# Package 'BGPhazard'

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**Type** Package

**Version** 1.1

**Date** 2014-09-08

**Title** Markov beta and gamma processes for modeling hazard rates

**Author** Garcia-Bueno, J. A. & Nieto-Barajas, L. E.

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**Description** Computes the hazard rate estimate as described by Nieto-Barajas and Walker (2002) and Nieto-Barajas (2003)

**Depends** R(>= 3.1.1), survival

**Suggests** MASS, KMsurv

**License** GPL (>= 2)

**NeedsCompilation** no

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## R topics documented:

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`BGPhazard-package` *Markov Beta and Gamma Processes for Modeling Hazard Rates*

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## Description

Computes the hazard rate estimate as described by Nieto-Barajas & Walker (2002) and Nieto-Barajas (2003).

## Details

| | |
|---|---|
| Package: | BGPhazard |
| Type: | Package |
| Version: | 1.1 |
| Date: | 2014-09-08 |
| License: | GPL version 2 or later |

## Author(s)

Garcia-Bueno, J. A. & Nieto-Barajas, L. E.

Maintainer: Jose Antonio Garcia Bueno <joseagbueno@gmail.com>

## References

1. Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

2. Nieto-Barajas, L. E. (2003). Discrete time Markov gamma processes and time dependent covariates in survival analysis. Bulletin of the International Statistical Institute 54th Session. Berlin. (CD-ROM)

## Examples

```
## Simulations may be time intensive. Be patient.
## require(MASS)
## data1 <- gehan[gehan[, 4] == "6-MP", 2:3]
## times <- data1[, 1]
## delta <- data1[, 2]
## GEX1 <- GaMRes(times, delta, K = 8, iterations = 3000)
## GaPloth(GEX1, fun = "both", confint = TRUE)
```

BeMRes *Markov Beta Model Summary*

## Description

Summary of the full Bayesian non-parametric Markov beta survival analysis.

## Usage

```
BeMRes(times, delta = rep(1, length(times)), alpha = rep(1e-04, K),
beta = rep(1e-04, K), c.r = rep(0, K), type.c = 4, epsilon = 1,
iterations = 1000, burn.in = floor(iterations * 0.2), thinning = TRUE,
thpar = 5, printtime = TRUE)
```

## Arguments

| | |
|---|---|
| `times` | Numeric positive vector. Failure times. |
| `delta` | Logical vector. Status indicator. `TRUE` (1) indicates exact lifetime is known, `FALSE` (0) indicates that the corresponding failure time is right censored. |
| `alpha` | Nonnegative vector. Small entries are recommended in order to specify a non-informative prior distribution. |
| `beta` | Nonnegative vector. Small entries are recommended in order to specify a non-informative prior distribution. |
| `c.r` | Nonnegative vector. The higher the entries, the higher the correlation of two consecutive intervals. |
| `type.c` | Integer. 1=defines `c.r` as a zero-entry vector; 2=lets the user define `c.r` feeely; 3=defines `c.r` by computing an exponential distribution with mean 1; 4=defines `c.r` by computing an exponential distribution with mean `epsilon`. |
| `epsilon` | Double. Mean of the exponential distribution assigned to `c.r` when `type.c`=4. |
| `iterations` | Integer. Number of iterations including the `burn.in` to be computed by the model. |
| `burn.in` | Integer. Length of the burn-in period for the Markov chain. |
| `thinning` | Logical. `TRUE` thins the Markov chain to reduce autocorrelation. |
| `thpar` | Integer. Factor by which the chain will be thinned if `thinning=TRUE`. |
| `printtime` | Logical. If `TRUE`, prints out the execution time. |

## Details

Computes the Gibbs sampler given by the full conditional distributions of u and Pi (Nieto-Barajas & Walker, 2002) and arranges the resulting Markov chain into a matrix which can be used to obtain posterior summaries.

## Value

| | |
|---|---|
| `times` | Numeric vector. Failure times. |
| `delta` | Numeric vector. Status indicator. |
| `tao` | Numeric vector. Partition for hazard function's support. |
| `K` | Integer. Partition length. |
| `t.unc` | Numeric vector. Uncensored failure times sorted ascendingly. |
| `iterations` | Integer. |
| `summary` | Numeric matrix. Contains the resulting Markov chain for Pi, u, c.r and epsilon (if applicable). |
| `S` | Numeric matrix. Survival estimates for each state of the chain. |

## Note

It is recommended to verify chain's stationarity. This can be done by checking each partition element individually. See `BePlotDiag`.

## References

Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

## See Also

BePlotDiag, BePloth

## Examples

```
## Simulations may be time intensive. Be patient.
## require(KMsurv)
## data(psych)
## times <- psych[, 3]
## delta <- psych[, 4]
## BEX1 <- BeMRes(times, delta, iterations = 3000)
## BEX2 <- BeMRes(times, delta, type.c = 2, c.r = rep(100, 39))
```

---

# BePlotDiag *Diagnosis plots for Pi, u, c and epsilon*

---

## Description

Informative plots for hazard rate (Pi), latent variable (u), dependence variable (c) and parameter of the hierarchical model (epsilon).

## Usage

```
BePlotDiag(M, variable = "Pi", pos = 1)
```

### Arguments

| | |
|---|---|
| M | List. Contains the information given for Pi and u by BeMRes |
| variable | Either "Pi", "u", "c" or "epsilon". Variable for which informative plot will be shown. |
| pos | Positive integer. Position of the selected variable to be plotted. |

### Details

This function returns a diagnosis plot for the chain of the selected variable. The diagnosis includes trace, ergodic mean, autocorrelation function and histogram.

### References

Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

### See Also

BeMRes

### Examples

```
## Simulations may be time intensive. Be patient.
## require(KMsurv)
## data(psych)
## times <- psych[, 3]
## delta <- psych[, 4]
## BEX1 <- BeMRes(times, delta, iterations = 3000)
## BePlotDiag(BEX1, variable = "Pi", pos = 2)
## BePlotDiag(BEX1, variable = "u", pos = 3)
```

---

## BePloth *Plots for the Hazard and Survival Function Estimates*

---

### Description

Plots the resulting hazard function along with the survival function estimate defined by the Markov beta process (Nieto-Barajas and Walker, 2002).

### Usage

```
BePloth(M, fun = "both", confint = TRUE, h.NA = TRUE, KM = TRUE,
confidence = 0.95, summary = FALSE, legend = TRUE)
```

## Arguments

| | |
|---|---|
| M | List. Contains the information given for Pi and u (generated by BeMRres). |
| fun | "h"=plots hazard function, "S"= plots survival function and "both"=plots both the hazard and survival functions. |
| confint | Logical. If TRUE, plots confidence bands for the selected functions including Nelson-Aalen and/or Kaplan-Meier estimate. |
| h.NA | Logical. If TRUE, Nelson-Aalen estimate is plotted over the hazard function. |
| KM | Logical. If TRUE, Kaplan-Meier estimate is plotted over the survival function. |
| confidence | Numeric. Confidence band width. |
| summary | Logical. If TRUE, a summary for hazard and survival functions is returned as a list. |
| legend | Logical. If FALSE, legend is not shown. |

## Details

This function returns plots for the resulting hazard rate as it is computed by BeMRes and the Nelson-Aalen estimate along with their confidence intervals for the data set given. Additionally, it plots the survival function and the Kaplan-Meier estimate with their corresponding confidence intervals.

## Value

| | |
|---|---|
| SUM.h | Numeric matrix. Summary for the mean, median, and a confint / 100 confidence interval for each segment of the hazard function. |
| SUM.S | Numeric matrix. Summary for the mean, median, and a confint / 100 confidence interval for each segment of the survival function. |

## Warning

The argument fun is case-sensitive and requires quotations as its class is character.

## References

Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

## See Also

BeMRes, BePlotDiag

## Examples

```
## Simulations may be time intensive. Be patient.
## require(KMsurv)
## data(psych)
## times <- psych[, 3]
## delta <- psych[, 4]
## BEX1 <- BeMRes(times, delta, iterations = 3000)
## BePloth(BEX1, confint = FALSE)
## BePloth(BEX1, fun = "both", confint = TRUE)
```

CGaMRes *Markov Gamma Model with Time Dependent Covariates Summary*

## Description

Summary of the full Bayesian non-parametric Markov gamma with time dependent covariates survival analysis.

## Usage

```
CGaMRes(data, type.t = 1, K = 5, alpha = rep(0.001, K.aux),
beta = rep(1e-04, K.aux), c.r = rep(0, K.aux - 1), type.c = 4,
epsilon = 1, iterations = 1000, burn.in = floor(iterations * 0.2),
thinning = TRUE, thpar = 3, printtime = TRUE)
```

## Arguments

| | |
|---|---|
| data | Numeric matrix. Contains failure times in the first column, status indicator in the second, and, from the third to the last column, the varying covariate(s). |
| type.t | Integer. 1=computes uniformly-dense intervals; 2=unitary length intervals and 3=same length intervals. |
| K | Integer. Partition length for the hazard function if type.t=1 or type.t=3. |
| alpha | Nonnegative entry vector. Small entries are recommended in order to specify a non-informative prior distribution. |
| beta | Nonnegative entry vector. Small entries are recommended in order to specify a non-informative prior distribution. |
| c.r | Correlation vector. Its entries must be nonnegative integers. |
| type.c | 1=defines c.r as a zero-entry vector; 2=lets the user define c.r feeely; 3=defines c.r by computing an exponential distribution with mean 1; 4=defines c.r by computing an exponential distribution with mean epsilon. |
| epsilon | Double. Mean of the exponential distribution assigned to c.r when type.c=4. |
| iterations | Integer. Number of iterations including the burn.in to be computed by the model. |
| burn.in | Integer. Length of the burn-in period for the Markov chain. |
| thinning | Logical. TRUE thins the Markov chain to reduce autocorrelation. |
| thpar | Integer. Factor by which the chain will be thinned if thinning=TRUE. |
| printtime | Logical. If TRUE, prints out the execution time. |

## Details

Computes the Gibbs sampler given by the full conditional distributions of h, lambda and theta (Nieto-Barajas, 2003) and arranges the resulting Markov chain into a matrix which can be used to obtain posterior summaries.

## Value

| | |
|---|---|
| `times` | Numeric vector. Failure times. |
| `delta` | Numeric vector. Status indicator. |
| `covar` | Numeric matrix. Matrix of time dependent covariates. |
| `type.t` | Integer. |
| `tao` | Numeric vector. Partition for hazard function's support. |
| `K` | Integer. Partition length. |
| `t.unc` | Numeric vector. Uncensored failure times sorted ascendingly. |
| `iterations` | Integer. |
| `summary` | Numeric matrix. Contains the resulting Markov chain for lambda, u, c.r and epsilon (if applicable). |
| `S` | Numeric matrix. Survival estimates for each state of the chain. |
| `H` | Numeric matrix. Cummulative hazard rate estimates for each state of the chain. |
| `p` | Integer. Number of dependent covariates for the data set given. |

## Note

It is recommended to verify chain's stationarity. This can be done by checking each partition element individually. See `CGaPlotDiag`.

## References

1. Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

2. Nieto-Barajas, L. E. (2003). Discrete time Markov gamma processes and time dependent covariates in survival analysis. Bulletin of the International Statistical Institute 54th Session. Berlin. (CD-ROM)

## See Also

CGaPlotDiag, CGaPloth

## Examples

```
## Simulations may be time intensive. Be patient.
## leukemia1 <- read.table("http://allman.rhon.itam.mx/~lnieto/index_archivos/Leucemia.txt",
## header = TRUE)
## leukemia1 <- as.matrix(cbind(leukemia1[, 1:3], log(leukemia1[, 4])))
## EX <- CGaMRes(data = leukemia1, K = 10, iterations = 3000)
```

CGaPlotDiag *Diagnosis plots for lambda, u, c, epsilon and theta*

## Description

Informative plots for hazard rate (Pi), latent variable (u), dependence variable (c), parameter of the hierarchical model (epsilon) and regression coefficients (theta).

## Usage

```
CGaPlotDiag(M, variable = "lambda", pos = 1)
```

## Arguments

| | |
|---|---|
| M | List. Contains the information given for lambda and u by CGaMRes |
| variable | Either "lambda", "u", "c", "epsilon" or "theta". Variable for which informative plot will be shown. |
| pos | Positive integer. Position of the selected variable to be plotted. |

## Details

This function returns a diagnosis plot for which the chain for the selected variable can be monitored. Diagnosis includes trace, ergodic mean, autocorrelation function and histogram.

## References

1. Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

2. Nieto-Barajas, L. E. (2003). Discrete time Markov gamma processes and time dependent covariates in survival analysis. Bulletin of the International Statistical Institute 54th Session. Berlin. (CD-ROM)

## See Also

CGaMRes

## Examples

```
## Simulations may be time intensive. Be patient.
## leukemia1 <- read.table("http://allman.rhon.itam.mx/~lnieto/index_archivos/Leucemia.txt",
## header = TRUE)
## leukemia1 <- as.matrix(cbind(leukemia1[, 1:3], log(leukemia1[, 4])))
## EX <- CGaMRes(data = leukemia1, K = 10, iterations = 3000)
## CGaPlotDiag(EX, variable = "lambda", pos = 2)
## CGaPlotDiag(EX, variable = "u", pos = 3)
```

CGaPloth *Plots for the Hazard and Survival Function Estimates*

## Description

Plots the resulting hazard function along with the survival function estimate defined by the Markov gamma process with time dependent covariates (Nieto-Barajas, 2003).

## Usage

```
CGaPloth(M, fun = "both", confint = TRUE, h.NA = TRUE, KM = TRUE,
confidence = 0.95, summary = FALSE, legend = TRUE)
```

## Arguments

| | |
|---|---|
| M | List. Contains the information given for lambda and u (generated by CGaMRres). |
| fun | "h"=plots hazard function; "S"= plots survival function and "both"=plots both the hazard and survival functions. |
| confint | Logical. If TRUE, plots confidence bands for the selected functions including Nelson-Aalen and/or Kaplan-Meier estimate. |
| h.NA | Logical. If TRUE, Nelson-Aalen estimate is plotted over the hazard function. |
| KM | Logical. If TRUE, Kaplan-Meier estimate is plotted over the survival function. |
| confidence | Numeric. Confidence band width. |
| summary | Logical. If TRUE, a summary for hazard and survival functions is returned as a list. |
| legend | Logical. If FALSE, legend is not shown. |

## Details

This function return plots for the resulting hazard rate as it is computed by CGaMRes and the Nelson-Aalen estimate along with their confidence intervals for the data set given. Additionally, it plots the survival function and the Kaplan-Meier estimate with their corresponding confidence intervals.

## Value

| | |
|---|---|
| SUM.h | Numeric matrix. Summary for the mean, median, and a confint / 100 confidence interval for each segment of the hazard function. |
| SUM.S | Numeric matrix. Summary for the mean, median, and a confint / 100 confidence interval for each segment of the survival function. |

## Warning

The argument fun is case-sensitive and requires quotations as its class is character.

## References

1. Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

2. Nieto-Barajas, L. E. (2003). Discrete time Markov gamma processes and time dependent covariates in survival analysis. Bulletin of the International Statistical Institute 54th Session. Berlin. (CD-ROM)

## See Also

CGaMRes, CGaPlotDiag

## Examples

```
## Simulations may be time intensive. Be patient.
## require(MASS)
## data1 <- gehan[gehan[,4] == "6-MP", 2:3]
## times <- data1[, 1]; delta <- data1[, 2]
## EX <- GaMRes(times, delta)
## CGaPloth(EX, confint = FALSE)
## CGaPloth(EX, fun = "both", confint = TRUE)
```

---

# CGaPred *Predictive hazard function*

---

## Description

Estimates the hazard function for a given vector of covariates.

## Usage

```
CGaPred(M, xf = "median", confidence = 0.95)
```

## Arguments

| | |
|---|---|
| M | List. Contains the information given for lambda and u by CGaMRes. |
| xf | Vector. Varying covariates that are used to generate the predictive hazard function estimate. |
| confidence | Numeric. Confidence band width. |

## Details

If no vector of varying covariates is specified, a vector of medians of each covariate will be taken.

## Value

| | |
|---|---|
| theta.summary | Numeric matrix. Summary for the regression coefficients. |
| h.xf | Numeric vector. Estimate for the hazard function given covariates vector xf. |
| S.xf | Numeric vector. Estimate for the survival function given covariates vector xf. |

## References

1. Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

2. Nieto-Barajas, L. E. (2003). Discrete time Markov gamma processes and time dependent covariates in survival analysis. Bulletin of the International Statistical Institute 54th Session. Berlin. (CD-ROM)

## See Also

CGaMRes, CLambdaSumm

## Examples

```
## Simulations may be time intensive. Be patient.
## leukemia1 <- read.table("http://allman.rhon.itam.mx/~lnieto/index_archivos/Leucemia.txt",
## header = TRUE)
## leukemia1 <- as.matrix(cbind(leukemia1[, 1:3], log(leukemia1[, 4])))
## EX <- CGaMRes(data = leukemia1, K = 10, iterations = 3000)
## CGaPred(EX)
```

---

GaMRes *Markov Gamma Model Summary*

---

## Description

Summary of the full Bayesian non-parametric Markov gamma survival analysis.

## Usage

```
GaMRes(times, delta = rep(1, length(times)), type.t = 1, K = 5,
alpha = rep(0.0001, K.aux), beta = rep(1e-04, K.aux),
c.r = rep(0, (K.aux - 1)), type.c = 4, epsilon = 1, iterations = 1000,
burn.in = floor(iterations * 0.2), thinning = TRUE, thpar = 5, printtime = TRUE)
```

## Arguments

| | |
|---|---|
| times | Numeric positive vector. Failure times. |
| delta | Logical vector. Status indicator. TRUE (1) indicates exact lifetime is known, FALSE (0) indicates that the corresponding failure time is right censored. |
| type.t | Integer. 1=uniformly-dense intervals; 2=unitary length intervals and 3=computes same length intervals. |
| K | Integer. Partition length for the hazard function if type.t=1 or type.t=3. |
| alpha | Nonnegative entry vector. Small entries are recommended in order to specify a non-informative prior distribution. |
| beta | Nonnegative entry vector. Small entries are recommended in order to specify a non-informative prior distribution. |

| | |
|---|---|
| c.r | Correlation vector. Its entries must be nonnegative integers. |
| type.c | 1=defines c.r as a zero-entry vector; 2=lets the user define c.r feeely; 3=defines c.r by computing an exponential distribution with mean 1; 4=defines c.r by computing an exponential distribution with mean epsilon. |
| epsilon | Double. Mean of the exponential distribution assigned to c.r when type.c=4. |
| iterations | Integer. Number of iterations including the burn.in to be computed by the model. |
| burn.in | Integer. Length of the burn-in period for the Markov chain. |
| thinning | Logical. TRUE thins the Markov chain to reduce autocorrelation. |
| thpar | Integer. Factor by which the chain will be thinned if thinning=TRUE. |
| printtime | Logical. If TRUE, prints out the execution time. |

## Details

Computes the Gibbs sampler given by the full conditional distributions of u and lambda (Nieto-Barajas & Walker, 2002) and arranges the resulting Markov chain into a matrix which can be used to obtain posterior summaries.

## Value

| | |
|---|---|
| times | Numeric vector. Failure times. |
| delta | Numeric vector. Status indicator. |
| type.t | Integer. |
| tao | Numeric vector. Partition for hazard function's support. |
| K | Integer. Partition length. |
| t.unc | Numeric vector. Uncensored failure times sorted ascendingly. |
| iterations | Integer. |
| summary | Numeric matrix. Contains the resulting Markov chain for lambda, u, c.r and epsilon (if applicable). |
| S | Numeric matrix. Survival estimates for each state of the chain. |

## Note

It is recommended to verify chain's stationarity. This can be done by checking each partition element individually. See GaPlotDiag.

## References

Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

## See Also

GaPlotDiag, GaPloth

## Examples

```
## Simulations may be time intensive. Be patient.
## require(MASS)
## data1 <- gehan[gehan[, 4] == "6-MP", 2:3]
## times <- data1[, 1]
## delta <- data1[, 2]
## GEX1 <- GaMRes(times, delta, K = 8, iterations = 3000)
## GEX2 <- GaMRes(times, delta, K = 8, type.c = 4, iterations = 3000)
## GEX3 <- GaMRes(times, delta, type.t = 2, type.c = 2, K = 35,
## c.r = rep(10, 34), iterations = 3000)
```

---

`GaPlotDiag` *Diagnosis plots for lambda, u, c and epsilon*

---

## Description

Informative plots for hazard rate (lambda), latent variable (u), dependence variable (c) and the parameter of the hierarchical model epsilon.

## Usage

```
GaPlotDiag(M, variable = "lambda", pos = 1)
```

## Arguments

| | |
|---|---|
| `M` | List. Contains the information given for lambda and u by `GaMRes`. |
| `variable` | Either "lambda", "u", "c" or "epsilon". Variable for which informative plot will be shown. |
| `pos` | Positive integer. Position of the selected `variable` to be plotted. |

## Details

This function returns a diagnosis plot for which the chain for the selected variable can be monitored. Diagnosis includes trace, ergodic mean, autocorrelation function and histogram.

## References

Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

## See Also

GaMRes

## Examples

```
## Simulations may be time intensive. Be patient.
## require(MASS)
## data1 <- gehan[gehan[, 4] == "6-MP", 2:3]
## times <- data1[, 1]
## delta <- data1[, 2]
## GEX1 <- GaMRes(times, delta, K = 8, iterations = 3000)
## GaPlotDiag(GEX1, variable = "lambda", pos = 2)
## GaPlotDiag(GEX1, variable = "u", pos = 5)
```

---

GaPloth *Plots for the Hazard and Survival Function Estimates*

---

## Description

Plots the resulting hazard function along with the survival function estimate defined by the Markov gamma process (Nieto-Barajas and Walker, 2002).

## Usage

```
GaPloth(M, fun = "both", confint = TRUE, h.NA = TRUE, KM = TRUE,
confidence = 0.95, summary = FALSE, legend = TRUE)
```

## Arguments

| | |
|---|---|
| M | List. Contains the information given for lambda and u (generated by GaMRres). |
| fun | "h"=plots hazard function; "S"= plots survival function and "both"=plots both the hazard and survival functions. |
| confint | Logical. If TRUE, plots confidence bands for the selected functions including Nelson-Aalen and/or Kaplan-Meier estimate. |
| h.NA | Logical. If TRUE, Nelson-Aalen estimate is plotted over the hazard function. |
| KM | Logical. If TRUE, Kaplan-Meier estimate is plotted over the survival function. |
| confidence | Numeric. Confidence band width. |
| summary | Logical. If TRUE, a summary for hazard and survival functions is returned as a list. |
| legend | Logical. If FALSE, legend is not shown. |

## Details

This function return plots for the resulting hazard rate as it is computed by GaMRes and the Nelson-Aalen estimate along with their confidence intervals for the data set given. Additionally, it plots the survival function and the Kaplan-Meier estimate with their corresponding confidence intervals.

## Value

| | |
|---|---|
| SUM.h | Numeric matrix. Summary for the mean, median, and a confint / 100 confidence interval for each segment of the hazard function. |
| SUM.S | Numeric matrix. Summary for the mean, median, and a confint / 100 confidence interval for each segment of the survival function. |

## Warning

The argument fun is case-sensitive and requires quotations as its class is character.

## References

Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

## See Also

GaMRes, GaPlotDiag

## Examples

```
## Simulations may be time intensive. Be patient.
## require(MASS)
## data1 <- gehan[gehan[, 4] == "6-MP", 2:3]
## times <- data1[, 1]
## delta <- data1[, 2]
## GEX1 <- GaMRes(times, delta, K = 8, iterations = 3000)
## GaPloth(GEX1, confint = FALSE)
## GaPloth(GEX1, fun = "both", confint = TRUE)
```

---

# PlotTheta *Plots for the varying covariates*

---

## Description

Plots density and histogram for one or all varying covariates.

## Usage

```
PlotTheta(M, i = 1, plot.all = TRUE)
```

## Arguments

| | |
|---|---|
| M | List. Contains the information given for lambda and u by CGaMRes. |
| i | Integer. If plot.all == FALSE, only the *ith* position is plot. |
| plot.all | Logical. If TRUE plots all p varying covariates. |

## References

1. Nieto-Barajas, L. E. & Walker, S. G. (2002). Markov beta and gamma processes for modelling hazard rates. Scandinavian Journal of Statistics 29, 413-424.

2. Nieto-Barajas, L. E. (2003). Discrete time Markov gamma processes and time dependent covariates in survival analysis. Bulletin of the International Statistical Institute 54th Session. Berlin. (CD-ROM)

## See Also

CGaMRes

## Examples

```
## Simulations may be time intensive. Be patient.
## leukemia1 <- read.table("http://allman.rhon.itam.mx/~lnieto/index_archivos/Leucemia.txt",
## header = TRUE)
## leukemia1 <- as.matrix(cbind(leukemia1[, 1:3], log(leukemia1[, 4])))
## EX <- CGaMRes(data = leukemia1, K = 10, iterations = 3000)
## PlotTheta(EX)
```

# Index