

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 cumulative 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
link default identity
pdf sn

```

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.family = list(sn.shape.max = 5.0))
summary(r)

```

Notes

None.