

**City University of Hong Kong
Course Syllabus**

**offered by Department of Management Sciences
with effect from Semester A 2022/23**

Part I Course Overview

Course Title:	<u>Statistical Modelling in Economics and Finance</u>
Course Code:	<u>MS6601</u>
Course Duration:	<u>One Semester</u>
Credit Units:	<u>3</u>
Level:	<u>P6</u>
Medium of Instruction:	<u>English</u>
Medium of Assessment:	<u>English</u>
Prerequisites: <i>(Course Code and Title)</i>	<u>MS5218 Applied Linear Statistical Models</u>
Precursors: <i>(Course Code and Title)</i>	<u>Nil</u>
Equivalent Courses: <i>(Course Code and Title)</i>	<u>MS6217 Statistical Modelling in Economics and Finance</u>
Exclusive Courses: <i>(Course Code and Title)</i>	<u>Nil</u>

Part II Course Details

1. Abstract

The goal of the class is to introduce financial econometrics: the intersection of statistics and asset pricing. We will cover a wide range of topics, including linear and nonlinear time series, volatility modeling, multivariate time series, and factor models. Particularly, we will discuss how factor-based investing and machine learning are employed in the investment industry. The prerequisites include one course in probability and statistics, one course in regression analysis, and basic knowledge in time series models. Students are expected to work at least 5 hours after every lecture.

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.	Basic Programming Concepts in R	20%	✓	✓	
2.	Knowledges in Financial Econometrics	50%		✓	✓
3.	Knowledges in Factor Asset Pricing	30%		✓	✓
		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 self-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. Teaching and Learning Activities (TLAs)
(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.							Hours/week (if applicable)
		1	2	3					
Classroom Lectures	Regular lecture and demonstration.	✓	✓	✓					
Computer Lab Tutorials	Students practice R programming	✓	✓						
Group Assignment	Coding together in a team.	✓	✓	✓					

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						
Continuous Assessment: 100 %									
Assignments	✓	✓	✓					40%	
In-Class Midterm Test		✓	✓					30%	
Project	✓	✓	✓					30%	
Examination: 0 % (duration: , if applicable)								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 in Semester A 2022/23 and thereafter

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

Applicable to students admitted before Semester A 2022/23

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

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.)

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.