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/\text{shape.max})/(1-x/\text{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.data = list(sn.shape.max = 5.0))
summary(r)
Notes
```

None.