The Gamma-distribution

Parametrisation

The Gamma-distribution has the following density

$$\pi(y) = \frac{b^a}{\Gamma(a)} y^{a-1} \exp(-by), \qquad a > 0, \quad b > 0$$

where $\mathrm{E}(y) = \mu = a/b$ and $\mathrm{Var}(y) = 1/\tau = a/b^2$, where τ is the precision and μ is the mean. We will use the following parameterisation for the precision

$$\tau = (s\phi)/\mu^2$$

where ϕ is the precision parameter (or $1/\phi$ is the dispersion parameter) and $s > 0$ is a fixed scaling, which gives this density

$$\pi(y) = \frac{1}{\Gamma(s\phi)} \left(\frac{(s\phi)}{\mu}\right)^{(s\phi)} y^{(s\phi)-1} \exp\left(-(s\phi)\frac{y}{\mu}\right)$$

Link-function

The linear predictor η is linked to the mean μ using a default log-link

$$\mu = \exp(\eta)$$

Hyperparameter

The hyperparameter is the precision parameter ϕ, which is represented as

$$\phi = \exp(\theta)$$

and the prior is defined on θ.

Specification

- family = `gamma`
- Required arguments: y and s (argument `scale`)

The scalings have default value 1.

Hyperparameter spesification and default values

hyper

theta

name precision parameter
short.name prec
initial 4.60517018598809
fixed FALSE
prior loggamma
param 1 0.01
to.theta `function(x) log(x)`
from.theta `function(x) exp(x)`

survival FALSE

discrete FALSE

link default log

pdf gamma

Example

In the following example we estimate the parameters in a simulated example.

```
n = 1000
x = rnorm(n)
eta = 1 + x
mu = exp(eta)
prec.scale = runif(n, min = 0.5, max = 2)
prec.par = 1.2
a = prec.par * prec.scale
b = mu / (prec.par * prec.scale)
y = rgamma(n, shape = a, scale = b)
r = inla(y ~ 1 + x,  data = data.frame(y, x),
        scale = prec.scale, family = "gamma")
```

Notes

None.