

## Student- $t$ with strata

### Parametrization

This model is an extension to the Student- $t$ , where different strata have their own precisions but the degrees-of-freedom parameter is common.

The Student- $t$  likelihood is defined so that

$$\sqrt{w \tau_s}(y - \eta) \sim T_\nu$$

for continuous response  $y$  where

$\tau_s$  : is the precision parameter, depending on the stratum  $s$

$w$  : is a fixed weight  $w > 0$

$\eta$  : is the linear predictor

$T_\nu$  : is a standardized Student- $t$  with  $\nu$  degrees of freedom such that its variance is 1 for any value of  $\nu$ , common for all strata.

### Link-function

Identity

### Hyperparameters

This likelihood  $N_s + 1$  hyperparameters

$$\begin{aligned}\theta_1 &= \log(\nu - 2) \\ \theta_2 &= \log(\tau_1) \\ \theta_3 &= \log(\tau_2) \\ &\text{etc....} \\ \theta_{N_s+1} &= \log(\tau_{N_s})\end{aligned}$$

where  $N_s$  is the number of strata defined. The current implementation limits  $N_s$  to 10, but this is easy to fix if needed. The prior is defined on  $\theta = (\theta_1, \theta_2, \dots)$ .

### Specification

- `family="tstrata"`
- Required argument:  $y$  and  $w$  (keyword `weights`, default to 1), and `inla()`-argument “`strata`” which is either a integer vector with elements  $1, 2, \dots, N_s$ , or factor for which the levels defines the strata.

### Hyperparameter specification and default values

`doc` A stratified version of the Student- $t$  likelihood

`hyper`

`theta1`

`hyperid 101001`

```

name log degrees of freedom
short.name dof
output.name.intern dof_intern for tstrata
output.name degrees of freedom for tstrata
initial 4
fixed FALSE
prior pc.dof
param 15 0.5
to.theta function(x) log(x - 5)
from.theta function(x) 5 + exp(x)
theta2
  hyperid 101002
  name log precision1
  short.name prec1
  output.name Prec for tstrata strata
  output.name.intern Log prec for tstrata strata
  initial 2
  fixed FALSE
  prior loggamma
  param 1 5e-05
  to.theta function(x) log(x)
  from.theta function(x) exp(x)
theta3
  hyperid 101003
  name log precision2
  short.name prec2
  output.name Prec for tstrata strata[2]
  output.name.intern Log prec for tstrata strata[2]
  initial 2
  fixed FALSE
  prior loggamma
  param 1 5e-05
  to.theta function(x) log(x)
  from.theta function(x) exp(x)
theta4
  hyperid 101004
  name log precision3
  short.name prec3
  output.name Prec for tstrata strata[3]
  output.name.intern Log prec for tstrata strata[3]
  initial 2
  fixed FALSE
  prior loggamma
  param 1 5e-05

```

```

    to.theta function(x) log(x)
    from.theta function(x) exp(x)
theta5
  hyperid 101005
  name log precision4
  short.name prec4
  output.name Prec for tstrata strata[4]
  output.name.intern Log prec for tstrata strata[4]
  initial 2
  fixed FALSE
  prior loggamma
  param 1 5e-05
  to.theta function(x) log(x)
  from.theta function(x) exp(x)
theta6
  hyperid 101006
  name log precision5
  short.name prec5
  output.name Prec for tstrata strata[5]
  output.name.intern Log prec for tstrata strata[5]
  initial 2
  fixed FALSE
  prior loggamma
  param 1 5e-05
  to.theta function(x) log(x)
  from.theta function(x) exp(x)
theta7
  hyperid 101007
  name log precision6
  short.name prec6
  output.name Prec for tstrata strata[6]
  output.name.intern Log prec for tstrata strata[6]
  initial 2
  fixed FALSE
  prior loggamma
  param 1 5e-05
  to.theta function(x) log(x)
  from.theta function(x) exp(x)
theta8
  hyperid 101008
  name log precision7
  short.name prec7
  output.name Prec for tstrata strata[7]
  output.name.intern Log prec for tstrata strata[7]

```

```

    initial 2
    fixed FALSE
    prior loggamma
    param 1 5e-05
    to.theta function(x) log(x)
    from.theta function(x) exp(x)
theta9
    hyperid 101009
    name log precision8
    short.name prec8
    output.name Prec for tstrata strata[8]
    output.name.intern Log prec for tstrata strata[8]
    initial 2
    fixed FALSE
    prior loggamma
    param 1 5e-05
    to.theta function(x) log(x)
    from.theta function(x) exp(x)
theta10
    hyperid 101010
    name log precision9
    short.name prec9
    output.name Prec for tstrata strata[9]
    output.name.intern Log prec for tstrata strata[9]
    initial 2
    fixed FALSE
    prior loggamma
    param 1 5e-05
    to.theta function(x) log(x)
    from.theta function(x) exp(x)
theta11
    hyperid 101011
    name log precision10
    short.name prec10
    output.name Prec for tstrata strata[10]
    output.name.intern Log prec for tstrata strata[10]
    initial 2
    fixed FALSE
    prior loggamma
    param 1 5e-05
    to.theta function(x) log(x)
    from.theta function(x) exp(x)

```

```
survival FALSE
```

**discrete** FALSE

**link** default identity

**pdf** tstrata

**Example**

**Notes**

None