

Package ‘BayesReversePLLH’

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Type Package

Title Fits the Bayesian Piecewise Linear Log-Hazard Model

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Description Contains posterior samplers for the Bayesian piecewise linear log-hazard and piecewise exponential hazard models, including Cox models. Posterior mean restricted survival times are also computed for non-Cox and Cox models with only treatment indicators. The `ApproxMean()` function can be used to estimate restricted posterior mean survival times given a vector of patient covariates in the Cox model. Functions included to return the posterior mean hazard and survival functions for the piecewise exponential and piecewise linear log-hazard models. Chapple, AG, Peak, T, Hemal, A (2020). Under Revision.

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R topics documented:

<code>ApproxMean</code>	2
<code>BayesPiecewiseHazard</code>	3
<code>BayesPiecewiseHazardCOV</code>	3
<code>BayesPiecewiseHazardTrt</code>	4
<code>BayesPiecewiseLinearLogHazard</code>	5
<code>BayesPiecewiseLinearLogHazardCOV</code>	6
<code>BayesPiecewiseLinearLogHazardTrt</code>	7

GetALLHazLogSlope	8
GetALLHazPiece	8
GetALLSurvPEH	9
GetALLSurvPLLH	9
PostMeanHazLogSlope	10
PostMeanHazPiece	10
PostMeanSurvPEH	11
PostMeanSurvPLLH	11

Index 12

ApproxMean	<i>Returns the approximate restricted posterior mean survival for the PLLH model.</i>
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Description

Uses a grid and parameter values to approximate the restricted posterior mean survival for the PLLH model using the integral of the survival function.

Usage

```
ApproxMean(Y, s, lam, J)
```

Arguments

Y	Sequence from 0.01 to the maximum observed event time used to compute the approximate restricted mean survival time. Smaller spaced sequences results in better approximation but longer computation time.
s	Vector of split points. The first and last entries must be 0 and max(Y).
lam	Vector of log-hazard values at each split point location. Must be same length as s.
J	Number of split points.

Value

Returns the approximate restricted posterior mean survival time for the PLLH model.

Examples

```
##Generate Data
Y1=rweibull(100,4,1)
##Create sequence from (0,max(Y1)) for approximation
Y=seq(.01,max(Y1),.01)
##Parameters used to approximate the mean
s=c(0,1,max(Y1))
lam=c(-2,0,-2)
J=1
ApproxMean( Y, s, lam, J)
```

BayesPiecewiseHazard *Samples from the PEH model without covariates.*

Description

Samples from the Piecewise Exponential Hazard (PEH) model and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseHazard(Y, I1, Poi, B)
```

Arguments

Y	Vector of event or censoring times.
I1	Vector of event indicators.
Poi	Prior mean number of split points.
B	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the posterior mean restricted survival time.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
##Hyperparameter for number of split points
Poi=5
##Number of iterations for MCMC
B=200
BayesPiecewiseHazard( Y, I, Poi, B)
```

BayesPiecewiseHazardCOV

Samples from the PEH Cox model with a patient covariate vector.

Description

Samples from the Piecewise Exponential Hazard (PEH) Cox model with a patient covariate vector and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseHazardCOV(Y, I1, COV, Poi, B)
```

Arguments

Y	Vector of event or censoring times.
I1	Vector of event indicators.
COV	Matrix of size nxp containing p patient covariates.
Poi	Prior mean number of split points.
B	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the coefficients in the Cox model.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
COV = matrix(rnorm(40,0,1),ncol=2)
##Hyperparameter for number of split points
Poi=5
##Number of iterations for MCMC
B=200
BayesPiecewiseHazardCOV( Y, I,COV, Poi, B)
```

```
BayesPiecewiseHazardTrt
```

Samples from the PEH Cox model with a patient covariate vector.

Description

Samples from the Piecewise Linear Log-Hazard (PLLH) Cox model and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseHazardTrt(Y, I1, Trt, Poi, B)
```

Arguments

Y	Vector of event or censoring times.
I1	Vector of event indicators.
Trt	Vector containing patient treatment/control assignment.
Poi	Prior mean number of split points.
B	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the treatment coefficient, (6) the mean restricted survival time of the control therapy, (7) the mean restricted survival time of the treatment therapy.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
Trt=rbinom(20,1,.5)
##Hyperparameter for number of split points
Poi=5
##Number of iterations for MCMC
B=200
BayesPiecewiseHazardTrt( Y, I,Trt, Poi, B)
```

BayesPiecewiseLinearLogHazard

Samples from the PLLH model without covariates.

Description

Samples from the Piecewise Linear Log-Hazard (PLLH) model and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseLinearLogHazard(Y, I1, Poi, B)
```

Arguments

Y	Vector of event or censoring times.
I1	Vector of event indicators.
Poi	Prior mean number of split points.
B	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the posterior mean restricted survival time.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
##Hyperparameter for number of split points
Poi=5
##Number of iterations for MCMC
B=200
BayesPiecewiseLinearLogHazard( Y, I, Poi, B)
```

BayesPiecewiseLinearLogHazardCOV

Samples from the PLLH Cox model with a patient covariate vector.

Description

Samples from the Piecewise Linear Log-Hazard (PLLH) Cox model with a patient covariate vector and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseLinearLogHazardCOV(Y, I1, COV, Poi, B)
```

Arguments

Y	Vector of event or censoring times.
I1	Vector of event indicators.
COV	Matrix of size nxp containing p patient covariates.
Poi	Prior mean number of split points.
B	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the coefficients in the Cox model.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
COV = matrix(rnorm(40,0,1),ncol=2)
##Hyperparameter for number of split points
Poi=5
##Number of iterations for MCMC
B=200
BayesPiecewiseLinearLogHazardCOV( Y, I,COV, Poi, B)
```

```
BayesPiecewiseLinearLogHazardTrt
```

Samples from the PEH Cox model with a treatment indicator.

Description

Samples from the Piecewise Exponential Hazard (PEH) Cox model with a treatment indicator and returns a list containing posterior parameters and posterior restricted mean survival.

Usage

```
BayesPiecewiseLinearLogHazardTrt(Y, I1, Trt, Poi, B)
```

Arguments

Y	Vector of event or censoring times.
I1	Vector of event indicators.
Trt	Vector containing patient treatment/control assignment.
Poi	Prior mean number of split points.
B	Number of iterations for MCMC.

Value

Returns a list containing posterior samples of (1) the split point locations, (2) the log-hazards at each split point, (3) the number of split points, (4) the variance parameter for the log-hazard values, (5) the treatment coefficient, (6) the mean restricted survival time of the control therapy, (7) the mean restricted survival time of the treatment therapy.

Examples

```
##Generate Data
Y=rweibull(20,4,1)
I=rbinom(20,1,.5)
Trt=rbinom(20,1,.5)
##Hyperparameter for number of split points
Poi=5
```

```
##Number of iterations for MCMC
B=200
BayesPiecewiseLinearLogHazardTrt( Y, I,Trt, Poi, B)
```

GetALLHazLogSlope *Computes the posterior distribution of hazard value for a vector x for the Piecewise Linear Log Hazard model (PLLH)*

Description

Computes the posterior distribution of hazard value for a vector x for the Piecewise Linear Log Hazard model (PLLH)

Usage

```
GetALLHazLogSlope(x, G1)
```

Arguments

x Vector of times to compute the posterior mean hazard function
G1 List of posterior samples from the BayesPiecewiseLinearLogHazard function.

Value

Matrix containing the posterior distribution of hazard values h(x)

GetALLHazPiece *Computes the posterior hazard values for a vector x for the Piecewise Exponential Hazard model (PEH)*

Description

Computes the posterior hazard values for a vector x for the Piecewise Exponential Hazard model (PEH)

Usage

```
GetALLHazPiece(x, G1)
```

Arguments

x Vector of times to compute the hazard.
G1 List of posterior samples from the BayesPiecewiseHazard function.

Value

Matrix containing the posterior distribution of hazard values h(x)

GetALLSurvPEH	<i>Computes the posterior distribution of survival probabilities for a vector x for the Piecewise Exponential Hazard model (PEH)</i>
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Description

Computes the posterior distribution of survival probabilities for a vector x for the Piecewise Exponential Hazard model (PEH)

Usage

GetALLSurvPEH(x , G1)

Arguments

x	Vector of times to compute the posterior mean survival probability.
G1	List of posterior samples from the BayesPiecewiseLinearHazard function.

Value

Matrix containing the posterior distribution of survival probabilities $S(x)$

GetALLSurvPLLH	<i>Computes posterior distribution of survival probabilities for a vector x for the Piecewise Linear Log Hazard model (PLLH)</i>
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Description

Computes posterior distribution of survival probabilities for a vector x for the Piecewise Linear Log Hazard model (PLLH)

Usage

GetALLSurvPLLH(x , G1)

Arguments

x	Vector of times to compute the posterior mean survival probability.
G1	List of posterior samples from the BayesPiecewiseLinearLogHazard function.

Value

Matrix containing the posterior distribution survival probabilities $S(x)$

PostMeanHazLogSlope	<i>Computes the posterior mean hazard value for a vector x for the Piecewise Linear Log Hazard model (PLLH)</i>
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Description

Computes the posterior mean hazard value for a vector x for the Piecewise Linear Log Hazard model (PLLH)

Usage

PostMeanHazLogSlope(x , $G1$)

Arguments

x	Vector of times to compute the posterior mean hazard function
$G1$	List of posterior samples from the BayesPiecewiseLinearLogHazard function.

Value

Vector containing the posterior mean hazard values $h(x)$

PostMeanHazPiece	<i>Computes the posterior mean hazard values for a vector x for the Piecewise Exponential Hazard model (PEH)</i>
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Description

Computes the posterior mean hazard values for a vector x for the Piecewise Exponential Hazard model (PEH)

Usage

PostMeanHazPiece(x , $G1$)

Arguments

x	Vector of times to compute the posterior mean hazard.
$G1$	List of posterior samples from the BayesPiecewiseHazard function.

Value

Vector containing the posterior mean hazard values $h(x)$

PostMeanSurvPEH	<i>Computes the posterior mean survival probabilities for a vector x for the Piecewise Exponential Hazard model (PEH)</i>
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Description

Computes the posterior mean survival probabilities for a vector x for the Piecewise Exponential Hazard model (PEH)

Usage

PostMeanSurvPEH(x, G1)

Arguments

x	Vector of times to compute the posterior mean survival probability.
G1	List of posterior samples from the BayesPiecewiseLinearHazard function.

Value

Vector containing the posterior mean survival probabilities S(x)

PostMeanSurvPLLH	<i>Computes the posterior mean survival probabilities for a vector x for the Piecewise Linear Log Hazard model (PLLH)</i>
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Description

Computes the posterior mean survival probabilities for a vector x for the Piecewise Linear Log Hazard model (PLLH)

Usage

PostMeanSurvPLLH(x, G1)

Arguments

x	Vector of times to compute the posterior mean survival probability.
G1	List of posterior samples from the BayesPiecewiseLinearLogHazard function.

Value

Vector containing the posterior mean survival probabilities S(x)

Index

ApproxMean, [2](#)

BayesPiecewiseHazard, [3](#)

BayesPiecewiseHazardCOV, [3](#)

BayesPiecewiseHazardTrt, [4](#)

BayesPiecewiseLinearLogHazard, [5](#)

BayesPiecewiseLinearLogHazardCOV, [6](#)

BayesPiecewiseLinearLogHazardTrt, [7](#)

GetALLHazLogSlope, [8](#)

GetALLHazPiece, [8](#)

GetALLSurvPEH, [9](#)

GetALLSurvPLLH, [9](#)

PostMeanHazLogSlope, [10](#)

PostMeanHazPiece, [10](#)

PostMeanSurvPEH, [11](#)

PostMeanSurvPLLH, [11](#)