Skew-Normal

Parametrisation

The Skew-Normal distribution is

$$f(y) = 2\frac{\sqrt{w\tau}}{\sqrt{2\pi}} \exp\left(-\frac{1}{2}w\tau\,(y-\mu)^2\right)\ \Phi(a\ a_{\max}\,[w\tau\,(y-\mu)])$$

for continuously responses y where $\Phi(\cdot)$ is the cummulative distribution function for a standard Normal, and

μ: is the the location parameter

τ: is the inverse scale

w: is a fixed weight, $w > 0$,

a: is the shape parameter

$a_{\max}$: is the (fixed) maximum value of the shape paramter (added for stability reasons). Default value is 5.

Link-function

The location parameter is linked to the linear predictor by

$$\mu = \eta$$

Hyperparameters

The inverse scale is represented as

$$\theta_1 = \log\tau$$

and the prior is defined on θ_1.

The shape parameter is

$$a = 2\frac{\exp(\theta_2)}{1+\exp(\theta_2)} - 1$$

and the prior is defined on θ_2.

Specification

- family = `sn`
- Required arguments: y and w (keyword `weights`). The weights has default value 1.
- Optional control arguments: `sn.shape.max`. Default value is 5.0.

Hyperparameter spesification and default values

hyper

theta1

name log inverse scale
short.name iscale
initial 4

fixed FALSE

prior loggamma

param 1 5e-05

theta2

name logit skewness

short.name skew

initial 4

fixed FALSE

prior gaussian

param 0 10

to.theta `function(x, shape.max = 1) log((1+x/shape.max)/(1-x/shape.max))`

from.theta `function(x, shape.max = 1) shape.max*(2*exp(x)/(1+exp(x))-1)`

survival FALSE

discrete FALSE

Example

This is a simulated example requiring the package `sn`.

```
library(sn)
n = 1000
z = rnorm(n)
y = z + rsn(n, shape = 2)
formula = y ~ z
r = inla(formula, family = "sn", data = data.frame(z,y),
         control.data = list(sn.shape.max = 5.0))
summary(r)
```

Notes

None.