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# hesvasicek1d

## 1 Description

The Heston Vasicek model concerns with cases where the volatility  $V$  and the interest rate  $r$  are assumed to be stochastic. The dynamics under the risk neutral measure of the share price  $S$  and the volatility process  $V$  are governed by the stochastic differential equation system

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

with initial data  $S_0 > 0$ ,  $V_0 > 0$  and  $r_0 > 0$ , where  $Z$ ,  $W^1$  and  $W^2$  are suitable and possibly correlated Brownian motions. Recall that  $V_t$  is a Cox-Ingersoll-Ross (hereafter CIR) process whereas  $r_t$  is a generalized Ornstein Uhlenbeck (hereafter OU) process.

## 2 Code Implementation

```
#ifndef _HESVASICEK1D_H
#define _HESVASICEK1D_H

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

#define TYPEMOD HESVASICEK1D

/* HESVASICEK1D World */
typedef struct TYPEMOD
{
```

```
VAR T;  
VAR S0;  
VAR divid;  
VAR r0;  
VAR kr;  
VAR thetar;  
VAR Sigmar;  
VAR V0;  
VAR kV;  
VAR thetaV;  
VAR SigmaV;  
VAR RhoSr;  
VAR RhoSV;  
VAR RhorV;  
  
} TYPEMOD;  
  
#endif
```