City University of Hong Kong
Course Syllabus

offered by Department of Management Sciences
with effect from Semester A 2024/25

Part I   Course Overview

Course Title: Statistical Modelling in Economics and Finance

Course Code: MS6601

Course Duration: One Semester

Credit Units: 3

Level: P6

**Medium of
Instruction:**   English

**Medium of
Assessment:**   English

Prerequisites:
(Course Code and Title)   MS5218 Applied Linear Statistical Models

Precursors:
(Course Code and Title)   Nil

Equivalent Courses:
(Course Code and Title)   MS6217 Statistical Modelling in Economics and Finance

Exclusive Courses:
(Course Code and Title)   Nil

Part II   Course Details

1. **Abstract**

This graduate-level course in financial econometrics explores advanced techniques for analyzing financial time series data. The course covers the following key topics: (1) Linear Time Series Models: Students will learn to model and forecast financial time series using methods such as autoregressive (AR), moving average (MA), and autoregressive integrated moving average (ARIMA) models. (2) Volatility Modeling: The course delves into ARCH and GARCH models, which are widely used for modeling and forecasting the volatility of financial assets, with applications in risk management and portfolio optimization. (3) Cointegration and Pairs Trading: Cointegration analysis will be introduced as a tool for identifying long-run relationships between financial variables, which can then be leveraged for pairs trading strategies. (4) Factor Models: The course covers factor models, which are used to explain the cross-sectional variation in asset returns, with implications for portfolio management and asset pricing. Throughout the course, students will gain hands-on experience in implementing these techniques using appropriate software, developing a strong foundation in financial econometrics that can be applied in various finance-related domains.

2. **Course Intended Learning Outcomes (CILOs)**
   (CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Apply appropriate statistical and econometric techniques to analyze and solve business problems.	50%	✓	✓	✓
2.	Evaluate the validity and limitations of statistical results and communicate them effectively to both specialists and non-specialists.	10%		✓	✓
3.	Select the most suitable statistical methods for given business contexts and justify the choices made.	10%	✓	✓	✓
4.	Implement relevant computer software to execute statistical and econometric analyses proficiently.	20%		✓	
5.	Collaborate effectively both in teams and individually to conduct financial econometric research and present findings coherently.	10%	✓	✓	✓
		100%			

A1:   Attitude
   Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.
A2:   Ability
   Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.
A3:   *Accomplishments*
   Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing

creative works/new artefacts, effective solutions to real-life problems or new processes.

3. **Learning and Teaching Activities (LTAs)**
   (LTAs designed to facilitate students' achievement of the CILOs.)

LTA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4	5		
Classroom Lectures	Engage in interactive classroom lectures where real-world examples are discussed, allowing you to apply statistical and econometrics techniques to business problems. Participate in class discussions and debates to analyze and evaluate the validity of statistical results, as well as the limitations of the techniques used	✓		✓	✓			
Computer Lab Tutorials	Attend computer lab tutorials where you will practice implementing statistical and econometrics techniques using relevant software. Engage in hands-on exercises and practical assignments during computer lab tutorials, where you will work individually and in groups to solve business problems using statistical and econometrics techniques.	✓	✓		✓	✓		
Group Assignment	Collaborate with your peers in a group assignment that involves conducting financial econometric research. Through this assignment, you will apply various statistical methods, evaluate the validity of the results, and present your findings coherently.	✓	✓	✓	✓	✓		

4. **Assessment Tasks/Activities (ATs)**
   (ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.						Weighting	Remarks
	1	2	3	4	5			
Continuous Assessment: 100 %								
Assignments	✓	✓	✓	✓	✓		40%	
In-Class Midterm Test		✓	✓				30%	
Project	✓	✓	✓	✓	✓		30%	
Examination: 0 %								
							100%	

5. Assessment Rubrics
(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignments	Core concepts and ideas; use of appropriate statistical methods	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. In-Class Midterm Test	Core concepts and ideas; use of appropriate statistical methods	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Project	Ability in using the appropriate statistical methods to solve the business problem	High	Significant	Moderate	Basic	Not even reaching marginal levels

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Assignments	Assessing students' understanding of core concepts and use of appropriate statistical methods.	High	Significant	Moderate	Inadequate
2. In-Class Midterm Test	Assessing students' ability in core concepts and problem solving using statistical models	High	Significant	Moderate	Inadequate
3. Project	Assessing students' ability to code and solve problems with appropriate statistical models	High	Significant	Moderate	Inadequate

Part III   Other Information (more details can be provided separately in the teaching plan)

1. **Keyword Syllabus**
    (An indication of the key topics of the course.)

    1. Introduction
        - Linear Time Series
        - Nonlinear Time Series
        - Introduction to R

    2. Volatility Modeling
        - ARCH and GARCH
        - More Volatility Models
        - Joint Estimation for Expected Return and Volatility

    3. Multivariate Time Series
        - Vector Autoregression
        - Random Walk and Unit Root Test
        - Cointegration and Paris Trading

    4. Factor Models
        - Risk Anomalies
        - Time Series Regression
        - Cross-Sectional Regression
        - Capital Asset Pricing Model
        - Fama-French Factor Models

    5. Factor-based Investing
        - Evaluation of Factor Models
        - Factor-based Portfolio Optimization

2. **Reading List**
2.1 **Compulsory Readings**
    (Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	An Introduction to Analysis of Financial Data with R by Ruey S. Tsay, John Wiley 2012.

2.2 **Additional Readings**
    (Additional references for students to learn to expand their knowledge about the subject.)

1.	Analysis of Financial Time Series by Tsay, RS , John Wiley 2010.
2.	Ang, A. Asset management: A systematic approach to factor investing. Oxford University Press, 2014.
3.	Carmona, R. Statistical analysis of financial data in R. Vol. 2. New York: Springer, 2014.