Assignment 2: Financial risk simulation in R

The solution to this assignment should analyze the risk strategy as a decision maker, with the investment objective of buying the stocks of the companies on the stock market. Risk assessments should be discussed on the risk preferences, such as being risk averse, risk prone or risk neutral on the performance of the stocks and its impact on the eventual investment decision-making process. Focus should be placed on performance analytics.

It is speculated that Microsoft Corporation’s stock price will experience a technical breakout (post COVID?) this year, with options traders suggesting that the stock will surge by 22% or more by the end of 2021. Whilst it looks tempting as a desirable choice by many investors this year, an elaborate in-depth analysis should be done to avoid purchasing the stock based on speculation. Conduct a technical analysis using R and compare how Microsoft Corporation’s (MSFT) stock is doing amongst some of the stocks such as Apple (AAPL), Coca-Cola (KO), Intel (INTC) and Walmart (WMT) beginning October 1, 2009 to September 30, 2021 (see R codes for data acquisition). Simulate for the next 4 years, the stock prices of Microsoft Corporation under the assumption that the log-return is normally and independently distributed. Generate the data from the mean and standard deviation log stock returns and use exponential growth rate to predict how much the stock will grow per day. The growth rate is randomly generated and dependent on the input values of the mean of log stock returns μ (you may assume it to be 0) and the standard deviation of log stock returns 𝜎, that is exp(rnorm(1, μ, 𝜎 ) ). Note that we do not generally have 365 days of stock records per year (e.g. due to weekend, holidays, etc.) but we treat the gaps between two consecutive trading days as one day, in all cases.

Proceed by answering the following questions :

1. Derive the mean of log stock returns of the companies and comment on your results.

2. Derive the standard deviation of log stock returns of the companies.  
3. Create a data frame for the 5 companies with each company's average log return and standard deviation, and compare their stock performances. Which stock (among these) would you buy, why?  
4. Make a risk analysis of the stock’s performance with a chat series (subset 2020) for the companies. You may also consider Bollinger bands.  
5. Analyze the correlation of the companys’ stock and explain the risk of buying stocks from the same or different sectors.  
6. Simulate for the next 4 years the stock prices of Microsoft Corporation using Monte Carlo (300 Monte Carlo simulations). Will you buy Microsoft’s stock and why?  
7. Suggest your favourite trading strategy and provide an intuitive motivation for your strategy. Code you rule and assess your strategy (with respect to the risk that you take) using the Monte Carlo simulation (in 7).

You have to accomplish this exercise in groups. Maintain the same groups as they were in “Home exercise 1”. However, changes in group composition can be arranged in very special circumstances (you need to arrange the changes, and explain to me, as soon as possible, why it was absolutely necessary).

Write a report on your findings, upload your report on Learn by October 19, 2021; 23:59 CET. Feel free to add more computations in R (to what is given in the R file in the attached materials for this exercise). You will also have to present your work in a seminar on October 22.