

## Log-gamma prior

### Parametrization

The Gamma distribution has density

$$\pi(\tau) = \frac{b^a}{\Gamma(a)} \tau^{a-1} \exp(-b \tau) \quad (1)$$

for positive  $\tau$  where:

$a > 0$  is the shape parameter

$b > 0$  is the inverse-scale parameter

The mean of  $\tau$  is  $a/b$  and the variance is  $a/b^2$ .

The variable  $\theta$  has a *log-Gamma* distribution if  $\tau = \exp \theta$  has a Gamma distribution.

### Specification

The Log-Gamma prior for the hyperparameters is specified inside the `f()` function as following:

```
f(<whatever>,prior=loggamma,param=c(<a>,<b>))
```

In the case where there is one hyperparameter for that particular f-model. In the case where we want to specify the prior for the hyperparameter of an observation model, for example the negative Gaussian, the the prior specification will appear inside the `control.data()`-argument; see the following example for illustration.

### Example

In the following example we estimate the parameters in a simulated example with gaussian responses and assign the hyperparameter (the precision parameter), a log-Gamma prior with parameters  $a = 0.1$  and  $b = 0.1$

```
n=100
z=rnorm(n)
y=rnorm(n,z,1)

data=list(y=y,z=z)
formula=y~1+z
result=inla(formula,family="gaussian",data=data,
            control.data=list(prior="loggamma",param=c(0.1,0.1)))
```

### Notes

None