Gaussian model for Stochastic volatility

Parametrization

The Gaussian likelihood for stochastic volatility models is defined as:

$$y|\ldots = \sigma\epsilon$$

where

$$\epsilon \sim \mathcal{N}(0, 1)$$

Link-function

The squared of the scale parameter σ is linked to the linear predictor η as:

$$\sigma^2 = \exp(\eta) + 1/\tau$$

where $1/\tau$ is an possible offset in the variance.

Hyperparameters

This likelihood has one hyperparmeter

$$\theta = \log(\tau)$$

and the prior is defined on θ.

See `Notes` for more info about the possible offset in the variance, as default $1/\tau = 0$ and fixed.

Specification

- family = `stochvol`
- Required argument: y.

Hyperparameter spesification and default values

hyper

theta

name log precision
short.name prec
initial 500
fixed TRUE
prior loggamma
param 1 0.005
to.theta `function(x) log(x)`
from.theta `function(x) exp(x)`

survival FALSE

discrete FALSE

link default log

pdf stochvolgaussian

Example

In the following example we specify the likelihood for the stochastic volatility model to be Gaussian

```
#simulated data
n=500
phi=0.53
eta=rep(0.1,n)
for(i in 2:n)
  eta[i]=0.1+phi*(eta[i-1]-0.1)+rnorm(1,0,0.6)
y=exp(eta/2)*rnorm(n)
time=1:n
data=list(ret=y,time=time)

#fit the model
formula=ret~f(time,model="ar1",
              hyper = list(prec = list(param=c(1,0.001))))
result=inla(formula,family="stochvol",data=data)
```

Notes

The default setting treat θ as fixed and with an initial value so that $1/\tau = 0$. If θ is random, then you *must* also give it a reasonable initial value.