

The Gamma-distribution

Parametrisation

The Gamma-distribution has the following density

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

where $E(y) = \mu = a/b$ and $\text{Var}(y) = 1/\tau = a/b^2$, 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"` 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 .

The scalings have default value 1.

Hyperparameter specification 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

pdf gammasurv

```

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.