

heshw2d

1 Description

The Heston-Hull-White2d model generalizes the previous model in the fact that the quantity η 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 η . Under the risk neutral measure, the dynamics are governed by the stochastic differential equation system

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

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 η evolve as a generalized OU process: θ_r and θ_η are deterministic functions of the time.

2 Code Implementation

```
#ifndef _HESHW2D_H
#define _HESHW2D_H

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

#define TYPEMOD HESHW2D
```

```

/* HESHW2D World */
typedef struct TYPEMOD
{
    VAR T;
    VAR S0;
    VAR flat_flag_rd;
    VAR flat_flag_rf;
    VAR kappa;
    VAR v0;
    VAR theta;
    VAR sigma;
    VAR rho;

} TYPEMOD;

extern double MOD(GetYield_rd)(TYPEMOD *pt);
extern char *MOD(GetCurve_rd)(TYPEMOD *pt);
extern double MOD(GetYield_rf)(TYPEMOD *pt);
extern char *MOD(GetCurve_rf)(TYPEMOD *pt);

#endif

```