MFE405 Project 8

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Problem 1.

(a)

The price of the zero coupon bond under Vasicek: $ 976.01367

(b)

The price of the coupon paying bond under Vasicek: $ 1052.3168050458744

(c)

The price of European Option on zero coupon bond (with explicit formula on zero coupon bond): $ 8.90533

(d)

The price of European Option on coupon paying bond (with Monte Carlo simulation): $ 79.15696

(e)

The price of European Option on coupon paying bond under Vasicek(with explicit formula): $ 82.13902.

Two methods (Monte Carlo Simulations) and explicit formula all return similar results. Since Monte Carlo simulations only has a very small number of paths, the variance could be quite large. With larger number of paths, the result of Monte Carlo simulations will converge to the result returned by explicit formula.

Problem 2

(a)

The price of European Option on zero coupon bond under CIR (with Monte Carlo Simulations): $ 0.40804

(b)

The price of European Option on zero coupon bond under CIR (with Implicit Finite Difference Method): $ 0.39392

(c)

The price of European Option on zero coupon bond under CIR (with Monte Carlo Simulations): $ 0.39406. the European Call option obtained from Monte Carlo simulation is very close to the price calculated using explicit method in part(a)

Problem 3

The zero coupon bond price under two factor models: $ 1.459444381827229
The zero coupon bond price with explicit formula: $ 1.86096

The European call option evaluated by these two methods returned very similar results. The variance of Monte Carlo Simulations is quite high. Larger number of paths are more desirable for the Monte Carlo Simulations to converge. Some variance reduction techniques could be used to reduce the variance and make them converge faster