RMSC4002 2017/18 1st term Assignment 1

Q1. The file "hkse50.csv" contains 50 names and codes of stocks list in the main board of Hong Kong Stock Exchange. Use the last 5 digits of your student ID as random seed and select 5 stocks randomly from the list. For example, if the last 5 digits of your student ID is 12345,

```
stock<-read.csv("hkse50.csv")      # read in data
set.seed(12345)                    # set random seed
r<-sample(1:50,size=5)             # select 5 random integers
stock[r,]                          # list the 5 selected stocks
   code            name
37 1044    Hengan Int'l
43 1880     Belle Int'l
50 3988   Bank of China
42 1398            ICBC
21  291 China Resources
```

In chapter one of my notes, I have generated one single path of future 90 days of stock prices for HSBC, CLP and CK. Now you are going to perform simulation on these 5 stocks. Imagine we have a portfolio of 5,000 shares of **each** of these 5 stocks. Now we want to generate 1000 random paths of future 10 days of these 5 stocks and hence compute the value of this portfolio based on these simulated prices. Modify my R codes according to the following:

1. In the internet, search and download the adjusted daily closing prices of the 5 selected stocks from 1/1/2015 to 31/12/2016. (In the *tseries* library, there is a function *get.hist.quote()* can download stock price easily, see *help(get.hist.quote)* for more details).
2. Compute the value of your portfolio based on the closing price of the last day, 31/12/2016, say, v_0.
3. Using the last 5 digits of your student id as initial seed, set up a loop to generate 1000 random paths of the prices for these 5 stocks for future 10 days. Use the last 60 days in your dataset to estimate the mean vector and covariance matrix in your simulation.
4. Save the last simulated stock prices and compute the portfolio value based on these simulated stock prices. Compute the profit/loss by *simulated stock prices* $- v_0$.
5. Find the min, max, mean, median, sd, lowest 1 and 5 percentile from this profit/loss distribution.

Q2. Continue with the stock prices in Q1, we want to fit a EWMA model using EXCEL. Choose the first stock in Q1 and fit a EWMA model which minimizes the sum of absolute error: $\sum_{i=1}^{n-19} |\sigma_i - s_i|$ instead of maximizing the likelihood function, where $\sigma_i^2 = \lambda\sigma_{i-1}^2 + (1-\lambda)u_{i-1}^2$ is the variance rate estimated from EWMA model and s_i^2 is the variance of $u_i, ..., u_{i+19}$.

1. Using EXCEL, compute the relative change of stock prices, setup the columns for σ_i and s_i and the parameter λ in EWMA model that minimizes the sum of absolute error: $\sum_{i=1}^{n-19} |\sigma_i - s_i|$.
2. Plot the fitted volatilities σ_i using the EWMA model in 1.
3. If we use λ=0.95, compute and compare the sum of absolute error with the EWMA model in 1?

You need to submit four files via **eLearning**: asg1.csv, asg1-1.r, asg1-1.out and asg1-2.xls. asg1.csv contains the stock prices of the 5 selected stocks. asg1-1.r, asg1-1.out contains all the R codes and output in Q1; asg1-2.xls contains the EXCEL and the data for Q2. The R codes should be **fully commented** as in my notes and ready to execute without bugs.

Submit your files on or before October 23, 2017.
Put a hardcopy of asg1-1.out in the drop-box outside the stat. lab. on or before October 24, 2017.