

Generalised Extreme Value (GEV) distribution

Parametrisation

The GEV distribution is defined through the cummulative distribution function

$$F(y; \eta, \tau, \xi) = \exp \left(- \left[1 + \xi \sqrt{\tau s} (y - \eta) \right]^{-1/\xi} \right)$$

for

$$1 + \xi \sqrt{\tau s} (y - \eta) > 0$$

and for a continuously response y where

η : is the linear predictor

τ : is the “precision”

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

Link-function

The linear predictor is given in the parameterisation of the GEV distribution.

Hyperparameters

The GEV-models has two hyperparameters. The “precision” is represented as

$$\theta_1 = \log \tau$$

and the prior is defined on θ_1 . The shape parameter ξ is represented as

$$\xi = \xi_s \theta_2$$

where $\xi_s > 0$ is a *chosen fixed scaling*, and the prior is defined on θ_2 ¹

Specification

- family = `gev`
- Required arguments: y and s (keyword `scale`)
- The scaling ξ_s is given by the argument `gev.xi.scale` and is default set to 0.01.

The weights has default value 1.

Hyperparameter spesification and default values

hyper

theta1

name log precision

short.name prec

initial 4

fixed FALSE

¹The ξ_s parameter is there for numerical reasons only, as the natural “scale” of ξ is small, and the scaling makes the natural scale of θ_2 similar to other θ ’s. The output from INLA reports the parameter ξ .

```

    prior loggamma
    param 1 5e-05
    to.theta function(x) log(x)
    from.theta function(x) exp(x)
  theta2
    name gev parameter
    short.name gev
    initial 0
    fixed FALSE
    prior gaussian
    param 0 6.25
    to.theta function(x) x
    from.theta function(x) x

survival FALSE

discrete FALSE

link default identity

pdf gev

```

Example

In the following example, we estimate the parameters of the GEV distribution on some simulated data.

```

rgev = function(n=1, xi = 0, mu = 0.0, sd = 1.0) {
  u = runif(n)
  if (xi == 0) {
    x = -log(-log(u))
  } else {
    x = ((-log(u))^-xi - 1.0)/xi
  }
  return (x*sd + mu)
}

n = 100
z = rnorm(n)
sd.y = 0.5
xi = 0
y = 1+z + rgev(n, xi=xi, sd = sd.y)

formula = y ~ 1 + f(inla.group(z), model="rw1")
data = data.frame(y,z)

r = inla(formula, data = data, family = "gev",
  control.family = list(gev.scale.xi = 0.01,
    ## just to show how to set an initial value
    hyper = list(prec=list(initial=2))))

```

Notes

None.