Project 5

MGMTMFE 405
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You will need to write codes for all the parts of the project. Make sure the codes work properly and understand the ideas behind each problem below. You may be asked to demonstrate how the codes work, by running them, and interpret the results. Code clarity and accuracy will determine the grades.

Submit your codes and a PDF file of your answers to questions (including graphs, histograms, but no codes, in this PDF file) by 11PM PDT on Next Wednesday

1. Consider the following information on the stock of company XYZ: The current stock price is $40, and the volatility of the stock price is $\sigma = 20\%$ per annum. Assume the prevailing risk-free rate is $r = 6\%$ per annum. Use the following method to price the specified option:

(a) Use the **LSMC** method with N=100,000 paths simulations (50,000 plus 50,000 antithetic) and time step of $\Delta = \frac{1}{\sqrt{N}}$ to price an American put option with strike price of $X = \$40$ and maturity of 0.5-years, 1-year, 2-years, and. Use the first k of the **Laguerre Polynomials** for $k = 2, 3, 4$. (That is, you will compute 9 prices here). Compare the prices for the 3 cases $k = 2, 3, 4$ and comment on the choice of k.

(b) Use the **LSMC** method with N=100,000 paths simulations (50,000 plus 50,000 antithetic) and time step of $\Delta = \frac{1}{\sqrt{N}}$ to price an American put option with strike price of $X = \$40$ and maturity of 0.5-years, 1-year, 2-years, and. Use the first k of the **Hermite Polynomials** for $k = 2, 3, 4$. Use time step of $\Delta = \frac{1}{\sqrt{N}}$. (That is, you will compute 9 prices here).
Compare the prices for the 3 cases $k = 2, 3, 4$ and comment on the choice of k.

(c) Use the **LSMC** method with N=100,000 paths simulations (50,000 plus 50,000 antithetic) and time step of $\Delta = \frac{1}{\sqrt{N}}$ to price an American put option with strike price of $X = \$40$ and maturity of 0.5-years, 1-year, 2-years, and. Use the first k of the **Simple Monomials** for $k = 2, 3, 4$. (That is, you will compute 9 prices here).
Compare the prices for the 3 cases $k = 2, 3, 4$ and comment on the choice of k.

(d) Compare all your findings above and comment.

Note: You will need to use weighted-polynomials as done by the authors of the method.

Inputs: S_0, X, T, r, σ, N
Outputs: Values of Option Prices; writeup: comments.