# MA 374: FE-Assignment #10

Due on Monday, April 11, 2016

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## PROBLEM

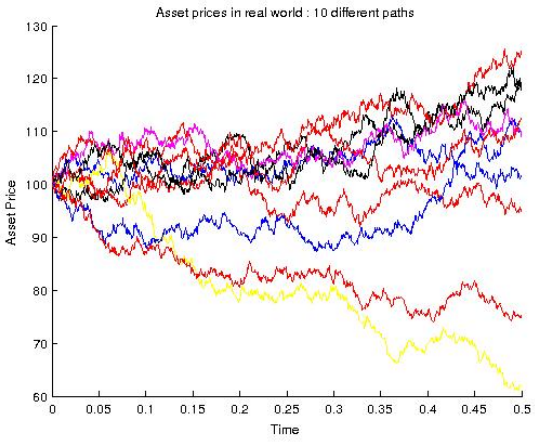
Consider an asset which follows a GBM with drift = 10% and volatiltiy = 20%. Assume that the risk free rate is r = 5%. The initial asset price at time t = 0 is S(0) = 100. Simulate 10 different paths of the asset price making use of the GBM, in both the real and the risk-neutral worlds. Now compute the price of a six month Asian option with a strike price of 105 (using arithmetic average). Do the pricing for both call and put options, using Monte Carlo simulation, along with 95% confidence interval. Repeat the above exercise with strike price K = 110 and K = 90. How do your results compare ? Now do a sensitivity analysis of the option prices.

## SOLUTION

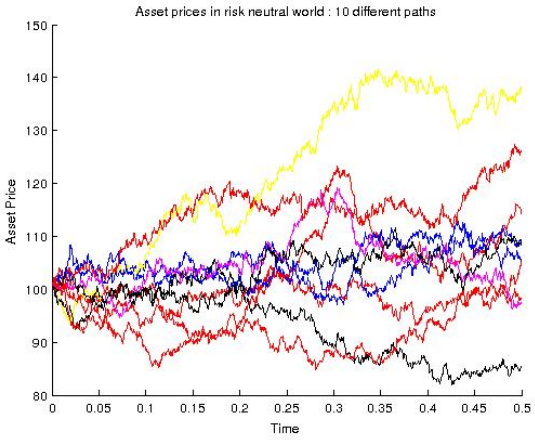
Geomectric brownian Motion is given by :

$$\ln \frac{S_t}{S_0} = \left(\mu - \frac{\sigma^2}{2}\right) t + \sigma W_t \,.$$

**Part a**
**Simulation of paths of the asset price making use of GBM in real worlds.**




**Simulation of paths of the asset price making use of GBM in risk neutral worlds.(Considering $\mu = r$)**



**Part b**
**For K = 105**
Asian Call :
2.5135

Put Price :
4.8175

Confidence interval (Call):
( a , b ) = ( 2.2735 , 2.8515 )

Confidence interval (Put):
( a , b ) = ( 4.4697 , 5.1653 )

**For K = 110**
Asian Call :
0.8997

Put Price :
8.8263

Confidence interval (Call):
( a , b ) = ( 2.2735 , 2.8515 )

Confidence interval (Put):
( a , b ) = ( 4.4697 , 5.1653 )

**For K = 90**
Asian Call :
12.5555

Put Price :
0.1828

Confidence interval (Call):
( a , b ) = ( 12.0596 , 13.0515 )

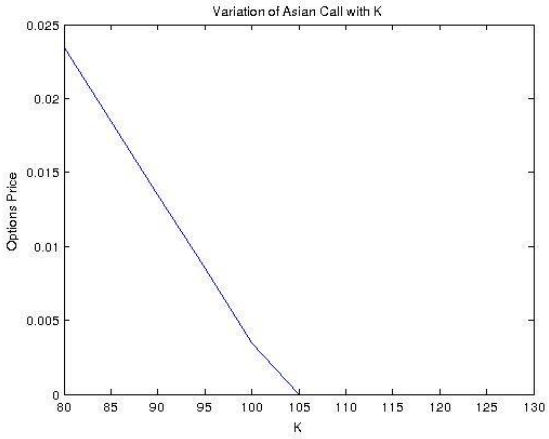
Confidence interval (Put):
( a , b ) = ( 0.1219 , 0.2436 )

For larger values of K, the price of put option is more and call option is less.

**Part c**

Variation of the prices with strike price :

Asian Call Option :




Asian Put Option :