CBinomial

Parametrisation

The clustered/clumped-Binomial distribution arrives from a transformation of Binomial observations. Let z be Binomial distributed

$$\text{Prob}(z) = \binom{n}{z} p^n (1-p)^{n-z}$$

for $z = 0, 1, 2, \ldots, n$, where

n**:** number of trials.

p**:** probability of success in each trial.

Then binary CBinomial distribution is the distribution for y, where

$$y = \begin{cases} 0 & z = 0 \\ 1 & z > 0 \end{cases}$$

It then follows that $\text{Prob}(y = 0) = (1-p)^n$ and $\text{Prob}(y = 1) = 1 - (1-p)^n$, i.e. y is Binomial distributed with size 1 and probability for success $1 - (1-p)^n$. In general we have k independent experiments, $y_1, \ldots, y_k$, and let $w = y_1 + \cdots + y_k$. Then w is CBinomial(k, n, p) distributed, i.e. w is Binomial$(k, 1 - (1-p)^n)$.

Link-function

The probability p is by default linked to the linear predictor by

$$p(\eta) = \frac{\exp(\eta)}{1 + \exp(\eta)}$$

but other choices are also available.

Hyperparameters

None.

Hyperparameter spesification and default values

hyper

survival FALSE

discrete TRUE

link default logit probit cloglog

status experimental

pdf cbinomial

Specification

- family = `cbinomial`
- Required arguments: the response w and the parameters k and n (keyword `Ntrials`, where the argument is a **two-column matrix**: `Ntrials = cbind(k,n)`)

Example

In the following example we estimate the parameters in a simulated example with CBinomial responses.

```
N=1000
a = -1
b = 1
z = rnorm(N)
eta = a + b*z
n = sample(c(1,5,10,15), size=N, replace=TRUE)
p = exp(eta)/(1 + exp(eta))
prob = 1.0 - (1-p)^n
k = sample(c(1,5,10,15), size=N, replace=TRUE)
y = rbinom(N, size=k, prob = prob)

data = list(y=y,z=z)
formula = y ~ 1+z
result = inla(formula, family = "cbinomial", data = data,
        Ntrials=cbind(k, n), verbose=TRUE)
summary(result)
```

Notes

None.