# Package 'spatialSPsurv'

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Type Package

Title Bayesian Spatial Split Population Survival Model

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betas.post

betas.post

### Description

log-posterior distribution of betas with pth element fixed as betas.p

### Usage

```
betas.post(betas.p, p, Sigma.b, Y, Y0, X, W, betas, delta, C, LY, rho, form)
```

#### Arguments

betas.p	current value of the pth element of betas
p	pth element
Sigma.b	variance estimate of betas
Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
X	covariates for betas
W	spatial random effects
betas	current value of betas
delta	probability of true censoring
С	censoring indicator
LY	last observation year
rho	current value of rho
form	type of parametric model (Exponential or Weibull)

### Value

log- posterior density of betas

betas.slice.sampling 3

```
betas.slice.sampling \quad \textit{betas.slice.sampling}
```

### Description

slice sampling for betas

### Usage

```
betas.slice.sampling(
   Sigma.b,
   Y,
   Y0,
   X,
   W,
   betas,
   delta,
   C,
   LY,
   rho,
   w,
   m,
   form
)
```

### Arguments

Sigma.b	variance estimate of betas
Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
Χ	covariates for betas
W	spatial random effects
betas	current value of betas
delta	probability of true censoring
С	censoring indicator
LY	last observation year
rho	current value of rho
W	size of the slice in the slice sampling. A vector of values for beta, gamma, rho.
m	limit on steps in the slice sampling
form	type of parametric model (Exponential or Weibull)

### Value

4 frailtySPsurv

frailtySPsurv

frailtySPsurv

#### Description

Markov Chain Monte Carlo (MCMC) to run Bayesian non-spatial frailty split population survival model

#### Usage

```
frailtySPsurv(
  formula,
  duration,
  immune,
  Y0,
  LY,
  S,
  data = list(),
  N,
  burn,
  thin,
  w = c(1, 1, 1),
  m = 10,
  form,
  prop.var
)
```

#### Arguments

formula ...
duration ...
immune ...

Y0 the elapsed time since inception until the beginning of time period (t-1)

LY last observation year

S spatial information (e.g. district ID) for each observation that matches the spatial

matrix row/column information

data ...

N number of MCMC iterations burn burn-in to be discarded

thin thinning to prevent from autocorrelation

w size of the slice in the slice sampling for (betas, gammas, rho). Write it as a

vector. E.g. c(1,1,1)

m limit on steps in the slice sampling. A vector of values for beta, gamma, rho.

form type of parametric model (Exponential or Weibull)

prop.var ...

#### Value

chain of the variables of interest

gammas.post 5

### Description

log-posterior distribution of gammas with pth element fixed as gammas.p

### Usage

```
gammas.post(gammas.p, p, Sigma.g, Y, Y0, eXB, Z, gammas, C, LY, rho, form)
```

#### **Arguments**

gammas.p	current value of the pth element of gammas
р	pth element
Sigma.g	variance estimate of gammas
Υ	the time (duration) dependent variable for the survival stage (t)
Υ0	the elapsed time since inception until the beginning of time period (t-1)
еХВ	exponentiated vector of covariates times betas
Z	covariates for gammas
gammas	current value of gammas
С	censoring indicator
LY	last observation year
rho	current value of rho
form	type of parametric model (Exponential or Weibull)

#### Value

log- posterior density of betas

### Description

log-posterior distribution of gammas with pth element fixed as gammas.p

```
gammas.post2(gammas.p, p, Sigma.g, Y, Y0, eXB, Z, V, gammas, C, LY, rho, form)
```

#### **Arguments**

gammas.p current value of the pth element of gammas pth element Sigma.g variance estimate of gammas the time (duration) dependent variable for the survival stage (t) Υ0 the elapsed time since inception until the beginning of time period (t-1) exponentiated vector of covariates times betas eXB Ζ covariates for gammas ٧ spatial random effects current value of gammas gammas censoring indicator C LY last observation year rho current value of rho

type of parametric model (Exponential or Weibull)

#### Value

form

log- posterior density of betas

```
gammas.slice.sampling gammas.slice.sampling
```

#### **Description**

slice sampling for gammas

### Usage

```
gammas.slice.sampling(Sigma.g, Y, Y0, eXB, Z, gammas, C, LY, rho, w, m, form)
```

#### **Arguments**

variance estimate of gammas Sigma.g Υ the time (duration) dependent variable for the survival stage (t) Υ0 the elapsed time since inception until the beginning of time period (t-1) eXB exponentiated vector of covariates times betas Ζ covariates for gammas gammas current value of gammas С censoring indicator LY last observation year rho current value of rho size of the slice in the slice sampling W limit on steps in the slice sampling m type of parametric model (Exponential or Weibull) form

#### Value

```
{\it gammas.slice.sampling 2} \\ {\it gammas.slice.sampling 2}
```

### Description

slice sampling for gammas

### Usage

```
gammas.slice.sampling2(
   Sigma.g,
   Y,
   Y0,
   eXB,
   Z,
   V,
   gammas,
   C,
   LY,
   rho,
   w,
   m,
   form
)
```

### Arguments

Sigma.g	variance estimate of gammas
Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
eXB	exponentiated vector of covariates times betas
Z	covariates for gammas
V	spatial random effects
gammas	current value of gammas
С	censoring indicator
LY	last observation year
rho	current value of rho
W	size of the slice in the slice sampling. A vector of values for beta, gamma, rho.
m	limit on steps in the slice sampling
form	type of parametric model (Exponential or Weibull)

### Value

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```
lambda.gibbs.sampling2
```

lambda.gibbs.sampling2

#### Description

log-posterior distribution of rho

#### Usage

```
lambda.gibbs.sampling2(S, A, W, V, a = 1, b = 1)
```

#### **Arguments**

```
S spatial information (e.g. district)
A adjacency information corresponding to spatial information
W spatial random effects
V spatial random effects
a shape parameter of gammas prior
b scale parameter of gammas prior
```

#### Value

log- posterior density of betas

mcmcfrailtySP

mcmcfrailtySP

#### Description

Markov Chain Monte Carlo (MCMC) routine to run Bayesian non-spatial frailties split population survival model

```
mcmcfrailtySP(
    Y,
    Y0,
    C,
    LY,
    X,
    Z,
    S,
    N,
    burn,
    thin,
    w = c(1, 1, 1),
    m = 10,
    form,
    prop.var
)
```

mcmcSP 9

#### Arguments

Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
С	censoring indicator
LY	last observation year
Χ	covariates for betas
Z	covariates for gammas
S	spatial information (e.g. district)
N	number of MCMC iterations
burn	burn-in to be discarded
thin	thinning to prevent from autocorrelation
W	size of the slice in the slice sampling for (betas, gammas, rho)
m	limit on steps in the slice sampling. A vector of values for beta, gamma, rho.
form	type of parametric model (Exponential or Weibull)
prop.var	proposal variance for Metropolis-Hastings
A	adjacency information corresponding to spatial information

### Value

chain of the variables of interest

mcmcSP $mcmcSP$
-----------------

### Description

Markov Chain Monte Carlo (MCMC) to run Bayesian split population survival model with no frailties

### Usage

```
mcmcSP(Y, Y0, C, LY, X, Z, N, burn, thin, w = c(1, 1, 1), m = 10, form)
```

#### Arguments

Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
С	censoring indicator
Χ	covariates for betas
Z	covariates for gammas
N	number of MCMC iterations
burn	burn-in to be discarded
thin	thinning to prevent from autocorrelation
W	size of the slice in the slice sampling for (betas, gammas, rho)
m	limit on steps in the slice sampling. A vector of values for beta, gamma, rho.
form	type of parametric model (Exponential or Weibull)

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#### Value

chain of the variables of interest

 ${\tt mcmcspatialSP} \qquad \qquad {\tt mcmcspatialSP}$ 

### Description

Markov Chain Monte Carlo (MCMC) routine for Bayesian spatial split population survival model

### Usage

```
mcmcspatialSP(
    Y,
    Y0,
    C,
    LY,
    X,
    Z,
    S,
    A,
    N,
    burn,
    thin,
    w = c(1, 1, 1),
    m = 10,
    form,
    prop.var
)
```

#### **Arguments**

Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
С	censoring indicator
LY	last observation year
Χ	covariates for betas
Z	covariates for gammas
S	spatial information (e.g. district)
A	adjacency information corresponding to spatial information
N	number of MCMC iterations
burn	burn-in to be discarded
thin	thinning to prevent from autocorrelation
W	size of the slice in the slice sampling for (betas, gammas, rho)
m	limit on steps in the slice sampling. A vector of values for beta, gamma, rho.
form	type of parametric model (Exponential or Weibull)
prop.var	proposal variance for Metropolis-Hastings

rho.post

#### Value

chain of the variables of interest

### Description

log-posterior distribution of rho

### Usage

```
rho.post(Y, Y0, eXB, delta, C, LY, rho, a = 1, b = 1)
```

### Arguments

Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
eXB	exponentiated vector of covariates times betas
delta	probability of true censoring
С	censoring indicator
LY	last observation year
rho	current value of rho
a	shape parameter of gammas prior
b	scale parameter of gammas prior

### Value

log- posterior density of betas

rho.slice.sampling
--------------------

### Description

univariate slice sampling for rho

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#### Usage

```
rho.slice.sampling(
    Y,
    Y0,
    eXB,
    delta,
    C,
    LY,
    rho,
    w,
    m,
    lower = 0.01,
    upper = +Inf
)
```

### Arguments

Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
еХВ	exponentiated vector of covariates times betas
delta	probability of true censoring
С	censoring indicator
LY	last observation year
rho	current value of rho
W	size of the slice in the slice sampling. A vector of values for beta, gamma, rho.
m	limit on steps in the slice sampling
lower	lower bound on support of the distribution
upper	upper bound on support of the distribution

#### Value

One sample update using slice sampling

### Description

Markov Chain Monte Carlo (MCMC) to run Bayesian spatial split population survival model

```
spatialSPsurv(
  duration,
  immune,
  Y0,
  LY,
  S,
```

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```
data = list(),
A,
N,
burn,
thin,
w = c(1, 1, 1),
m = 10,
form,
prop.var
)
```

#### **Arguments**

duration immune Υ0 the elapsed time since inception until the beginning of time period (t-1) LY last observation year S spatial information (e.g. district ID) for each observation that matches the spatial matrix row/column information data Spatial Matrix (load separate spatial weights matrix file) Α number of MCMC iterations Ν burn burn-in to be discarded thin thinning to prevent from autocorrelation size of the slice in the slice sampling for (betas, gammas, rho). Write it as a vector. E.g. c(1,1,1)limit on steps in the slice sampling. A vector of values for beta, gamma, rho. m type of parametric model (Exponential or Weibull) form

#### Value

prop.var

chain of the variables of interest

proposal variance for Metropolis-Hastings

#### Description

Markov Chain Monte Carlo (MCMC) to run Bayesian split population survival model with no frailties

#### Usage

```
SPsurv(
    duration,
    immune,
    Y0,
    LY,
    data = list(),
    N,
    burn,
    thin,
    w = c(1, 1, 1),
    m = 10,
    form
)
```

#### **Arguments**

duration ...
immune ...

Y0 the elapsed time since inception until the beginning of time period (t-1)

LY last observation year

data

N number of MCMC iterations

burn burn-in to be discarded

thin thinning to prevent from autocorrelation

w size of the slice in the slice sampling for (betas, gammas, rho). Write it as a

vector. E.g. c(1,1,1)

m limit on steps in the slice sampling. A vector of values for beta, gamma, rho.

form type of parametric model (Exponential or Weibull)

#### Value

chain of the variables of interest

```
univ.betas.slice.sampling

univ.betas.slice.sampling
```

#### Description

univariate slice sampling for betas.p

### Usage

```
univ.betas.slice.sampling(
  betas.p,
  p,
  Sigma.b,
  Υ,
  Υ0,
  Χ,
  W,
  betas,
  delta,
  С,
  LY,
  rho,
  W,
  m,
  lower = -Inf,
  upper = +Inf,
  \quad \text{form} \quad
)
```

### Arguments

betas.p	current value of the pth element of betas
p	pth element
Sigma.b	variance estimate of betas
Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
Χ	covariates for betas
W	spatial random effects
betas	current value of betas
delta	probability of true censoring
С	censoring indicator
LY	last observation year
rho	current value of rho
W	size of the slice in the slice sampling
m	limit on steps in the slice sampling
lower	lower bound on support of the distribution
upper	upper bound on support of the distribution
form	type of parametric model (Exponential or Weibull)

#### Value

```
univ.gammas.slice.sampling
univ.gammas.slice.sampling
```

### Description

univariate slice sampling for gammas.p

### Usage

```
univ.gammas.slice.sampling(
  gammas.p,
  Sigma.g,
  Υ,
  Υ0,
  eXB,
  Ζ,
  gammas,
  С,
  LY,
  rho,
  w,
  lower = -Inf,
  upper = +Inf,
  form
)
```

#### Arguments

gammas.p	current value of the pth element of gammas
р	pth element
Sigma.g	variance estimate of gammas
Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
eXB	exponentiated vector of covariates times betas
Z	covariates for gammas
gammas	current value of gammas
С	censoring indicator
LY	last observation year
rho	current value of rho
W	size of the slice in the slice sampling
m	limit on steps in the slice sampling
lower	lower bound on support of the distribution
upper	upper bound on support of the distribution
form	type of parametric model (Exponential or Weibull)

#### Value

One sample update using slice sampling

```
univ.gammas.slice.sampling2
univ.gammas.slice.sampling2
```

### Description

univariate slice sampling for gammas.p

#### Usage

```
univ.gammas.slice.sampling2(
  gammas.p,
  р,
  Sigma.g,
  Υ,
  Υ0,
  eXB,
  Ζ,
  ٧,
  gammas,
  С,
  LY,
  rho,
  W,
  m,
  lower = -Inf,
  upper = +Inf,
  form
)
```

#### **Arguments**

```
gammas.p
                   current value of the pth element of gammas
                   pth element
р
                   variance estimate of gammas
Sigma.g
Υ
                   the time (duration) dependent variable for the survival stage (t)
Υ0
                   the elapsed time since inception until the beginning of time period (t-1)
eXB
                   exponentiated vector of covariates times betas
                   covariates for gammas
Ζ
٧
                   spatial random effects
gammas
                   current value of gammas
С
                   censoring indicator
                   last observation year
LY
rho
                   current value of rho
```

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w size of the slice in the slice sampling. A vector of values for beta, gamma, rho.

m limit on steps in the slice sampling

lower lower bound on support of the distribution upper upper bound on support of the distribution

form type of parametric model (Exponential or Weibull)

#### Value

One sample update using slice sampling

V.F.MH. sampling *V.F.MH. sampling (Cure Model with non-spatial Frailties)* 

#### **Description**

MH sampling for rcpp\_log\_dmvnorm

#### Usage

```
V.F.MH.sampling(Sigma.v, S, Y, Y0, eXB, Z, V, gammas, C, LY, rho, prop.var)
```

#### **Arguments**

S spatial information (e.g. district)

Y the time (duration) dependent variable for the survival stage (t)

Y0 the elapsed time since inception until the beginning of time period (t-1)

eXB exponentiated vector of covariates times betas

Z covariates for gammas

V spatial random effects
gammas current value of gammas

C censoring indicator

LY last observation year

rho current value of rho

prop. var proposal variance for Metropolis-Hastings

#### Value

V.F.post

### Description

log-posterior distribution of W with sth element fixed as W.s

### Usage

```
\mbox{V.F.post(Sigma.v, S, Y, Y0, eXB, Z, V, gammas, C, LY, rho)} \\
```

### Arguments

S	spatial information (e.g. district)
Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
еХВ	exponentiated vector of covariates times betas
Z	covariates for gammas
V	spatial random effects
gammas	current value of gammas
С	censoring indicator
LY	last observation year
rho	current value of rho

### Value

log- posterior density of betas

### Description

MH sampling for rcpp\_log\_dmvnorm

```
V.MH.sampling(S, A, lambda, Y, Y0, eXB, Z, V, gammas, C, LY, rho, prop.var)
```

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#### **Arguments**

S spatial information (e.g. district)

A adjacency information corresponding to spatial information

lambda CAR parameter

Y the time (duration) dependent variable for the survival stage (t)

Y0 the elapsed time since inception until the beginning of time period (t-1)

eXB exponentiated vector of covariates times betas

Z covariates for gammas

V spatial random effects
gammas current value of gammas

C censoring indicator

LY last observation year
rho current value of rho

prop.var proposal variance for Metropolis-Hastings

#### Value

One sample update using slice sampling

V.post V.pos	
--------------	--

#### **Description**

log-posterior distribution of W with sth element fixed as W.s

#### Usage

```
V.post(S, A, lambda, Y, Y0, eXB, Z, V, gammas, C, LY, rho)
```

#### **Arguments**

S spatial information (e.g. district)

A adjacency information corresponding to spatial information

lambda CAR parameter

Y the time (duration) dependent variable for the survival stage (t)

Y0 the elapsed time since inception until the beginning of time period (t-1)

eXB exponentiated vector of covariates times betas

Z covariates for gammas
V spatial random effects
gammas current value of gammas
C censoring indicator
LY last observation year
rho current value of rho

#### Value

log- posterior density of betas

W.F.MH.sampling 21

W.F.MH.sampling	W.F.MH.sampling (Cure Model with Frailties)

### Description

MH sampling for W

### Usage

```
W.F.MH.sampling(Sigma.w, S, Y, Y0, X, W, betas, delta, C, LY, rho, prop.var)
```

### Arguments

S	spatial information (e.g. district)
Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
Χ	covariates for betas
W	spatial random effects
betas	current value of betas
delta	probability of true censoring
С	censoring indicator
LY	last observation year
rho	current value of rho
prop.var	proposal variance for Metropolis-Hastings

#### Value

One sample update using slice sampling

### Description

log-posterior distribution of W with sth element fixed as W.s

```
W.F.post(Sigma.w, S, Y, Y0, X, W, betas, delta, C, LY, rho)
```

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#### **Arguments**

S spatial information (e.g. district)

Y the time (duration) dependent variable for the survival stage (t)

Y0 the elapsed time since inception until the beginning of time period (t-1)

X covariates for betas
W spatial random effects
betas current value of betas

delta probability of true censoring

C censoring indicator
LY last observation year
rho current value of rho

#### Value

log-posterior density of W

W.MH.sampling W.MH.sampling

#### **Description**

MH Sampling for W

#### Usage

```
W.MH.sampling(S, A, lambda, Y, Y0, X, W, betas, delta, C, LY, rho, prop.var)
```

#### **Arguments**

S spatial information (e.g. district)

A adjacency information corresponding to spatial information

lambda CAR parameter

Y the time (duration) dependent variable for the survival stage (t)

Y0 the elapsed time since inception until the beginning of time period (t-1)

X covariates for betas
W spatial random effects
betas current value of betas

delta probability of true censoring

C censoring indicator
LY last observation year
rho current value of rho

prop.var proposal variance for Metropolis-Hastings

#### Value

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st W.post
-----------

### Description

log-posterior distribution of W with sth element fixed as W.s

current value of rho

### Usage

```
W.post(S, A, lambda, Y, Y0, X, W, betas, delta, C, LY, rho)
```

### Arguments

S	spatial information (e.g. district)
Α	adjacency information corresponding to spatial information
lambda	CAR parameter
Υ	the time (duration) dependent variable for the survival stage (t)
Y0	the elapsed time since inception until the beginning of time period (t-1)
X	covariates for betas
W	spatial random effects
betas	current value of betas
delta	probability of true censoring
С	censoring indicator
LY	last observation year

### Value

rho

log- posterior density of W

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