

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

$$\theta_2 = \xi$$

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.scale.xi` and is default set to 0.1.

The weights has default value 1.

¹Internally, the parameter θ_2 is scaled with a fixed scaling ξ_s (default 0.1), to improve the numerics as the natural “scale” of ξ is small. For this reason the $\theta_2 (= \xi)$ reported in `result$mode$theta` will appear as θ_2/ξ_s . For the same reason, if you define the mode using `control.mode = list(theta = ..., ...)` then the element representing θ_2 should be given as θ_2/ξ_s .

Hyperparameter specification and default values

doc The Generalized Extreme Value likelihood

hyper

theta1

hyperid 76001
name log precision
short.name prec
output.name precision for GEV observations
output.name.intern log precision for GEV observations
initial 4
fixed FALSE
prior loggamma
param 1 5e-05
to.theta function(x) log(x)
from.theta function(x) exp(x)

theta2

hyperid 76002
name tail parameter
short.name tail
output.name tail parameter for GEV observations
output.name.intern tail parameter for GEV observations
initial 0
fixed FALSE
prior gaussian
param 0 25
to.theta function(x) x
from.theta function(x) x

survival FALSE

discrete FALSE

link default identity

status disabled: Use likelihood model 'bgev' instead; see inla.doc('bgev')

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 = 300
z = rnorm(n)
sd.y = 0.5
xi = 0.2
y = 1+z + rgev(n, xi=xi, sd = sd.y)

r = inla(y ~ 1 + z, data = data.frame(y, z), family = "gev",
        control.family = list(gev.scale.xi = 0.01))
summary(r)

```

Notes

None.