fd_gauss_vasicek1d_swaption

Input parameters:

- Space StepNumber N_r
- Time StepNumber M

Output parameters:

- Price

The stochastic differential equation representing the short rate is given by

$$dr_t = k(\theta - r_t)dt + \sigma\, dW(t)$$

The price of the zero-coupon bond with maturity S>T is solution of the following PDE

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

that we solve using standard Crank-Nicholson. We apply Dirichlet boundary conditions at $r = r_{min}$ and $r = r_{max}$. 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. The price of the coupon bearing is obtained as linear combination of zero-coupon prices, taking in account properly of the coupon adjustment. A swaption can also be seen as an option of strike 1 over a certain coupon bearing.