

# Bym model for spatial effects

## Parametrization

This model is simply the sum of a besag model and a iid model.

The benefite is that this allows to get the posterior marginals of the sum of the spatial and iid model; otherwise it offers no advantages.

## Hyperparameters

The hyperparameters are the precision  $\tau_1$  of the iid model and the precision  $\tau_2$  of the besag model. The precision parameters are represented as

$$\theta = (\theta_1, \theta_2) = (\log \tau_1, \log \tau_2)$$

and the prior is defined on  $\theta$ .

## Specification

The bym model is specified inside the `f()` function as

```
f(<whatever>, model="bym", graph=<graph>,
  hyper=<hyper>, adjust.for.con.comp = TRUE)
```

The neighbourhood structure of `x` is passed to the program through the `graph` argument.

The option `adjust.for.con.comp` adjust the model if the graph has more than one connected compoment, and this adjustment can be disabled setting this option to `FALSE`. This means that `constr=TRUE` is interpreted as a sum-to-zero constraint on *each* connected component and the `rankdef` parameter is set accordingly.

## Hyperparameter spesification and default values

### hyper

#### theta1

```
name  log unstructured precision
short.name  prec.unstruct
prior  loggamma
param  1 5e-04
initial  4
fixed  FALSE
to.theta  function(x) log(x)
from.theta  function(x) exp(x)
```

#### theta2

```
name  log spatial precision
short.name  prec.spatial
prior  normal
param  0 5e-05
initial  4
fixed  FALSE
to.theta  function(x) log(x)
```

```
      from.theta  function(x) exp(x)
constr  TRUE
nrow.ncol  FALSE
augmented  TRUE
aug.factor  2
aug.constr  2
n.div.by
n.required  TRUE
set.default.values  TRUE
pdf  bym
```

### Example

For examples of application of this model see the Bym example in Volume I.

### Notes

None