

## MTH6113 Assessment 1, *Deadline March 15, 5PM*

Please submit two files (one Excel, one PDF) in QMPlus

### Steps for data collection:

1. Go to finance.yahoo.com. Here you will choose three stocks and download their price histories for one year.
2. On the right of the webpage, there is a Quote Lookup bar. Enter the ticker (stock symbol) search here. How to choose the tickers:
  - a. Type the first letter of your first name – the search bar will offer some suggested tickers – choose one.
  - b. Type the first letter of your last name – again choose a stock that begins with this letter
  - c. If you have a middle name, choose your third stock based on your middle initial. If not, use the second letter of your last name.
  - d. If in any of the case above, there is no stock available with your first letter, move to the next letter in your name, and so on.
3. For each stock: click on the one you have chosen – it will open the stock quote page. On this page, there is a top row consisting of several links, including “Historical data.” Choose this link, then check that the top row settings show a time period going back 1 year (starting today’s date) and frequency = daily. Remember to check that you are getting one year of data. If this is not available, choose a different stock (still using the same initial) for which 1 year of data is available. Now click on “download data.” You will have a csv file, which opens with Excel.
4. Remember to check that the dates for the three stocks match – if there are misaligned observations, please remove them so that all three stocks have the same one year of data.

### Instructions:

1. Use the Adj Close column (these prices are adjusted by the dividend yield) to calculate the daily returns.

$$R_t = \ln P_t - \ln P_{t-1}$$

2. Calculate the average returns, variance and the standard deviation of the returns in your sample.
3. Calculate the covariance and the correlation coefficients of the stocks
4. For a range of weights between -30 and +30 (or more if needed) for two of the stocks (the other is automatically determined so the weights sum to 1), calculate the average return and the standard deviation of the portfolio.
  - You may do this using the Data Table functionality in Excel. Consider  $w_1$  to be a row input and  $w_2$  to be a column input, then  $w_3 = 1 - w_1 - w_2$ . You can then generate a range of values of standard deviation using the formula and the same for the return. You will have one matrix each for

return and standard deviation. For the Data Table, please use the help and tutorial in Excel to see exactly how to enter the formula, in case you are not familiar with it. You will find Data Tables under “What-if analysis” in the “Data” tab in the new version of Excel.

5. You can now create two columns using all the pairs of points (return, standard deviations) and produce a scatter plot. You can now mark the Mean Variance frontier and the efficient frontier on the graph.

### Questions:

Please provide two files:

1. one Excel file with your data work. (30 marks)
2. One PDF file with:
  - a. Analysis of your stocks:
    - Brief overview of your stocks. Please make sure you research your stocks and the industry they operate in. Please check financial news outlets – Yahoo finance, Financial Times, Google, IBKR, etc. [10 marks]
    - Interpretation of the descriptive statistics found in Excel. [5 marks]
  - b. Analysis of your portfolio created with the Excel
    - Reasons for investing in a portfolio instead of one stock only (please make sure your answer refers to your data). [10 marks]
    - Please provide at least 3 inefficient portfolios. Using their standard deviations find portfolios that are efficient. Explain, how you found these efficient portfolios. Identify these portfolios on the diagram. [10 marks]
    - Identify the minimum variance portfolio on the diagram and provide approximate weights for each stock in this portfolio. [10 marks]
    - ***Solve for the minimum variance portfolio analytically. Hint: This is an unconstrained optimization. You will have to solve a system of 3 equations with 3 unknowns.*** [10 marks]
    - Your client asks you for suggesting some investment alternatives. What would you suggest? Do you need extra information for taking an optimal decision for your client? Explain your answer with the diagram. [15 marks]

**Total marks: 100**