The Gamma-distribution

Parametrisation

The Gamma-distribution has the following density

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

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 (for the regression model), 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"` for regression models and `family="gamma.surv"` for survival models.
- Required arguments: for `gamma.surv`, y (to be given in a format by using `inla.surv()`), and for `gamma`, y and s (default value 1).

The scalings s is **not** used for `family="gamma.surv"`.

Hyperparameter spesification and default values

doc The Gamma likelihood

hyper

theta

hyperid 58001
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 quantile

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hyper

theta1

hyperid 58101
name precision parameter
short.name prec
initial 0
fixed FALSE
prior loggamma
param 1 0.01
to.theta `function(x) log(x)`
from.theta `function(x) exp(x)`

theta2

hyperid 58102
name beta1
short.name beta1
initial -7
fixed FALSE
prior normal
param -4 100
to.theta `function(x) x`
from.theta `function(x) x`

theta3

hyperid 58103
name beta2
short.name beta2
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta4

hyperid 58104
name beta3
short.name beta3
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta5

hyperid 58105
name beta4
short.name beta4
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta6

hyperid 58106
name beta5
short.name beta5
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta7

hyperid 58107
name beta6
short.name beta6
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta8

hyperid 58108
name beta7
short.name beta7
initial 0

fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta9
hyperid 58109
name beta8
short.name beta8
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta10
hyperid 58110
name beta9
short.name beta9
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta11
hyperid 58111
name beta10
short.name beta10
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

survival TRUE

discrete FALSE

status experimental

link default log neglog quantile

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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.