Source | Model Presentation

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 S0;
  VAR divid;
  VAR flat_flag;
  VAR kr;
  VAR Sigmar;
  VAR V0;
  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
```