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IE 525

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Computation Homework 3

1.

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C:\Users\jloss\Documents\Projects\Comp_Euro_Asians\Price_Euro_Asians.py
Monte-Carlo Pricing for European and Asian Calls
Input Parameters:
Expiration Time (Years) = 1
Drift Rate = 0.1
Risk-free rate = 0
Volatility (%age of stock value) = 15
Initial Stock Price = 15
Strike Price = 16
Number of Trials = 10000
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European Call Option Price = 1.06177
European Put Option Price = 0.745633
European Call Variance = 2.2706
European Put Variance = 1.19729
Asian Call Option Price = 0.0812099
Asian Call Variance = 0.059853
Press any key to continue . . .

```

1b. As can be seen above, the monte carlo variance for European put options is 1.19729, while the monte carlo variance for the European call is 2.2706. This is likely because of the fact that with call options, the stock price can technically rise to infinity. Hence more variability in potential underlying asset prices, which leads to more variability in potential derivative prices. On the other hand, put options are limited because the stock price can't go below 0.

1c. The Asian call has a variance much smaller than that of the European, this is most likely due to the fact that Asian options take into account the average stock price rather than just the stock price. This averaging method reduces the variability in underlying prices, thus reducing the variability in Asian derivative prices.

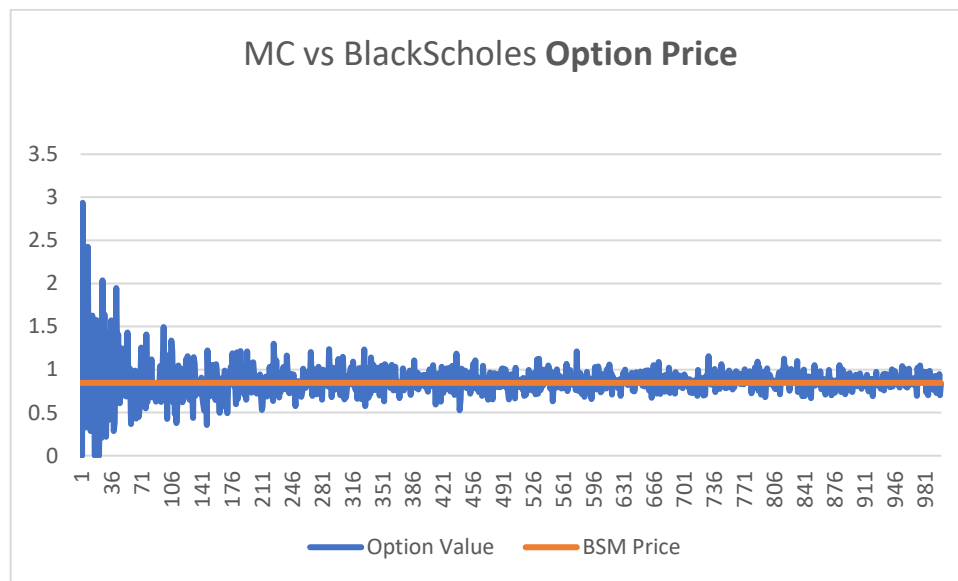
2.

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Monte-Carlo Exchange Option Pricing Model
Input Parameters:
Stock1 initial price (v0) = 50
Stock2 initial price (u0) = 60
Risk-free rate = 0.05
Stock1 sigma = 0.3
Stock2 sigma = 0.4
Rho = 0.7
Time to expiration = 0.416667
Call (C) or Put (P) = C
Number of simulations = 100000
Number of steps = 100

Monte-Carlo Exchange Option Price = $ 0.870631
Black-Scholes Exchange Option Price = $ 0.845503

Press any key to continue . . .
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2b



3a. I observed that as the Number of T-steps increased in small amounts (with $T = 1.0$ constant), the rates followed a variable price path. When I chose a large number of t-steps, however, the output suggests that the Euler discretization produces too many values close to 0 and a mode to the right of the true mode.

3b.

