Master of Science in Quantitative Finance

COURSE CODE: **QF604**
COURSE TITLE: **Econometrics of Financial Markets**

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COURSE AREA
Quantitative Finance

GRADING BASIS
Graded

COURSE UNIT
1 CU

FIRST OFFERING TERM
Academic Year: AY2023-2024
Academic Term: Term 2

COURSE DESCRIPTION
This course will provide a firm foundation in the understanding of financial econometrics applied to financial market asset pricing. By learning the critical steps of understanding the finance theory, using the appropriate econometric approach, selecting adequate data and programming, estimation, testing, and then useful interpretations, the student should be able to tackle many applied market problems and data situations. Lectures will be accompanied by hands-on Python programming exercises so students can gain via experiential learning and be ready to perform at job situations. The topics include time series analyses, time series and cross-sectional multiple linear regressions, generalized method of moments, maximum likelihood, cointegration and error correction models, vector autoregression, and panel regression. The course is taught at a level that is sufficiently rigorous at university post-graduate level.

LEARNING OBJECTIVES
By the end of this course, students will be able to:
- Understand financial model building and implications
- Understand how to estimate, test, and make use of the model in making financial decisions and in forecasting
- Be able to perform actual estimation and testing using Python programming

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- Avoid methodological mistakes that could lead to spurious estimates, erroneous conclusions, errors of predictions. and costly decisions

PRE-REQUISITE/ CO-REQUISITE/ MUTUALLY EXCLUSIVE COURSE(S)

Asset Pricing, Stochastic Modelling in Finance, Quantitative Analysis of Financial Markets, Programming and Computational Finance (these are earlier sequence courses in MQF). It is assumed that students entering this course have learnt at least one statistical programming language, e.g. Python, and has come across linear regression and some other basics of data analyses.

ASSESSMENT METHODS

Individual Econometrics Homework (x 4) using Computer[1]   40%

Class 9 Written Project Submission and Randomly Selected Presentations[2]   30%

Class 10 Test[3]   30%

Total: 100%

Notes:

[1] The Homework problem will be released in ELEARN Content – HOMEWORK. Students may consult with each other on the computer exercises but **should submit individual answers via ELEARN "Quiz - Homework"**. Student self-learning is important as the skills and knowledge are tested during the Class 10 Test. **Please pay attention to the submission deadline.**

[2] Students can **form groups of 1 up to 5 (max)** to do the written Project Work involving data collection, applied econometrics, empirical findings and reporting. The group can **freely choose one published paper** from the bin in ELEARN Content – Project or choose one published paper referenced in the book used for this course. The papers in the bin focus on climate risk impact on financial markets and is a current important topic.

The **requirements for the Project are**: (1) To replicate the empirical findings and extend where possible to a later date, as far as is possible **[20%]**, and (2) To come up with new methods or new ways in exploring the data to contribute new angles or new interpretations **[10%]**. Introduction and literature review need not be replicated. Sometimes, it may be that opposing results and interpretations to the published paper are found. Group members' names and the title of the replicated paper must be shown on the first page of the report. Details of how the data are obtained should also be shown.

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The papers in the bins are selected with their scopes and lengths within manageable capacities so that they are reasonably accessible to PG students. In working through the Project, students should become familiar with applying econometrics to data on real world issues.

All groups should **hand in 1 x hard copy of project report** (A4 typewritten, preferably size 11 fonts in 1 ½ - line pages) **at start of Class 9. Also importantly, the group should submit 1 x group soft copy project report to ELEARN "Assignment".** There will be randomly selected Group Presentations [15 mins each]. All groups must come prepared in case your group is called to present. A student who asks a relevant question will be awarded a bonus 2 points, for participation, to be added to the project score.

[3] The **in-class test will comprise two parts, 1 and 2**. Part I (1 hour) **[10%]** is Programming for solution given a data set. Students need to bring laptop to class. Part 2 (1 ½ hours) **[20%]** is MCQs including solving some short problems. **Part I will be open book** (you may access your computer and any other materials). **Part 2 will be closed book**. Students need to bring a calculator as the laptop will be engaged with the ELEARN Quiz. For Part I and 2, **there will strictly be no use of handphone, no email communications, and no interpersonal consultations during the test. All Answers for Part 1 and 2 must be entered in ELEARN under Quiz – "TEST".**

Preparations for the Test can be done via the following.
☐ Read the lecture power-points. If possible, also read the reference book.
☐ Practise on the Econometrics in-class Computer Exercises and Homeworks using Python
☐ Practise on "+3 Practice Questions with Suggested Answers.pdf" in ELEARN Content - Practice
☐ Practise on "+Q604 MCQ Practice Test 1.pdf" , "+Q604 MCQ Practice Test 2.pdf", "+Q604 MCQ Practice Test 3.pdf", "+Q604 MCQ Practice Test 4.pdf", "+Q604 MCQ Practice Test 5.pdf" in ELEARN Content – Practice
☐ Homework solutions will be posted also in ELEARN Content – Practice

To ensure fairness, there will typically be no instructor assistance for the graded home-works and project.

ACADEMIC INTEGRITY
All acts of academic dishonesty (including, but not limited to, plagiarism, cheating, fabrication, facilitation of acts of academic dishonesty by others, unauthorized possession of exam questions, or tampering with the academic work of other students) are serious offences. All work (whether oral or written) submitted for purposes of assessment must be the student's

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own work. Penalties for violation of the policy range from zero marks for the component assessment to expulsion, depending on the nature of the offence.

When in doubt, students should consult the course instructor. Details on the SMU Code of Academic Integrity may be accessed at http://www.smuscd.org/resources.html.

ACCESSIBILITY

SMU strives to make learning experiences accessible for all. If you anticipate or experience physical or academic barriers due to disability, please let me know immediately. You are also welcome to contact the university's disability services team if you have questions or concerns about academic provisions: included@smu.edu.sg. Please be aware that the accessible tables in our seminar room should remain available for students who require them.

EMERGENCY PREPAREDNESS FOR TEACHING AND LEARNING (EPTL)

Where there is an emergency that makes it infeasible to have classes on campus, classes will be conducted online via WebEx or Zoom, with no disruption to the schedule.

CLASS TIMINGS AND METHODS OF INSTRUCTIONS

This course will be taught with lectures. Many of the lectures will be followed by hands-on econometric exercises using Python programming. Students should bring their notebooks or laptops to class.

As laptops/notebooks will be used in class, it is important that each student checks his/her laptop/notebook configurations such that it can work with Python particularly if it is a Macbook. It is important that you install an updated version of Python. See the video in https://www.youtube.com/watch?v=5DgWvU0p2bk for more information.

COURSE READINGS

Reference book is "Theory and Econometrics of Financial Asset Pricing," 2022, Academic Publisher de Gruyter, Berlin, Germany, by Kian Guan Lim.

Existing SMU students can access the soft copy of the book with their SMU email and password via direct link:

https://www-degruyter-com.libproxy.smu.edu.sg/document/doi/10.1515/9783110673951/html

The errata page is in ELEARN miscellaneous.

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WEEKLY LESSON PLANS

*Items marked in red denote key events and deadlines.

Class No.	Lesson/Activity	Reference Readings
1	Probability Distributions, Simple Linear Regressions Loading Python, Anaconda Exercise: N225_Hedging.ipynb, N225.CSV	Chapters 1,2
2	Capital Asset Pricing Model, Event Studies Exercise: Betas.ipynb[+] , BOA_Event_Study.ipynb, BOA_Event_Study.csv CSM_Event_Study.ipynb, CSM_Event_Study.csv [+] uses data from Yahoo! Finance's API.	Chapters 3,4
3	Time Series Modeling Exercise: SARIMAX.ipynb, Airline-passengers.csv Individual Homework 1 based on Lectures 1, 2 (10%)	Chapter 5
4	Multiple Linear Regressions and Specification Errors Exercise: Day-of-Week.ipynb, Day-of-Week.csv Individual Homework 2 based on Lecture 3 (10%)	Chapter 6, 7 Homework 1 due 30 Jan 2359h
5	Multi-Factor Models and Cross-Sectional Regressions Individual Homework 3 based on Lecture 4 (10%)	Chapter 7 Homework 2 due 6 Feb 2359h
6	Euler Equation and Generalized Method of Moments Exercise: Interest_Rate_Model.ipynb, Interest_Rate.csv	Chapter 8, 11 Homework 3 due 19 Feb 2359h
7	Maximum Likelihood Method and GARCH Exercise: S&P_GARCH.ipynb, S&P500_Yahoo_Finance.csv Individual Homework Exercise 4 based on Lecture 6 (10%)	Chapter 9
8	Unit Roots and Cointegration Exercise: PPP.ipynb, POUND_USD.csv, UK_CPI.csv, US_CPI.csv	Chapter 10 Homework 4 due 5 March 2359h
9	Hand up Group Project Work (30%). Only one submission is required from each group. Randomly selected Group Presentations [15 mins each].	Due 11/3 (G1) 12/3 (G2) in class
10	Test (30%) [2 ½ hours] – Part I [1 hour] (10%): Programming for solution given a data set – Part 2 [1 ½ hours] (20%): MCQs. Part 2 is closed book.	
	There is No Final Examination	