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heshw1d

1 Description

The Heston Hull-White 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

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

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: here θ_r is not constant but it is a deterministic function which is completely determined by the market values of the zero-coupon bonds.

2 Code Implementation

```
#ifndef _HESHW1D_H
#define _HESHW1D_H

#include "optype.h"
#include "var.h"
#include "error_msg.h"
#include "enums.h"

#define TYPEMOD HESHW1D
```

```
/* HESHW1D World */
typedef struct TYPEMOD
{
    VAR T;
    VAR SO;
    VAR divid;
    VAR flat_flag;
    VAR kr;
    VAR Sigmar;
    VAR VO;
    VAR kV;
    VAR thetaV;
    VAR SigmaV;
    VAR RhoSr;
    VAR RhoSV;
    VAR RhorV;

} TYPEMOD;

extern double MOD(GetYield)(TYPEMOD *pt);
extern char *MOD(GetCurve)(TYPEMOD *pt);

#endif
```