Project 8

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Q1- Vasicek Model

(a) The price (at time t=0) of the given pure discount bond with face value $1000 observed through Monte Carlo Simulations is **$975.7497**

(b) The price (at time t=0) of the given coupon paying bond through Monte Carlo simulations is **$1048.2174**

(c) The price (at time t=0) of a European Call option maturing at time t=0.25 on the given pure discount bond with face value $1000 through Monte Carlo simulations is **$8.8850**

(d) The price (at time t=0) of a European Call option maturing at time t=0.25 on the given coupon paying bond through Monte Carlo simulations is **$82.1190**

(e) The price (at time t=0) of a European Call option maturing at time t=0.25 on the given coupon paying bond through Explicit formula is **$82.4917**

Comments: It is observed that the value obtained through Monte Carlo simulations is close to that obtained through explicit formula. This shows that the price of an option on a bond can be obtained even if the explicit formula is not known.

Q2- Cox-Ingersoll-Ross Model

(a) The price (at time t=0) of a European Call option maturing at time t=0.5 on the given pure discount bond with face value $1000 through Monte Carlo Simulations is **$0.3921**

(b) The price (at time t=0) of a European Call option maturing at time t=0.5 on the given pure discount bond with face value $1000 through the implicit finite difference method is **$0.3924**

(c) The price (at time t=0) of a European Call option maturing at time t=0.5 on the given pure discount bond with face value $1000 through the explicit formula is **$0.3940**

Comments: The results are observed to be very close to each other with an infinitesimal error. This shows that we can calculate the price of the option purely using Monte Carlo

simulations if we are given the dynamics of the underlying without any explicit formulae for the price of the call option.

Q3- G2++ Model

The price (at time t=0) of a European Put option maturing at time t=0.5 on the given pure discount bond with face value $1000 through Monte Carlo Simulations is **$1.8935**

The price (at time t=0) of a European Put option maturing at time t=0.5 on the given pure discount bond with face value $1000 through the explicit formula is **$1.8609**

Comments: The results are almost similar with a negligible error. This shows that we can calculate the price of the option purely using Monte Carlo simulations if we know the dynamics of the underlying without knowing any explicit formulae for the price of the put option.