
Assignment One

In Question 1 you will use the mean-variance approach and data on returns for two shares for the period January 2019–January 2022 to form a portfolio. You will then examine the performance of your portfolio in the period January 2022–January 2023. In Question 2 you will use the single-index model to develop a more complete understanding of this performance. In Question 3 you will consider changing bond yields in the Eurozone between August and September 2022, and predict the effect on bond prices.

Explain and illustrate your answers to these questions, which are based on Units 1 to 3, in no more than 2,500 words. This limit includes tables and captions but excludes footnotes, endnotes, tables of figures and references. Answers that exceed this limit will result in a loss of marks. Full details of penalties for late submission, exceeding the word limit and other information can be found at the end of this assignment.

Your assignment should be submitted via the Virtual Learning Environment (VLE) to The Centre for Financial and Management Studies **no later than 16th May 2023**. *Full instructions are available on the VLE.*

Question 1

The tab-delimited text file M423_A1_S3_2023_Q1_Q2.txt contains weekly data on the share prices of the Nvidia Corporation (denoted NVDA) and Qualcomm (QCOM), the American multinational technology companies; and the Standard and Poor's 500 share index (SP500). The file also includes the simple weekly return on Nvidia shares (R1), the weekly return on Qualcomm shares (R2), and the weekly return on the S&P 500 index (RM). The data are from 21/1/2019 to 23/1/2023. The share prices and index are in US dollars. The data are from finance.yahoo.com.

- 1(a)** Using the share returns for the period 28 January 2019 to 24 January 2022, and the methods you have studied in Unit 1, construct a portfolio consisting of Nvidia shares and Qualcomm shares. Justify your choices. [30% of total marks]
- 1(b)** For the portfolio you formed in part 1(a), examine the performance over the period 31 January 2022 to 23 January 2023. Comment on your results. [10% of total marks]

Question 2

- 2(a)** Using the share returns and the return on the market index for the period 28 January 2019 to 24 January 2022, estimate the parameters of the single-index model for Nvidia and for Qualcomm as shown in equation (2.1)

$$R_i = \alpha_i + \beta_i R_m + e_i \quad (2.1)$$

where R_i is the return on asset i ($i = 1$ for Nvidia and $i = 2$ for Qualcomm), R_m is the return on the market index, and e_i is a random disturbance.

Comment on your results. [25% of total marks]

- 2(b)** Historical betas are acknowledged to be biased predictors of future betas. Explain this bias, and Blume's method for transforming historical betas to address the bias. Apply this transformation to the estimated betas you obtained in Q2(a), and comment on your results. [10% of total marks]

Question 3

At the start of August 2022 the yield on ten-year government bonds issued by the German federal government was 0.8 per cent. Towards the end of September 2022 the yield was 2.3 per cent (source: bundesbank.de). Predict the effect of these changes in yield on the price of the ten-year government bonds. [25% of total marks]

Student Assignment Guidelines

There is no single right way to answer these questions; rather there are a number of approaches, and different students will have their own view of what is expected and how much weight to give any particular element, within the mark weighting for each question. Whatever your approach, you will need to plan your answers carefully, in order to provide a focused and succinct answer to the questions, within the word-limit.

In your answers, you should demonstrate your knowledge of and ability to explain and apply economic and financial models. You must justify any conclusion you reach on the basis of evidence provided by you by reference to, or quotation from, the course notes, textbooks, other course readings, or any other source you choose to use. As long as your answers give a good justification and demonstrate your reasoning ability and your knowledge, you can obtain a good grade.

At all stages you should explain your reasoning in a way that shows your understanding of the theory and empirical studies of Units 1, 2 and 3. You can also introduce knowledge you have gained from other parts of the course, where appropriate, or from other courses, or elsewhere. But remember that the assignment is designed to focus on the subjects you studied in Units 1, 2 and 3.

Your answers should be written in an academic manner, presenting your view carefully, justifying your view with rigour and discussion. When you present a relevant theory, in your justification it is good, where possible, to demonstrate your understanding of it by using a simple equation or diagram. In presenting your arguments, you should also comment on possible weaknesses and limitations.

The questions are intended to develop your understanding of the relevant materials, and to assess your understanding of this material. Therefore the point of the questions is not just to get the numerical answers. You should explain what is being calculated,

how it is calculated, the results at appropriate stages of the calculation, and what the final answer represents. It is not advisable to present only your final numerical answer with no explanation, interpretation, or comment.

Question 1(a)

This question requires you to choose the weights to assign to the two securities in your portfolio; the question is not concerned with the overall size of the portfolio. To help you decide on these weights you should use the methods you have studied in Unit 1, and the share returns for the dates indicated, 28/1/2019 to 24/1/2022. (For simplification, it might be advisable if you do not consider the possibility of short-selling, or of borrowing and lending at a risk-free rate. If you do consider this possibility, you will need to decide on an appropriate risk-free rate for January 2022.) You do not need to do any other research on the two companies concerned, and you do not need to download any additional share price or share index data – you should use only the information provided and the methods you have studied in Unit 1.

The tab-delimited text file can be opened from Excel (or similar spreadsheet software). Excel will allocate the data to the relevant columns. You may need to increase the width of the date column to see the dates. These are closing prices. For reference, for the week beginning 21/1/2019 the share price for Nvidia (NVDA) is 40.04, Qualcomm (QCOM) is 51.30, SP500 is 2,664.76, and there are no values for R1, R2 and RM (the calculation of the returns uses the share price or index in the previous period). For 28/1/2019 NVDA is 36.18, QCOM is 49.61, SP500 is 2,706.53, R1 is -0.096404, R2 is -0.032943, and RM is 0.015675. And for 23/1/2023 NVDA is 203.65, QCOM is 133.40, SP500 is 4,070.56, R1 is 0.141600, R2 is 0.085435, and RM is 0.024656.

The returns are weekly proportionate returns calculated as

$$R_t = \frac{S_t - S_{t-1}}{S_{t-1}}$$

where S_t is the share price in period t , and S_{t-1} is the share price in the previous period. The return on the market index is calculated in the same way. For example, the return on Nvidia stock in the final week is 0.141600, which is equivalent to 14.16 per cent.

For part 1(a), *do not* use the share return data from the period 31/1/2022 to 23/1/2023.

To choose your portfolio, you could consider the following aspects. You could analyse the expected return for the two shares. For this you could use the =AVERAGE() function in Excel. You could examine the variance of the returns for the two shares; in Excel, you could use the population variance function =VAR.P(), or VARP() depending on your version of Excel. You might also consider the covariance between the returns on the two shares, obtained in Excel as =COVARIANCE.P(), or COVAR(). The correlation between the two share returns can be obtained using the relevant formula in Unit 1, or the Excel function =CORREL().

You could calculate the expected return and standard deviation of the portfolio for various weightings (e.g. increase the weighting on Nvidia from 0 to 1 in increments of 0.05), and plot the expected portfolio return against the portfolio standard deviation. Using this figure you could derive approximate weightings for the minimum variance portfolio. Alternatively, you could calculate exact weights for the minimum variance portfolio, using the formula in Elton *et al.* To choose your portfolio, you will need to make a statement about your preferences regarding risk and return.

What is the expected return and standard deviation of your chosen portfolio?

Question 1(b)

Q1b requires you to examine the performance of your portfolio over the later period, 31/1/2022 to 23/1/2023. Using the weights you chose in part (a), you could calculate the expected return of the portfolio for these dates. You could compare it to the expected return on the individual shares over this period. What are your conclusions?

Question 2(a)

Question 2 relates to the material studied in Unit 2.

For Q2(a) you could provide a brief explanation of the single-index model, and estimate the parameters of the model using the data on share and market returns for the first period, 28/1/2019 to 24/1/2022. You could then interpret the values of the estimated parameters you have obtained. You might also consider whether your results – in particular, the two estimated β_i coefficients – help you to understand the results you obtained in Question 1.

Question 2(b)

Q2(b) requires you to consider whether the estimates of the company betas you obtain in Q2(a) are good predictors of the future beta values. It is acknowledged that historical betas are biased predictors of future betas. You are required to explain this bias, and to explain Blume's transformation to address the bias. You should apply Blume's technique to the estimated betas in Q2(a), and comment on the transformed estimated beta values you obtain.

Question 3

Question 3 relates to material studied in Unit 3. To answer this question you could consider a ten-year bond issued in August 2022 with yield 0.8%. It pays annual coupons of €8 each, and a principal repayment of €1,008 on redemption. Calculate the modified duration and convexity, and predict the change in bond price if yields increase from 0.8% by 150 basis points (+1.5%). You might also choose to compare these predictions to the actual change in bond price for a yield of 2.3%. Make sure you explain what you are doing, provide interpretation of the results, and comment on your findings. In your calculations keep time to maturity at 10 years.

Your assignment must be properly referenced. Further information on referencing (ie the Harvard system) is available in *Studying at a Distance* by Talbot on the Virtual Learning Environment.

Plagiarism

All assignments submitted must be your own work and written in your own words. Where you have used quoted material, you must make full reference to it. You must cite all references used throughout your work at the end of your assignment. Advice on what is classified as plagiarism and the action taken against this can be found in the University of London Regulations and on the Virtual Learning Environment.

Submitting Assignments

Students are required to submit their assignment in one place only on the Virtual Learning Environment using TurnItIn, the plagiarism detection software. Instructions on how to do this can be found on the Virtual Learning Environment on your module assignment page.

Please see the information below for the current policy on penalties.

IMPORTANT INFORMATION

Late Submission

Assignments submitted after the published deadline will be penalised.

Marks will be deducted at a rate of **two** marks per working day (ie Mon-Fri, and a maximum of **10 marks** for up to **one week** after the deadline). Assignments will **not** be accepted or marked beyond seven days after the deadline. If the submission deadline beyond seven days is missed, students must re-enrol for the course and submit all outstanding assignments. There is no procedure for extensions.

Penalties for late submission of assignments (ie up to seven days from the deadline) may be waived if all the following conditions are met:

- Immediate, unexpected or unforeseen difficulties. Such difficulties may include: illness, bereavement, impact of disability, sudden and severe change in personal circumstances.
- The impact of such difficulties will be of a significant and unavoidable nature.
- The request must be accompanied by relevant documentation (eg medical certification).

Word count & Over length Assignments

Tutor Marked Assignments should be 2500 words in length. The word count excludes footnotes (provided they contain a reference and are not part of the assignment answer) endnotes, bibliography and figures. Tables which contain text will be included in the total word count, whilst tables which contain numerical data will not.

Over length assignments will be penalised as follows: Up to and including 10% - **5 marks**

Between 10% & 20% - **10 marks** Between 20% & 30% - **15 marks**.

Over 30%. The assignment will not be marked but will be given a grade of **0**.

In the case of assignments that are not essays, alternative but commensurate limits and penalties will be applied to over-length submissions.

Referencing and Citation

Students are expected to use the Harvard system of referencing. Incorrect referencing can lead to penalties and if a student is found to have plagiarised it is an examination offence. For this reason, all assignments must be submitted to TurnItIn which checks students' work against existing books, journals and student assignments.

The penalties for plagiarism are set by the University of London. Please see the Virtual Learning Environment resources on Referencing and Citation for detailed examples of how to reference correctly to avoid unnecessary deductions.

Eligibility for examination

Should a student sit an examination without having submitted the required number of assignments, the examination entry and/or examination result will be declared invalid.