Financial Econometrics, 2022 T2

Case Study Part I
(25% of the course mark)

1. This Part I c st be completed in a **group of 3 or 4 students**. Each group is ider e (e.g. Tue13) and a group number (e.g. Group 2).
2. Each group v taset for the project.
3. Each group r y of the assignment via Turnitin. Only one submission per group. Each group must select one person to submit the assignment.
4. **The online submission deadline is 5:00 pm on Monday 11 July, (WEEK 7).** Each group MUST submit the online copy to Turnitin.

   The project Cover Sheet must be properly filled, which includes tutorial/group id, names and student numbers of the group members.
5. A late-submission penalty of 20% will apply for each 24 hours late.
6. All submissions will be checked for plagiarism. The University regards plagiarism as a form of academic misconduct, and has very strict rules regarding plagiarism. Where it can be established that individual students are responsible for the plagiarism, those individual students will be penalized. However, where it is judged that the plagiarism should have been clear to the other group members, the penalty will apply to all members of the group.

UNSW Business School
School of Economics

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Study Part I

Group Cover Sheet

Check-list

1. Choose one member to submit the assignment: one soft-copy to be submitted online.
2. Class number, group number, all names and student numbers of the group must be filled in on this Cover Sheet.

Class/Group ID: _____

	Full Name	Student No.
1. (person for submission)		
2.		
3.		
4.		

Software

You MUST use Python to complete this assignment. You must attach a copy of your codes with your submission.

Topics

This assessment req erial covered in the lectures of Week 1 to Week 4 inclusive.

Data

Select the company corresponding to your group (all these are large companies significant for superannuation funds, international share portfolios likely to hold most of these companies). The data allocation (company name) to groups can be seen in the Excel sheet: https://docs.google.com/spreadsheets/d/1shPrDAbxrNuGEuz9Qp_SHRLKGj66rl9eDtG0aLOyFJU/edit?usp=sharing

Download open/close stock prices and volume information from http://finance.yahoo.com as described below.

Enter the company name in the window near GET QUOTES button.

Please, make sure that you download the information for the "main" stock of the company (not its derivative, or a non-US quote). See appendix for some example screen shots.

Once you are on the company page download historical prices by clicking on the corresponding link on the left-side menu.

Select the following data-period for your historical quotes:
16 June 2012 till the 17 of June 2022

Enter the date range and click on "download to spreadsheet" on the bottom of the page (see Appendix). You will receive a comma-delimited file opened by Excel. The data are sorted in descending date order. For the purpose of the analysis you need to re-sort the data in the ***ascending*** **date** order.

Note: Some companies may have shorter periods of data available. Possible reason: company changed its name or merged with another company. Investigate if this is the case and add the data on the predecessor. Talk to me if you have difficulties. If your company doesn't go back to 2012, go as far as you can. Similarly, if the data stops earlier than June 2022, that is fine. Just specify these sample restrictions at the description of the company with reasons if known.

REPORT

Write a report on the tasks below. Keep your answers short and to the point. Show the necessary information (the null of a test and the decision rule, derivation of analytical results, and only necessary Python output that is needed to answer the question). Make sure to provide comments on all of your results. Please keep the page numbers limited to 7 pages maximum.
Python codes are added as an appendix and are not counted in the pages limit.

Case Study (I) Description

Suppose that you work as a financial advisor. Your client (bank) is interested in investing in a given share.

1. Give a short pro its business and recent history (2-4 sentences).

(2 Points)

2. Transform daily og) returns. Plot returns over time. Plot the histogram and obtain basic des scuss your findings.

(3 Points)

3. **CAPM Model**

   a) Estimate CAPM model for your company. Use S&P500 index returns as a proxy for the market portfolio. The data on the index are available from yahoo (you still need to transform them into log returns). As a proxy for interest rates use the rate of return on a three-month U.S. Treasury bill (short-term government-issued securities have virtually zero risk of default). The data are available from https://fred.stlouisfed.org/series/DGS3MO.

   (3 Points)

Notes:
Dates when shares were traded may not fully coincide with the dates when TBills were traded. To match the dates use Excel's VLOOKUP function (make sure to use false option for range_lookup to disable approximate date match). Alternatively, you may use MS Access database.

   b) Test whether CAPM holds and interpret an estimate of β. If CAPM does not hold explain possible reasons and suggest possible solutions (you do not have to implement them). Assume that CAPM hold (at least approximately) and construct replication portfolio with S&P500 index and T-Bill. Compute the historical expected return and the variance of the portfolio and compare it to the variance of the share. Based on these findings advise your client whether investment in portfolio is a better option.

   (3 Points)

   c) Check whether the CAPM model specification is stable under the COVID-19 period. You May use parameters/model stability tests like the CUSUM test. If you reject stability, re-estimate a post COVID-19 CAPM and comment on the COVID-19 market beta.

   (3 Points)

4. **APT Model**

   a) Estimate and test an APT type pricing model using the Fama & French **three factor** model for your company stock. Data on the size/book-to-market factors can be downloaded from:
   http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Research
   In your report interpret the meaning of the factors beta, and what they represent in addition to the CAPM premium.

   (3 Points)

   b) Investigate whether unexpected changes in oil prices, and currency exchange rate are sources of risk that pay premium on your company stock.

Hint: Data on oil price and currency exchange rates are also available from Yahoo Finance. Whether you include an exchange rate and which currency you wish to consider depends on your company. If your company is domiciled in Australia and buys parts from China, changes in the AUD/YUAN exchange rate may impact profitability of the company and the return on investment.

(3 Points)

5. Model Selection

a) Test for Unit… escribe the Dickey-Fuller test (the null hypothesis and the alternati… the conclusion of the test.

(2 Points)

b) If you do no… nit root, describe your strategy for transforming the series into stationarity. Note that you may have deterministic source of non-stationarity. For example a structural break around COVID-19 pandemic!

(2 Points)

c) Fit an ARIMA(1,1) model to your company returns data. Obtain the standardized residuals from your model and investigate if there is any dependence structure left in the residuals.

Hint: To do this you can use BDS test (Brock, Dechert and Schienkman [1987](*)). Explain why this test is appropriate, and why this test is more informative that a test for zero correlation in the residuals series. Shortly explain the test, the null hypothesis and the outcomes. What conclusions do you reach?

(3 Points)

- In Python, you can find codes for implementing the BDS test in:

https://programtalk.com/vs2/python/12423/statsmodels/statsmodels/tsa/tests/test_bds.py

(*)Brock, Dechert, Scheinkman, and LeBaron, A test for independence based on the correlation dimension, Econometric Reviews, 15, 1996: 197-235.

d) Derive and plot the impulse response function of the ARIMA model you have estimated in (c)

(3 Points)