Source | Model Presentation

fps2d

1 Description

We consider a two-factor stochastic volatility model (S_t, Y_t, Z_t), where S_t is the underlying price, and Y_t and Z_t are correlated diffusion processes. Under the risk-neutral probability measure, the model is described by the following equations:

$$\begin{aligned}
dS_t &= rS_t dt + \sigma_t S_t dW_t^S, \\
\sigma_t &= f(Y_t, Z_t), \\
dY_t &= \left(\alpha(m_f - Y_t) - \nu_f\sqrt{2\alpha}ł_f(Y_t, Z_t)\right) dt \\
&\quad + \nu_f\sqrt{2\alpha}\left(\rho_1 dW_t^S + \sqrt{1-\rho_1 2}dW_t^Y\right), \\
dZ_t &= \left(\delta(m_s - Z_t) - \nu_s\sqrt{2\delta}ł_s(Y_t, Z_t)\right) dt \\
&\quad + \nu_s\sqrt{2\delta}\left(\rho_2 dW_t^S + \rho_{12} dW_t^Y + \sqrt{1-\rho_2 2-\rho_{12}2}dW_t^Z\right).
\end{aligned}$$

Here (W_t^S, W_t^Y, W_t^Z) are independent standard Brownian motions, and the correlation coefficients ρ_1, ρ_2, and ρ_{12} satisfy $-1 < \rho_1 < 1$, $\rho_2 2 + \rho_{12} 2 < 1$ respectively.

2 Code Implementation

```
#ifndef _FPS2D_H
#define _FPS2D_H

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

```
#define TYPEMOD FPS2D

/*2D Fouque Papanicolau Sircar World*/
typedef struct TYPEMOD
{
  VAR T;
  VAR S0;
  VAR Divid;
  VAR R;
  VAR InitialSlow;
  VAR InitialFast;
  VAR SigmaSlow;
  VAR SigmaFast;
  VAR MeanReversionSlow;
  VAR MeanReversionFast;
  VAR LongRunVarianceSlow;
  VAR LongRunVarianceFast;
  VAR Rho1;
  VAR Rho2;
  VAR Rho12;
} TYPEMOD;


#endif
```