#2. Derivatives

Guideline: Solve the exercises in the next page using software. You must submit (1) Project Report(.pdf) and (2) Programming codes(.pdf).

(0) Submission to LMS

- Must set the names of files as follows:
  - *FamilyName_GivenName_StudentID_PA2_Project_Report.pdf*
  - *FamilyName_GivenName_StudentID_PA2_Programming_Code.pdf.*
- Compress the report and code as follows and submit:
  - *FamilyName_GivenName_StudentID_PA2.zip*
- Fail to meet the format incurs 2 points deduction as penalty.

(1) Project Report

- Recommend using any word processor (MS word, Hangul).
- Your answer to each question must be written in the report.
- Convert your report to PDF and submit.

(2) Programming Code

- Convert your programming code file into PDF and submit.
- If your code consists of more than one file, you must convert and submit all of them. Note that the name of the PDFs should be:
  - *..._Programming_Code_**AdditionalInfo**.pdf.*

[**Binomial Trees**]

Let S_0 is the current price of the underlying asset; K is the strike price; r is the risk-free rate; σ is the volatility of the underlying asset; and $\Delta t = T/N$ where T is the time to maturity and N is the number of periods in the model.

Show (1) the corresponding binomial tree (in forms of matrix) and (2) the price of the following options based on the binomial option pricing model.

1. European call option ($S_0 = 70$, $K = 60$, $T = 10$, $r = 0.05$, $\sigma = 0.2$, $N = 10$)
2. American call option ($S_0 = 70$, $K = 60$, $T = 10$, $r = 0.05$, $\sigma = 0.2$, $N = 10$)
3. European put option ($S_0 = 100$, $K = 95$, $T = 5$, $r = 0.04$, $\sigma = 0.1$, $N = 10$)
4. American put option ($S_0 = 100$, $K = 95$, $T = 5$, $r = 0.04$, $\sigma = 0.1$, $N = 10$)

[**Black-Scholes-Merton Model**]

Using the same set-up as in Binomial Trees, find the prices of European call and put options based on the Black-Scholes-Merton model and compare the results against those of binomial trees.