

# Financial Modelling & Forecasting Modelling Task-1 (Session-1, 2021)

## Assignment on Factor Models and Portfolio Analysis

Total Marks: 100

Submission Deadline: 11:59pm, 12 April 2021

### General Instructions

- The assignment requires submission of your working R codes and Excel Files.
  - All data files used in the code must be submitted.
  - The code must be included in the appendix of the document.
- Your individual paper must not exceed 10 A4 pages of 11pt font size with 2 spacing. This excludes any appendices or exhibits you may elect to incorporate in the report.
- The word count mentioned in the questions is the maximum word count and excludes any figures and/or tables.
- Marks will be awarded for depth of coverage, quality of insight, succinctness and accuracy of answers.
- Marks will be deducted for poorly informed reports which lack proper formatting, referencing etc. Following deduction will apply
  - No references (in-text and end text), includes reference to data source: -10
  - No coversheet: -5
  - Illegible presentation: -10
  - Lack of informed research: -10
  - Plagiarism will be dealt according to the university policy and a high similarity score will be penalized.
- The discussion must be informed by research and the report must cite all the sources.
- Both, in-text and end text citations are required. End text references are excluded from the page limit.
- FACTSET is the preferred data source for the assignment along with publicly available information from company website and ASX.
- Assignment (document) must include a cover sheet.
- A sample coversheet is provided on ilearn, you may choose to use it.

Please contact your unit convenor well before the submission deadline for any clarifications you may need on the assignment instructions. You may also post your questions on the discussion forum.

### Assignment Questions

You have been assigned a company to work with (look at 'Assignment\_afin8090\_s1\_2021.xlsx' on ilearn), you must work on the company listed against your name<sup>1</sup> as one of the companies in your analysis. The following rules and benchmarks must be used for the analysis

1. ASX All Ordinaries for the Market Index
2. 90 Day Accepted Bills (SFE) Futures (Factset Code: IR00-SFE) Settlement Price for the Risk Free rate ( $R_f$ )
3. Data time period for the analysis: 01-Jan-2019 to 31-Dec-2020 and as stated in the questions.
4. Data frequency: Daily

## 1 Question 1: Returns, CAPM

Question-1 should be completed using Excel.

### 1.1 Company Description (word limit: 250 words)

Provide a well researched company description including any significant corporate actions in the last six months. (5)

### 1.2 Calculate daily Simple (Arithmetic) and Continuous (Log) Returns for the company and the benchmark market factor.

- Download the daily closing prices for the assigned stock and ASX All Ordinaries Index for the two years period from 1 Jan 2019 to 31 Dec 2020 and calculate daily simple and continuous returns. (2)
- Plot and present the closing prices for both time series and returns on separate graphs. Label the graphs appropriately. (3)
- Calculate descriptive statistics (including, Kurtosis, Skewness values) for both stock and market log return series. Provide a brief description (100 words maximum) to highlight the statistics. (5)

### 1.3 CAPM/Single Index Model

- The Capital Asset Pricing Model can be calculated using Market Portfolio and regression analysis. Regression analysis using OLS

$$r_i - r_f = \alpha + \beta_i(r_m - r_F) + \varepsilon_i \quad (1)$$

- Use the CAPM model to calculate the value of  $\beta$  for your company.
  - Run the linear regression using Excel. *Excel file is required to be submitted along with the report.*(5)
  - Present the results including the regression coefficients and regression fit plots in the report.(5)
  - Provide a brief overview on the level of systematic risk as quantified by the analysis.(5)

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<sup>1</sup> Inform the unit convenor ASAP if the data time period is not available for the company allocated to you.

## 2 Question 2: Fama-French Three Factor Model

*Question-2 can be completed using either R or Excel.*

- Fama and French (1992, 1993) extended the basic CAPM to include size and book-to-market effects as explanatory factors in explaining the cross-section of stock returns.
- SMB (Small minus Big) gives the size premium which is the additional return received by investors from investing in companies having a low market capitalization.
- HML (High minus Low), gives the value premium which is the return provided to investors for investing in companies having high book-to-market values.
- The three factor Fama-French model is written as;

$$r_A - r_F = +\beta_A(r_M - r_F) + s_A SMB + h_A HML + \alpha + e \quad (2)$$

Where  $s_A$  and  $h_A$  capture the security's sensitivity to these two additional factors.

### 2.1 Critical overview of the Fama-French three Factor Model (word limit: 250 words)

Provide a well researched critical overview of the Fama-French Three Factor Model. The review should highlight the assumptions of the model and their validity. *All references must be cited.* (7)

### 2.2 Fama-French factor Analysis.

- Use the Fama-French three factor model to evaluate the factor specific risks for your assigned company. Use the following as factor proxies.
  - ASX All Ordinaries excess returns for the Market Factor
  - As the other two factors are not available for Australia. We use the following proxies (see Mietzner, Schweizer, and Tyrell (2011), paper available here [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1879170#](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1879170#)).
    - \*  $SMB = \text{Return (MSCI Australia Small Cap Index)} - \text{Return (MSCI Australia Large Cap Index)}$
    - \*  $HML = \text{Return (MSCI Australia Value Index)} - \text{Return (MSCI Australia Growth Index)}$
- Present the regression results including the fit summary in a table. (4)
- Discuss the three regression coefficients as risk factors. Provide answers to the following question in your discussion. (word limit: 500 words)
  - Are the coefficients significant? Discuss the implications w.r.t all the coefficients ( $\alpha, \beta, s$  and  $h$ )
  - Which is the largest significant coefficient out of  $\beta, s$  and  $h$ ? What does this mean for your stock?
  - Compare the level of residual and  $R^2$  and comment on the model fit as compared to the CAPM analysis in Question1. (11)

### 3 Question 3: Diversified Portfolio

#### *Question 3 is to be completed in R*

- This question requires construction of a diversified portfolio with 9 other stocks from the list of stocks in the excel sheet.
- All calculations are to be completed using a **Long Only** portfolio.
- Assume a 100,000 AUD investment.

#### 3.1 Equally weighted portfolio (10)

- Select nine (9) other stocks from the list of stocks mentioned in the excel spreadsheet to create a diversified portfolio. Clearly mention these stocks and rationale for the choice in the report.
- Calculate the variance-covariance matrix and descriptive statistics of the selected asset returns and present them in the report. Briefly discuss the statistics, highlighting any key items. (word limit: 200 words)
- Allocate equal weights to the assets (stocks) to create an equally weighted portfolio of 10 stocks.
  - Compute the return and risk (daily and annual)<sup>2</sup>.

#### 3.2 Efficient Frontier (7.5)

*From the various methods discussed in the class, the R code should use the most appropriate method for this question.*

- Create an efficient frontier using random weights for the assets in your portfolio.
- Plot the efficient frontier and mark the following.
  - Minimum Variance Portfolio<sup>3</sup>
  - Efficient and Inefficient areas of the area under curve.

#### 3.3 Tangency Portfolio (7.5)

- Use the risk free return proxy to calculate the portfolio with the highest Sharpe Ratio.
- Plot the tangency portfolio on the efficient frontier. Present this in your report along with the risk, return, asset weights and dollar allocation.

#### 3.4 Portfolio with a Risk Free Asset (10)

- Consider the same investment of 100,000 AUD
- You are required to create a portfolio with a 90% return of the Sharpe (Tangency) portfolio. Use the Sharpe (Tangency) Portfolio's return (calculated in 3.3) as the risky portfolio and calculate the amount invested in the risky portfolio and riskless asset. Also calculate the resulting total risk.

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<sup>2</sup> Daily portfolio return and risk will have to be converted to annual after computation.

<sup>3</sup> Ensure a minimum allocation of at least 5% in each asset.

### 3.5 Portfolio Hold Strategy. (5)

The portfolio calculated above has been calculated as of 30 June 2020. After calculating the mean-variance portfolio, you decided to hold it for another two months. What will be the portfolio return and risk at the end of August 2020, i.e, on 31st of August 2020? Comment on the level of risk and return. (word limit: 200 words)

**\*\*End of Assignment Questions\*\***

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Tab. 1: Marking Guide

Question	Marks
Question-1	30 Marks total
1.1	5
1.2 (2+3+5)	10
1.3 (5+5+5)	15
Question-2	30 Marks Total
2.1	7
2.2 (8+4+11)	25
Question-3	40 Marks Total
3.1 (5+3+2)	10
3.2 (2.5+5)	7.5
3.3 (2.5+5)	7.5
3.4	10
3.5	5
Total	100
Deductions	As Per Guidelines

## References

- Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. *the Journal of Finance*, 47(2), 427–465.
- Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of financial economics*, 33(1), 3–56.
- Mietzner, M., Schweizer, D., & Tyrell, M. (2011, Apr 01). Intra-industry effects of shareholder activism in germany — is there a difference between hedge fund and private equity investments? *Schmalenbach Business Review*, 63(2), 151–185. Retrieved from <https://doi.org/10.1007/BF03396816> doi: 10.1007/BF03396816