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

doc `The Gaussian stochvol likelihood`

hyper

theta

hyperid `82001`
name `log precision`
short.name `prec`
output.name `Offset precision for stochvol`
output.name.intern `Log offset precision for stochvol`
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.