

## Faculty of Business and Law

### ACFI5041 - Assignment Brief

<b>Module Title</b>	Financial Econometrics	<b>Assignment Number</b>	1
<b>Module Code</b>	ACFI5041	<b>Assignment Title</b>	Final Assignment
<b>Module Leader</b>	Freddie Ahiabor	<b>Assignment Weighting</b>	100%

<b>Assignment Release Date:</b>	<b>23<sup>rd</sup> February 2023</b>
<b>Submission Date/Time:</b>	<b>11<sup>th</sup> May 2023</b>

#### Assessment Information – What you need to do

This assignment is an individual assignment.

This assignment requires is split into four parts. The relevant data is provided on Blackboard.

#### Part One: Asset pricing and abnormal returns

Select any ten (10) equities listed on the New York Stock Exchange (NYSE) or NASDAQ and download their **daily** adjusted close price series from [Yahoo Fund Screener](#) or [Refinitiv Eikon](#). In addition, download data on the daily S&P 500 return (MKT-RF) and the risk-free rate (RF), small-minus-big (SMB), and high-minus-low (HML) portfolios from the [Fama-French website](#). The data series should cover the period from 1 January 2010 to 31 December 2022. Compile your data series into a single excel file and upload it to EViews.

- a) Construct an equal-weighted and price-weighted portfolios of all the 10 stocks you selected and estimate the excess return on the two portfolios.

*Note: The price-weighted portfolios should be estimated using the end-of-year adjusted close price for the equities and rebalanced annually. For instance, the end-of-year price of 2010 should be used as the weight for 2011, and so on.*

- b) Estimate the capital asset pricing model (CAPM) and Fama-French Three Factor (FF3) regressions for the equal-weighted and price-weighted portfolios and test for abnormal return in each case.
- c) Interpret the coefficients on the CAPM and FF3 regressions for the price-weighted portfolios and comment on the statistical significance of all the coefficients.
- d) Compare the CAPM and FF3 regression models using the Adjusted R-Squared and comment on how the model fits the data series.
- e) Conduct a hypothesis test to determine if the residuals of the price-weighted regression outputs are different from 0.
- f) Discuss the normality of the residuals from the price-weighted portfolio regression using the Jarque-Bera and Kolmogorov-Smirnov tests.
- g) Check for heteroskedasticity in the residuals for the price-weighted portfolio using the White Test and BPG Test. Interpret your results.
- h) Check for autocorrelation in the residuals for both equal-weighted and price-weighted portfolios using the DW test and BG test. Interpret your results.

**(30 marks)**

## **Part 2: Time Series Modelling**

Choose any two (2) equities from your portfolio in Part One and carry out the following analysis.

- a) Perform the Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) tests for stationarity on the price and return series of the equities you selected. Interpret your results fully.
- b) Fit an appropriate ARMA (p, q) model for the return series using the Box-Jenkins methodology. Explain the Box-Jenkins procedure and how you implemented it.
- c) Conduct an “out-of-sample” forecast for the last year (2022) based on the ARMA model specified in b) above and analyse the forecast accuracies using RMSE, MAPE and the Theil Inequality Coefficient. Comment on the quality of the forecast from the ARMA model.
- d) Fit an ARCH(q) model for the two equity stocks. Comment on your choice of order q and interpret your ARCH (q) results.
- e) Fit the appropriate GARCH model for the two equity stocks and test for the leverage effects.

**(40 marks)**

## Part 3: VAR and VECM models

**Choose only one question from this section**

### Part 3A Vector Autoregressive Models

Collect quarterly on the following series from the [FRED Database](#) (Federal Reserve Bank Economic Data).

- Real Gross Domestic Product [GDPC1]
- Industrial Output [INDPRO]
- Consumer price index [USACPIALLMINMEI]
- Federal fund effective rate [FEDFUNDS]
- Yield spreads (difference between the US 3 months T-Bill and 10-Year Treasury Constant Maturity Rate) [T10Y3M].

Merge the above data with:

- The quarterly returns on your price-weighted portfolio.
- The quarterly returns on the SP 500 index.

Compile all your data series in a single excel file for the period 2010Q1 to 2022Q4 and upload it to EViews.

- a) Estimate an unrestricted vector autoregressive model for all the seven variables indicated above.
- b) Conduct a Granger causality test between the returns on your price-weighted portfolio and all the variables. Comment on your results thoroughly.
- c) Conduct an impulse response analysis of all the factors on your price-weighted portfolio returns (ignoring all other impulse responses). Comment on your results thoroughly.

**(20 marks)**

### 3B Modelling long-run relationships (VECM)

From the Country data.xlsx file, select any six (6) market index series and

- a) Make five (5) pairs of data with one data series fixed and test for cointegration among the variables.
- b) Critically comment on the assumptions used for the co-integration tests and on your results for each of the cointegration tests in light of the following issues:

- a) Is cointegration found for each pair of series?
- b) What is the order of this cointegration?
- c) Then perform a Johansen cointegration test on ALL FIVE pairs. Comment on whether cointegration is present.
- d) For any cointegrated pair of market indices, carryout a vector error correction modelling and discuss if there are any long-run relationship

**(20 marks)**

### **Presentation of Report**

The written report should be around 3,500 words in length and word-processed. The main results should be reported in the main body of the report, while estimated outputs (EViews printouts) should be reported in the appendix.

Where graphs and diagrams are relevant, they should be reported in the main report.

In the report, you should:

- Explain the rationale behind your empirical tests and the methodology adopted also clearly state any assumptions made for any particular requirement. This part has to be concise and precise.
- You have to use the appropriate scientific rhetoric. Therefore, you should define clearly your null and alternative hypotheses tested in each stage of the analysis.
- Provide a clear definition and rationale of the techniques/statistical tests used.

**(10 marks)**

### **Criteria for Assessment - How you will be marked**

The majority of the marks will be awarded to students that produce evidence of:

- Good understanding of the theory of models estimated.
- Good understanding of statistical procedures.
- Ability to link properly the first two points above and critical interpretation of the findings.

Therefore, the final assignment will be a report with all the Econometric output in the appendix.

**The grade you achieve for this assignment will depend entirely on the level of understanding demonstrated in your report and your sound empirical backing.**

Further information on University mark descriptors [can be found here.](#)

This assignment is designed to assess the following learning outcomes:

- Appraise the problems of non-stationarity in the data series and how these problems can be detected using unit roots and cointegration tests.
- Produce forecasts for ARMA and volatility models and evaluate the usefulness, relative advantages and disadvantages of VAR, ARCH and GARCH modelling.
- Apply the various techniques using standard econometric software (EViews, or STATA).

### **Assessment Details**

**Length:** Maximum 3500 words.

**Style:** Report using the Harvard system of referencing.

**Weighting:** 100% of total course assessment

**This is an individual exercise.**

There will be a penalty of a deduction of 10% of the mark for work exceeding the word limit by 10% or more.

The word limit includes tables, figures, quotations and citations, but excludes the references list and appendices

### **How to Submit your Assessment**

The assessment must be submitted by **12:00 noon (GMT/BST) on 11 May 2022**. No paper copies are required. You can access the submission link through the module web.

- Your coursework will be given a zero mark if you do not submit a copy through Turnitin. Please take care to ensure that you have fully submitted your work.
- Please ensure that you have submitted your work using the correct file format, unreadable files will receive a mark of zero. The Faculty accepts Microsoft Office and PDF documents, unless otherwise advised by the module leader.
- All work submitted after the submission deadline without a valid and approved reason will be subject to the [University regulations](#) on late submissions.
  - If an assessment is submitted up to 14 days late the mark for the work will be capped at the pass mark of 40 per cent for undergraduate modules or 50 per cent for postgraduate modules
  - If an assessment is submitted beyond 14 calendar days late the work will receive a mark of zero per cent

- The above applies to a student's first attempt at the assessment. If work submitted as a reassessment of a previously failed assessment task is submitted later than the deadline the work will immediately be given a mark of zero per cent
- If an assessment which is marked as pass/fail rather than given a percentage mark is submitted later than the deadline, the work will immediately be marked as a fail
- The University wants you to do your best. However, we know that sometimes events happen which mean that you can't submit your coursework by the deadline – these events should be beyond your control and not easy to predict. If this happens, you can apply for an extension to your deadline for up to two weeks, or if you need longer, you can apply for a deferral, which takes you to the next assessment period (for example, to the re-sit period following the main Assessment Boards). You must apply before the deadline. You will find information about applying for [extensions and deferrals here](#).
- Students MUST keep a copy and/or an electronic file of their assignment.
- Checks will be made on your work using anti-plagiarism software and approved plagiarism checking websites.

### **Return of Marked Work**

You can expect to have feedback returned to you on 2 June 2023 (15 working days). If for any reason there is a delay you will be kept informed. Marks and feedback will be provided online. It is important that you access the feedback you receive as this will help to make improvements to your later work, you can request a meeting with your Module Leader or Personal Tutor to discuss your feedback in more detail.

Marks will have been internally moderated only, and will therefore be provisional; your mark will be formally agreed later in the year once the external examiner has completed their review. More information on assessment and feedback [can be found here](#).

### **Academic Integrity**

In submitting a piece of work for assessment it is essential that you understand the University's requirements for maintaining academic integrity and ensure that the work does not contravene University regulations. Some examples of behaviour that would not be considered acceptable include plagiarism, re-use of previously assessed work, collusion with others and purchasing your assignment from a third party. For more information on academic offences, bad academic practice, and academic penalties, please read [chapter four of our academic regulations](#).

## Academic Support and Your Well-being

Referencing is the process of acknowledging other people's work when you have used it in your assignment or research. It allows the reader to locate your source material as quickly and easily as possible so that they can read these sources themselves and verify the validity of your arguments. Referencing provides the link between what you write and the evidence on which it is based.

You identify the sources that you have used by citing them in the text of your assignment (called **citations** or **in-text citations**) and referencing them at the end of your assignment (called the **reference list** or **end-text citations**). The reference list only includes the sources cited in your text. The main referencing guide can be [found here](#) and includes information on the basics of referencing and achieving [good academic practice](#). It also has tabs for the specific referencing styles depending on whether you require [Harvard style used in business](#) or [OSCOLA style used by the Law school](#).

The University has a wealth of support services available to students; further information can be obtained from [Student Gateway](#), the [Student Advice Centre](#), [Library and Learning Services](#) and, most importantly, your Personal Tutor. If you are struggling with your assessments and/or deadlines please do seek help as soon as possible so that appropriate support and guidance can be identified and put in place for you. More information can be found on the [Healthy DMU pages](#).