

The Gammacount-distribution

Parametrisation

The Gammacount-distribution is a discrete probability distribution on $0, 1, 2, 3, \dots$, where

$$\text{Prob}(y) = G(y\alpha, \beta) - G((y+1)\alpha, \beta)$$

where

$$G(a, b) = \frac{1}{\Gamma(a)} \int_0^b x^{a-1} \exp(-x) dx.$$

The reciprocal of the expected waiting time depends on the linear predictor

$$(\alpha/\beta)^{-1} = \exp(\eta),$$

so that high values of η corresponds to high values of y , and low values of η corresponds to low values of y .

Link-function

The linear predictor η is linked to the reciprocal of the expected waiting time, by a log-link,

$$(\alpha/\beta)^{-1} = \exp(\eta).$$

Hyperparameter

The hyperparameter is the parameter α , which is represented as

$$\alpha = \exp(\theta)$$

and the prior is defined on θ .

Specification

- family = `gammacount`
- Required arguments: y

Hyperparameter spesification and default values

hyper

theta

name log alpha

short.name alpha

initial 0

fixed FALSE

prior loggamma

param 10 10

to.theta function(x) log(x)

from.theta function(x) exp(x)

survival FALSE

discrete FALSE

link default log

status experimental

pdf gammacount

Example

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

```
G = function(Alpha, Beta) {
  return (pgamma(Beta, shape=Alpha, rate=1))
}

n = 1000
x = rnorm(n)
eta = 1 + x
alpha = 1.5
T = 1
m = 100
y = numeric(n)
prob = numeric(m+1)

for(i in 1:n) {

  ## compute the discrete probability distribution and
  ## then sample from it
  for(j in 1:m) {
    yy = j-1
    beta = alpha * exp(eta[i])
    prob[j] = (G(yy*alpha, beta*T) -
               G((yy+1)*alpha, beta*T))
  }
  y[i] = sample(0:m, size=1, prob = prob)
}

r = (inla(y ~ 1 + x,
          data = data.frame(y, x),
          family = "gammacount"))
summary(r)
```

Notes

None.