

bscir2d

1 Description

We consider, under the risk-neutral probability measure, the following dynamics for the equity value

$$\frac{dS(t)}{S(t)} = r(t)dt + \sigma_S dZ_S(t), \quad S(0) = S_0 > 0, \quad (1)$$

where $r(t)$ is the short interest rate, σ_S is the constant stock price volatility and $Z_S(t)$ is a standard Brownian motion.

The risk-neutralized process for the short rate is described, as in the Cox-Ingersoll-Ross model [?] (CIR hereafter), by the following stochastic differential equation

$$dr(t) = k[\theta - r(t)]dt + \sigma_r \sqrt{r(t)} dZ_r(t), \quad r(0) = r_0 > 0, \quad (2)$$

where k is a constant representing the reversion speed, θ is the long term reversion target, σ_r is a constant and $Z_r(t)$ is a standard Brownian motion whose correlation with $Z_S(t)$ is ρ .

2 Code Implementation

```
#ifndef _BSCIR2D_H
#define _BSCIR2D_H

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

#define TYPEMOD BSCIR2D
```

```
/* BSCIR2D World */
typedef struct TYPEMOD
{
    VAR T;
    VAR S0;
    VAR Sigma;
    VAR r0;
    VAR k;
    VAR SigmaR;
    VAR theta;
    VAR Rho;
    //VAR Mortality;
} TYPEMOD;

#endif
```

References