Gompertz

Parametrisation

The Gompertz distribution has log survial function

$$\log S(y) = -\frac{\mu}{\alpha}\left(\exp(\alpha y) - 1\right)$$

for response $y \geq 0$, $\mu > 0$ and $\alpha > 0$. The cummulative distribution function and the density then follows as

$$F(y) = 1 - \exp\left[-\frac{\mu}{\alpha}\left(\exp(\alpha y) - 1\right)\right]$$

and

$$f(y) = \mu \exp\left[\alpha y - \frac{\mu}{\alpha}\left(\exp(\alpha y) - 1\right)\right].$$

Link-function

The parameter μ is linked to the linear predictor η as:

$$\mu = \exp(\eta)$$

Hyperparameters

The shape parameter α is represented as

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

and the prior is defined on θ. The constant S currently set to 0.1 to avoid numerical instabilities in the optimization, since small changes of α can make a huge difference.

Specification

- `family="gompertz"` for regression models and `family="gompertz.surv"` for survival models.
- Required arguments: y (to be given in a format by using `inla.surv()` for survival models)

Hyperparameter spesification and default values

doc gompertz distribution

hyper

theta

hyperid 105101
name shape
short.name alpha
initial -1
fixed FALSE
prior normal
param 0 1
to.theta `function(x, sc = 0.1) log(x) / sc`
from.theta `function(x, sc = 0.1) exp(sc * x)`

status experimental

survival FALSE

discrete FALSE

link default log neglog

pdf gompertz

doc gompertz distribution

hyper

theta1

hyperid 106101
name shape
short.name alpha
initial -10
fixed FALSE
prior normal
param 0 1
to.theta `function(x, sc = 0.1) log(x) / sc`
from.theta `function(x, sc = 0.1) exp(sc * x)`

theta2

hyperid 106102
name beta1
short.name beta1
initial -5
fixed FALSE
prior normal
param -4 100
to.theta `function(x) x`
from.theta `function(x) x`

theta3

hyperid 106103
name beta2
short.name beta2
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta4

hyperid 106104
name beta3
short.name beta3
initial 0

fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta5

hyperid 106105
name beta4
short.name beta4
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta6

hyperid 106106
name beta5
short.name beta5
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta7

hyperid 106107
name beta6
short.name beta6
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta8

hyperid 106108
name beta7
short.name beta7
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`

from.theta `function(x) x`

theta9

hyperid 106109
name beta8
short.name beta8
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta10

hyperid 106110
name beta9
short.name beta9
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

theta11

hyperid 106111
name beta10
short.name beta10
initial 0
fixed FALSE
prior normal
param 0 100
to.theta `function(x) x`
from.theta `function(x) x`

status experimental

survival TRUE

discrete FALSE

link default log neglog

pdf gompertz

Example

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

```
library(flexsurv)
library(INLA)

n <- 1000
alpha <- 1.0
intercept <- 1.1
beta <- 1.2
x <- rnorm(n, sd = 0.2)
eta <- intercept + beta*x
mu <- exp(eta)
event <- rep(1,n)
y <- rgompertz(n, rate = mu, shape = alpha)

r <- inla(y ~ 1 + x,
          family ="gompertz", data=data.frame(y, x))
r.surv <- inla(inla.surv(y, event) ~ 1 + x,
               family ="gompertzsurv", data=data.frame(y, event, x))

## should be 'small'
print(r$mlik - r.surv$mlik)
```

Notes