp generates random deviates.

Examples

```
n <- 10
tgrid <- c(0, 1, 3, 7, Inf)
rates <- c(0.5, 4, 0.8, 0.1)
x <- sort(rpexp(n, tgrid=tgrid, rates=rates))
Fx <- ppexp(x, tgrid, rates)
y <- qpexp(Fx, tgrid, rates)
# checking:
x==y
```

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telecom *GTE Corporation telecommunication systems*

Description

Failure times (in days) of 125 installed telecommunication systems installed by GTE Corporation.

Format

A data frame with 125 rows and 2 variables:

- time: vector of failure times (in days)
- status: vector of failure indicator

Author(s)

Fabio N. Demarqui <fndemarqui@est.ufmg.br>

References

Piecewise Exponential Estimator for the Survival Function. J. S. Kim and F. Proschan. IEEE TRANSACTIONS ON RELIABILITY, VOL. 40, NO. 2, 1991.

Examples

```
library(peppm)
data(telecom)
fit1 <- with(telecom, peppm(time, status, cohesion=1, nburnin=0, nlag=1, npost=100))
fit2 <- with(telecom, peppm(time, status, cohesion=2, nburnin=0, nlag=1, npost=100))
fit3 <- with(telecom, peppm(time, status, cohesion=3, nburnin=0, nlag=1, npost=100))
fit4 <- with(telecom, peppm(time, status, cohesion=4, nburnin=0, nlag=1, npost=100))
# time grid associated with the first line of the matrix U:
```

---

timeGrid *Time grid for the PE distribution*

Description

This function make use of the observed times and failure indicators to create a time grid for the PE distribution.

Usage

```
timeGrid(time, status, n.int = NULL)
```

Arguments

time	Vector of failure times
status	Vector of failure indicators
n.int	Optional. Number of intervals. If NULL, the number of intervals is set to be equal to the number of distinct observed failure times.

Value

the time grid needed to specify the PE distribution.

Examples

```
data(telecom)
tgrid1 <- with(telecom, timeGrid(time, status))
tgrid1
tgrid2 <- with(telecom, timeGrid(time, status, n.int = 4))
tgrid2
```

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