

## Gaussian

### Parametrisation

The Gaussian distribution is

$$f(y) = \frac{\sqrt{s\tau}}{\sqrt{2\pi}} \exp\left(-\frac{1}{2}s\tau(y-\mu)^2\right)$$

for continuously responses  $y$  where

$\mu$ : is the the mean

$\tau$ : is the precision

$s$ : is a fixed scaling,  $s > 0$ .

### Link-function

The mean and variance of  $y$  are given as

$$\mu \quad \text{and} \quad \sigma^2 = \frac{1}{s\tau}$$

and the mean is linked to the linear predictor by

$$\mu = \eta$$

### Hyperparameters

The precision is represented as

$$\theta = \log \tau$$

and the prior is defined on  $\theta$ .

### Specification

- family = gaussian
- Required arguments:  $y$  and  $s$  (argument **scale**)

The scalings have default value 1.

### Hyperparameter spesification and default values

**doc** The Gaussian likelihood

**hyper**

**theta**

**hyperid** 65001  
**name** log precision  
**short.name** prec  
**initial** 4  
**fixed** FALSE  
**prior** loggamma  
**param** 1 5e-05

```
to.theta function(x) log(x)
from.theta function(x) exp(x)
```

**survival** FALSE

**discrete** FALSE

**link** default identity logit cauchit log logoffset

**pdf** gaussian

## Example

In the following example we estimate the parameters in a simulated example with Gaussian responses, giving  $\tau$  a Gamma-prior with parameters (1, 0.01) and initial value (for the optimisations) of  $\exp(2.0)$ .

```
n=100
a = 1
b = 1
z = rnorm(n)
eta = a + b*z
tau = 100
scale = exp(rnorm(n))
prec = scale*tau
y = rnorm(n, mean = eta, sd = 1/sqrt(prec))

data = list(y=y, z=z)
formula = y ~ 1+z
result = inla(formula, family = "gaussian", data = data,
              control.family = list(hyper = list(
                prec = list(
                  prior = "loggamma",
                  param = c(1.0,0.01),
                  initial = 2))),
              scale=scale, keep=TRUE)
summary(result)
```

## Notes

None.