

Assignment 2

ACFI111: Quantitative Methods for Accounting and Finance

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1 Instructions

1.1 Guidelines

Do not write more than 2,000 words in total, excluding tables, references, and equations. In addition, do not include more than 10 tables in your report. In general, it is not good to copy and paste raw output from Excel into a report.

The project represents **50%** of your total mark in the module. The report should be submitted by the deadline date: **January 11, 2023** at **14:00h**. Before submitting the report, include information about the total word count at the bottom of the cover page.

The University's penalty structure for late work will apply to any project submitted after this deadline. Extensions to the deadline will only be given under very exceptional circumstances. For further information, please go to the following page: <https://www.liverpool.ac.uk/student-administration/examinations-assessments-and-results/ug-and-pgt/extenuating-circumstances/>.

1.2 Assessment Criteria

The written assignment of 2,000 words is to be completed in accordance with University of Liverpool guidelines for academic writing (plagiarism, referencing, etc.). The project will be assessed using the following criteria:

1. Understanding of different theories and concepts (20%).
2. Implementation of the probability and statistical knowledge (20%).
3. Evaluation of initial results including reflection on potential improvements or ways to address the statistical issues (20%).
4. Interpretation of the results (20%).
5. Communication of results – Is the project well-structured, clearly organized and with good flow? Does the project use clear English with no spelling, grammatical or typographical mistakes, and are the graphs and tables easily comprehensible? I strongly recommend that you use a proper Equation editor to type up your formulas. All files must be submitted as a Word or PDF document (20%).

2 Background

The purpose of this project is to analyze the properties of the Capital Asset Pricing Model (CAPM). The CAPM describes the relationship between systematic risk, and expected returns for assets, particularly stocks. The project would be easier to handle in Excel, as it involves the manipulation of data.

3 Description of the Tasks

The Excel file titled “Assignment_2_Data.xlsx”, contains the following data (extracted from Bloomberg):

- Weekly Prices for Apple Inc. (AAPL), McDonald’s Corp (MCD), FedEx Corp. (FDX), Chevron Corp. (CVX), S&P 500 Index (SPX), and the risk-free rate.
- The sample period is January 02, 2009 to December 31, 2021.

- With weekly data, the prices (and dates) you observe in the Excel file correspond to the last trading day, i.e. Usually this day is a Friday.
- Given that the data is weekly, using the day and month of your birthdate, your sample data should begin and end during the week that covered your birthdate. For instance, if your birthdate is on **12/02/2009** (format dd/mm/yyyy), then your initial date should be **13/02/2009**, and the last date should be **12/02/2021**.
- Clearly state the beginning and ending date of your sample period.
- Finally, use your sample period (trimmed according to your birthdate's day and month) to compute the different tasks outlined below.

Using the following formula estimate the arithmetic return for each company:

$$R_t = \left[\frac{P_t - P_{t-1}}{P_{t-1}} \right] \times 100, \quad (1)$$

where P_t is the last price observed on week t , and P_{t-1} is the last price observed on week $t - 1$ (i.e., the previous week).

1. Using the output from the descriptive statistics, do you think the returns of the companies are normally distributed?
 - (a) If the returns are not normally distributed, what are the implications of this non-normality for the CAPM model?
2. Using a 5% significance level, formally test whether the variance of the stocks are equal to that of the index.
 - (a) Present the null and alternative hypotheses.
 - (b) Implement and interpret the results of the test: What is your conclusion? Does your conclusion change if you use a 1% significance level?
 - (c) How does the beta of the stock relate to the variances of the companies and the index.

3. Compute the CAPM model, i.e. estimate the following linear regression model:

$$R_t - R_f = \alpha + \beta (R_{M,t} - R_f) + \epsilon_t, \quad (2)$$

where R_t is the return of one of the companies, R_f is the risk-free rate, $R_{M,t}$ is the market index return, and ϵ_t is the error term. α and β are respectively the intercept and slope. **Please note that the risk-free rate (R_f) is already expressed in percentage points.**

- (a) Interpret the Regression output.
- (b) Using the output of the regressions and a 1% significance level, test whether the companies are undervalued.
- Explain how you would carry out the test.
 - Discuss the test statistic and the critical value.
 - Explain the economic importance of testing this null hypothesis. In other words, why is this an interesting hypothesis and what do we learn from this test?
- (c) Using the output of the regression, test whether the companies are riskier than the market index. Use a 1% significance level.
- Explain how you would carry out the test.
 - Discuss the test statistic and the critical value.
 - Explain the economic importance of testing this null hypothesis. In other words, why is this an interesting hypothesis and what do we learn from this test?
- (d) Plot the Security Market Line for all the stocks and comment on the profitability of investing in these companies.

4. A financial analyst has recently commented on ABC News that tomorrow's stock Market index will increase by 10% driven by good economic results, i.e. $R_{M,t+1} =$

10%. Based on this information, predict the next-day expected return for McDonald's Corp. (MCD), and construct the confidence interval using a 95% confidence level. Interpret this result.

5. A colleague points out that the explanatory power of your model could be improved. Discuss how you would modify the research design to address this concern.

End of Exam Paper