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 the 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 $1 - (1-p)^n$.

Link-function

The probability p is linked to the linear predictor by

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

Hyperparameters

None.

Specification

- family = `binomial`
- Required arguments: y and n (keyword `Ntrials`)

Example

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

```
n=100
a = -1
b = 1
z = rnorm(n)
eta = a + b*z
Ntrials = sample(c(1,5,10,15), size=n, replace=TRUE)
prob = exp(eta)/(1 + exp(eta))
yy = rbinom(n, size=Ntrials, prob = prob)
y = as.numeric(yy != 0)

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

Notes

None.