

Gaussian model for Stochastic volatility

Parametrization

The Gaussian likelihood for stochastic volatility models is defined as:

$$y|\dots = \sigma\epsilon$$

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 hyperparameter

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

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

doc The Gaussian stochvol likelihood

hyper

theta

hyperid 82001

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.