fd_gauss_cir1d_capfloor

Input parameters:

- Space StepNumber N
- Time StepNumber M

Output parameters:

- Price

The stochastic differential equation representing the short rate is given by

$$dr_t = k(\theta - r_t)dt + \sigma\sqrt{r_t}dW(t)$$

The price of the zero-coupon bond is solution of the following PDE

$$u_t + \frac{1}{2}\sigma^2 r u_{rr} + [k(\theta - r)]u_r - ru = 0u(r, T, T) = 1$$

that we solve using standard Crank-Nicholson scheme. We apply boundary condition at $r = 0$ solving

$$u_t + +[k(\theta)]u_r = 0$$

using a one-sided finite difference scheme. The price of the option is obtained solving the same PDE with boundary condition at the maturity of the option T, the price of the Zero Coupon Bond. A cap(floor) is equivalent to a portfolio of European zero-coupon Put(Call)-Options.

References