Log-normal model for Stochastic volatility

Parametrization

The likelihood is

$$y_i|\ldots \ \sim \ N(c - \frac{1}{2}\sigma_i^2, \sigma_i^2)$$

where the mean depends on the variance, and c is an optional hyperparameter.

Link-function

The variance is linked to the linear predictor as η_i as:

$$\log(\sigma_i^2) = \eta_i$$

Hyperparameters

This likelihood has one hyperparmeter

$$\theta = c$$

and the prior is defined on θ. By default, c is fixed to $c = 0$.

Specification

- `family="stochvolln"`

Hyperparameter spesification and default values

doc `The Log-Normal stochvol likelihood`

hyper

    theta

        hyperid `82011`
        name `offset`
        short.name `c`
        output.name `Mean offset for stochvolln`
        output.name.intern `Mean offset for stochvolln`
        initial `0`
        fixed `FALSE`
        prior `normal`
        param `0 10`
        to.theta `function(x) x`
        from.theta `function(x) x`

survival `FALSE`

discrete `FALSE`

link `default log`

pdf `stochvolln`

Example

```
n <- 1000
s <- 0.5
rho <- 0.95
x <- s * as.numeric(scale(arima.sim(n, model = list(ar = rho))))
v <- exp(x) ## variance
cc <- 0.5 * mean(v)

y <- rnorm(n, mean = cc - 0.5 * v, sd = sqrt(v))

r <- inla(y ~ -1 + f(time, model = "ar1",
                     hyper = list(rho = list(prior = "pc.cor1",
                                             param = c(0.9, 0.5)),
                                  prec = list(prior = "pc.prec",
                                              param = c(1, 0.01),
                                              initial = 0))),
          data = list(y = y, n = n, time = 1:n),
          family = "stochvolln",
          verbose = TRUE, safe = F, keep = T)

par(mfrow = c(3, 2))
plot(y, type = "l", main = "y")
plot(x, type = "l", main = "x and x.est")
lines(r$summary.linear.predictor$mean, col = "blue")

m <- inla.tmarginal(function(x) sqrt(1/x), r$marginals.hyperpar[["Precision for time"]])
plot(m, type = "l", lwd = 3, main = "sd")
abline(v=s)

m <- inla.smarginal(r$marginals.hyperpar[["Rho for time"]])
plot(m, type = "l", lwd = 3, main = "rho")
abline(v=rho)

m <- inla.smarginal(r$marginals.hyperpar[["Mean offset for stochvolln"]])
plot(m, type = "l", lwd = 3, main = "c")
abline(v=cc)
```