

# Package ‘splineCox’

December 16, 2024

**Type** Package  
**Title** A Two-Stage Estimation Approach to Cox Regression Using M-Spline Function  
**Version** 0.0.1  
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**Description** Implements a two-stage estimation approach for Cox regression using five-parameter M-spline functions to model the baseline hazard. It allows for flexible hazard shapes and model selection based on log-likelihood criteria.  
**License** GPL (>= 3)  
**Encoding** UTF-8  
**RoxygenNote** 7.3.2  
**Roxygen** list(markdown = TRUE)  
**Imports** joint.Cox  
**Suggests** knitr, rmarkdown  
**VignetteBuilder** knitr  
**NeedsCompilation** no

## R topics documented:

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splineCox.reg1	<i>Fitting the five-parameter spline Cox model giving a specified shape</i>
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## Description

splineCox.reg1 estimates the parameters of a five-parameter spline Cox model based on a specified shape for the baseline hazard function. The function calculates the estimates for the model parameters (beta) and the baseline hazard scale parameter (gamma), using non-linear optimization.

**Usage**

```
splineCox.reg1(
  t.event,
  event,
  Z,
  xi1 = min(t.event),
  xi3 = max(t.event),
  model = "constant",
  p0 = rep(0, 1 + ncol(as.matrix(Z)))
)
```

**Arguments**

<code>t.event</code>	a vector for time-to-event
<code>event</code>	a vector for event indicator (=1 event; =0 censoring)
<code>Z</code>	a matrix for covariates; <code>nrow(Z)</code> =sample size, <code>ncol(Z)</code> =the number of covariates
<code>xi1</code>	lower bound for the hazard function; the default is <code>min(t.event)</code>
<code>xi3</code>	upper bound for the hazard function; the default is <code>max(t.event)</code>
<code>model</code>	A character string specifying the shape of the baseline hazard function. Available options include: "increase", "constant", "decrease", "unimodal1", "unimodal2", "unimodal3", "bathtub1", "bathtub2", "bathtub3". Default is "constant"
<code>p0</code>	Initial values to maximize the likelihood (1 + p parameters; baseline hazard scale parameter and p regression coefficients)

**Value**

A list containing the following components:

<code>model</code>	A character string indicating the shape of the baseline hazard function used.
<code>parameter</code>	A numeric vector of the parameters defining the baseline hazard shape.
<code>beta</code>	A named vector with the estimates, standard errors, and 95% confidence intervals for the regression coefficients
<code>gamma</code>	A named vector with the estimate, standard error, and 95% confidence interval for the baseline hazard parameter
<code>loglik</code>	A named vector containing the log-likelihood (LogLikelihood), Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC)

**Examples**

```
# Example data
library(joint.Cox)
data(dataOvarian)
t.event = dataOvarian$t.event
event = dataOvarian$event
Z = dataOvarian$CXCL12

reg1 <- splineCox.reg1(t.event, event, Z, model = "constant")
print(reg1)
```

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splineCox.reg2	<i>Fitting the five-parameter spline Cox model with a specified shape, selecting the best fit</i>
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## Description

splineCox.reg2 estimates the parameters of a five-parameter spline Cox model for multiple specified shapes and selects the best fitting model based on the minimization of the log-likelihood function. The function calculates the estimates for the model parameters (beta) and the baseline hazard scale parameter (gamma), using non-linear optimization.

## Usage

```
splineCox.reg2(
  t.event,
  event,
  Z,
  xi1 = min(t.event),
  xi3 = max(t.event),
  model = names(shape.list),
  p0 = rep(0, 1 + ncol(as.matrix(Z)))
)
```

## Arguments

t.event	a vector for time-to-event
event	a vector for event indicator (=1 event; =0 censoring)
Z	a matrix for covariates; nrow(Z)=sample size, ncol(Z)=the number of covariates
xi1	lower bound for the hazard function; the default is min(t.event)
xi3	upper bound for the hazard function; the default is max(t.event)
model	A character vector specifying which model shapes to consider for the baseline hazard. Available options are: "increase", "constant", "decrease", "unimodal1", "unimodal2", "unimodal3", "bathtub1", "bathtub2", "bathtub3". Default is names(shape.list) which includes all available models.
p0	Initial values to maximize the likelihood (1 + p parameters; baseline hazard scale parameter and p regression coefficients)

## Value

A list containing the following components:

model	A character string indicating the shape of the baseline hazard function used.
parameter	A numeric vector of the parameters defining the baseline hazard shape.
beta	A named vector with the estimates, standard errors, and 95% confidence intervals for the regression coefficients
gamma	A named vector with the estimate, standard error, and 95% confidence interval for the baseline hazard parameter

<code>loglik</code>	A named vector containing the log-likelihood (LogLikelihood), Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC) for the best-fitting model
<code>other_models</code>	A data frame containing the log-likelihood (LogLikelihood) for all other evaluated models, with model names as row names.

**Examples**

```
# Example data
library(joint.Cox)
data(dataOvarian)
t.event = dataOvarian$t.event
event = dataOvarian$event
Z = dataOvarian$CXCL12

M = c("constant", "increase", "decrease")
reg2 <- splineCox.reg2(t.event, event, Z, model = M)
print(reg2)
```

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