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# hesvasicek2d

## 1 Description

The Heston-Vasicek2d model generalizes the previous model in the fact that the quantity  $\eta$  is a diffusion model itself. So, the underlying process is now 4-dimensional and is given by: the share price  $S$ , the volatility process  $V$ , the interest rate  $r$  and the continuous dividend  $\eta$ . Under the risk neutral measure, the dynamics are governed by the stochastic differential equation system

$$\begin{aligned}\frac{dS_t}{S_t} &= (r_t - \eta_t)dt + \sqrt{V_t} dZ_t, \\ dV_t &= \kappa_V(\theta_V - V_t)dt + \sigma_V \sqrt{V_t} dW_t^1, \\ dr_t &= \kappa_r(\theta_r - r_t)dt + \sigma_r dW_t^2, \\ d\eta_t &= \kappa_\eta(\theta_\eta - \eta_t)dt + \sigma_\eta dW_t^3,\end{aligned}$$

with initial data  $S_0, V_0, r_0, \eta_0 > 0$ , where  $Z$ ,  $W^1$ ,  $W^2$  and  $W^3$  are suitable and possibly correlated Brownian motions. Note that the processes  $r$  and  $\eta$  evolve as a generalized OU process.

## 2 Code Implementation

```
#ifndef _HESVASICEK2D_H
#define _HESVASICEK2D_H

#include "optype.h"
#include "var.h"

#define TYPEMOD HESVASICEK2D

/* HESVASICEK2D World */
```

```
typedef struct TYPEMOD
{
    VAR T;
    VAR S0;
    VAR vrq;
    VAR kappa;
    VAR theta;
    VAR sigma;
    VAR rho;

} TYPEMOD;

#endif
```