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 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.

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 confiuration fixed θ so that $\tau = 0$. If θ is random, then you must also set a reasonable initial value.