The Berkson Measurement Error (MEB) model

Parametrization

This is an implementation of the Berksom measurement error model for a fixed effect. The observed covariate is w but it is x that goes into the linear predictor

$$\eta = \ldots + \beta x + \ldots \ ,$$

where $x = w + u$ and u is Gaussian with precision $\tau_u \cdot s$, and s is a vector of fixed scalings (default all are 1).

Hyperparameters

This model has 2 hyperparameters, $\theta = (\theta_1, \theta_2)$. The hyperparameter specification is as follows:

$$\theta_1 = \beta$$

and the prior is defined on θ_1,

$$\theta_2 = \log(\tau_u)$$

and the prior is defined on θ_2.

Specification

The MEB is specified inside the `f()` function as

```
f(w, [<weights>,] model="meb", hyper = <hyper>, scale = <s>)
```

Here, `w` are the observed covariates, and the fixed scaling of the observational precision is given in argument `scale`. If the argument `scale` is not given, then s is set to 1.

Note that only the unique values of `w` are used, so if two or more elements of `w` are *identical*, then they refer to the *same* element in the covariate x.

Hyperparameter specification and default values

hyper

theta1

name beta
short.name b
prior gaussian
param 1 0.001
initial 1
fixed FALSE
to.theta `function(x) x`
from.theta `function(x) x`

theta2

name prec.obs
short.name prec
prior loggamma
param 1 1e-04
initial 6.90775527898214

fixed FALSE
to.theta `function(x) log(x)`
from.theta `function(x) exp(x)`

constr FALSE

nrow.ncol FALSE

augmented FALSE

aug.factor 1

aug.constr

n.div.by

n.required FALSE

set.default.values FALSE

status experimental

pdf meb

Example

```
n = 100
beta = 2
w = rnorm(n)
prec.u = 100
prec.y = 1000
s = runif(n, min = 0.5, max = 1/0.5)
x = w + rnorm(n, sd = 1/sqrt(s*prec.u))
y = 1 + beta * x + rnorm(n, sd = 1/sqrt(prec.y))

formula = y ~ f(w, model="meb",
        hyper = list(prec = list(param = c(1, 0.01))))

r = inla(formula, data = data.frame(y, w, s),
        family = "gaussian")
```

Notes

- `INLA` provide the posterior of $\beta\widetilde{x}$ and NOT $\widetilde{x}$. The results comes in the order given by the sorted (from low to high) values of `x` and the field `ID` gives the mapping.