# City University of Hong Kong Course Syllabus

# offered by Department of Economics and Finance with effect from Semester A 2024/25

## Part I Course Overview

Course Title:	Financial Econometrics
Course Code:	EF5070
Course Duration:	1 semester
Credit Units:	3
Level:	P5
Medium of Instruction:	English
Medium of Assessment:	English
<b>Prerequisites</b> : (Course Code and Title)	Nil
<b>Precursors</b> : <i>(Course Code and Title)</i>	Nil
<b>Equivalent Courses</b> : <i>(Course Code and Title)</i>	Nil
<b>Exclusive Courses</b> : <i>(Course Code and Title)</i>	Nil

### Part II Course Details

### 1. Abstract

This course aims to equip students with financial econometric methods to analyse time series in the respect of risk and return, and volatility modelling and risk management. Students are expected to gain practical experience in analysing financial and macroeconomic data.

### 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)		
			Al	A2	A3
1.	Apply econometric methods to analyse financial time series.		$\checkmark$	$\checkmark$	$\checkmark$
2.	Demonstrate econometric models to solve risk management problems.			$\checkmark$	$\checkmark$
3.	Explain portfolio risk through various volatility models.			$\checkmark$	$\checkmark$
		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.

#### Learning and Teaching Activities (LTAs) 3.

(LTAs designed to facilitate students' achievement of the CILOs.)

LTA	Brief Description		O No.		Hours/week (if applicable)
		1	2	3	
Lectures	Students will engage in lectures on instruction to the R program, with a review of probability and statistics, linear time series analysis, nonlinear models, high-frequency data analysis, and their applications.	V		$\checkmark$	3 hours/week

### 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: 60%					
Assignments (4-5 individual problem sets) Assignments on basic statistics and R programming, and on the application of R to financial time series analysis, demonstrating students' ability to model linear time series models, evaluate model adequacy, build time-varying conditional models, detect structural changes in the mean and variance processes, etc.	V	$\checkmark$	$\checkmark$	60%	
Examination: 40% (duration: 2 hours) One final examination on concepts and analytics of financial time series and on R programming examples of financial time series analysis, demonstrating students' ability to model linear time ser models, evaluate model adequacy, build time-varying conditional models, detect structural change in the mean and variance processes, etc.					model linear time series
				100%	

### 5. Assessment Rubrics

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

nalytical nd rogramming kills	(A+, A, A-) Demonstrate very strong knowledge in the subject, and a superior grasp of the critical issue and techniques, which include the ability to model linear time series models,	(B+, B, B-) Demonstrate good knowledge in the subject, and a good grasp of the critical issue and techniques, which include the ability to model linear time series models,	(C+, C, C-) Demonstrate adequate knowledge in the subject, and adequate grasp of the critical issue and techniques, which include the ability to	(D) Demonstrate limited knowledge in the subject, and some idea of the critical issue and techniques, which include the	(F) Demonstrate very little knowledge in the subject, and no awareness of the critical issue and tashnigues which
nd rogramming	strong knowledge in the subject, and a superior grasp of the critical issue and techniques, which include the ability to model linear time	knowledge in the subject, and a good grasp of the critical issue and techniques, which include the ability to model linear	adequate knowledge in the subject, and adequate grasp of the critical issue and techniques, which	knowledge in the subject, and some idea of the critical issue and techniques,	knowledge in the subject, and no awareness of the critical issue and
	evaluate model adequacy, build time- varying conditional models, and detect structural changes in the mean and variance processes etc. Also, students will explore high-frequency analysis and explore the microstructure noise issue in financial	evaluate model adequacy, build time- varying conditional models, and detect structural changes in the mean and variance processes etc. Also, students will explore high-frequency analysis and explore the microstructure noise issue in financial analysis.	model linear time series models, evaluate model adequacy, build time- varying conditional models, and detect structural changes in the mean and variance processes etc. Also, students will explore high- frequency analysis and explore the microstructure noise	ability to model linear time series models, evaluate model adequacy, build time-varying conditional models, and detect structural changes in the mean and variance processes etc. Also, students will explore high-frequency analysis and explore the microstructure noise issue in	techniques, which include the ability to model linear time series models, evaluate model adequacy, build time-varying conditional models, and detect structural changes in the mean and variance processes etc. Also, students will explore high-frequency analysis and explore the microstructure noise issue in financial analysis.
	analysis.	anarysis.	issue in financial	financial analysis.	anarysis.
nalytical cills and nowledge cout rogramming	Demonstrate very strong knowledge in the subject, and a superior grasp of the critical issue and techniques, which include the ability to model linear time	Demonstrate good knowledge in the subject, and a good grasp of the critical issue and techniques, which include the ability to model linear time series models.	Demonstrate adequate knowledge in the subject, and adequate grasp of the critical issue and techniques, which include the ability to	Demonstrate limited knowledge in the subject, and some idea of the critical issue and techniques, which include the ability to model linear time series	Demonstrate very little knowledge in the subject, and no awareness of the critical issue and techniques, which include the ability to model linear time
cill nov 501	s and wledge 1t	lytical Demonstrate very s and strong knowledge in wledge the subject, and a superior grasp of the critical issue and techniques, which include the ability to model linear time	lytical s and wledge at gramming superior grasp of the the subject, and a superior grasp of the critical issue and techniques, which include the ability to model linear time superior grasp of the critical issue and techniques, which include the ability to model linear time	Iytical s and wledgeDemonstrate very strong knowledge in the subject, and a superior grasp of the critical issue and techniques, which include the ability to model linear timeDemonstrate good knowledge in the subject, and a good grasp of the critical issue and techniques, which include the ability to model linear time series models,analysis.Int adequate knowledge in the subject, and a adequate grasp of the critical issue and techniques, which include the ability to model linear timeDemonstrate adequate good grasp of the critical issue and techniques, which include the ability to model linear time series models,Demonstrate analysis.	Ivical s and wledgeDemonstrate very s and wledgeDemonstrate good knowledge in the subject, and a superior grasp of the critical issue and techniques, which include the ability to model linear timeDemonstrate good he subject, and a good grasp of the critical issue and techniques, which include the ability to model linear time series models,Demonstrate analysis.Demonstrate he adequate knowledge in the subject, and adequate grasp of the critical issue and techniques, which include the ability to model linear timeDemonstrate limited knowledge in the grasp of the critical issue and techniques, which include the ability to model linear time seriesDemonstrate adequate knowledge in the subject, and adequate grasp of the critical issue and techniques, which include the ability to model linear timeDemonstrate limited knowledge in the subject, and a good in the subject, and adequate grasp of the critical issue and techniques, which include the ability to model linear time series models,Demonstrate analysis.Demonstrate adequate knowledge in the subject, and adequate grasp of the critical issue and techniques, which include the ability to model linear time series

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

evaluate model	adequacy, build time-	evaluate model	model adequacy,	model adequacy, build
adequacy, build time-	varying conditional	adequacy, build time-	build time-varying	time-varying
varying conditional	models, and detect	varying conditional	conditional models,	conditional models,
models, and detect	structural changes in	models, and detect	and detect structural	and detect structural
structural changes in	the mean and variance	structural changes in	changes in the mean	changes in the mean
the mean and variance	processes etc. Also,	the mean and	and variance	and variance processes
processes etc. Also,	students will explore	variance processes	processes etc. Also,	etc. Also, students will
students will explore	high-frequency	etc. Also, students	students will explore	explore high-frequency
high-frequency	analysis and explore	will explore high-	high-frequency	analysis and explore
analysis and explore	the microstructure	frequency analysis	analysis and explore	the microstructure
the microstructure	noise issue in financial	and explore the	the microstructure	noise issue in financial
noise issue in financial	analysis.	microstructure noise	noise issue in	analysis.
analysis.		issue in financial	financial analysis.	-
		analysis.		

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

Assessment Task	Criterion	Excellent	Good	Marginal	Failure
		(A+, A, A-)	(B+, B)	(B-, C+, C)	(F)
Assignments (4-5	Analytical	Demonstrate very strong	Demonstrate good	Demonstrate limited	Demonstrate very little
individual problem	and	knowledge in the subject,	knowledge in the subject,	knowledge in the subject, and	knowledge in the subject,
sets)	programming	and a superior grasp of the	and a good grasp of the	some idea of the critical issue	and no awareness of the
	skills	critical issue and	critical issue and	and techniques, which include	critical issue and techniques,
		techniques, which include	techniques, which include	the ability to model linear time	which include the ability to
		the ability to model linear	the ability to model linear	series models, evaluate model	model linear time series
		time series models,	time series models,	adequacy, build time-varying	models, evaluate model
		evaluate model adequacy,	evaluate model adequacy,	conditional models, and detect	adequacy, build time-varying
		build time-varying	build time-varying	structural changes in the mean	conditional models, and
		conditional models, and	conditional models, and	and variance processes etc.	detect structural changes in
		detect structural changes	detect structural changes in	Also, students will explore	the mean and variance
		in the mean and variance	the mean and variance	high-frequency analysis and	processes etc. Also, students
		processes etc. Also,	processes etc. Also,	explore the microstructure	will explore high-frequency
		students will explore high-	students will explore high-	noise issue in financial	analysis and explore the
		frequency analysis and	frequency analysis and	analysis.	microstructure noise issue in
		explore the microstructure	explore the microstructure		financial analysis.
		noise issue in financial	noise issue in financial		
		analysis.	analysis.		

Examination	Analytical	Demonstrate very strong	Demonstrate good	Demonstrate limited	Demonstrate very little
	skills and	knowledge in the subject,	knowledge in the subject,	knowledge in the subject, and	knowledge in the subject,
	knowledge	and a superior grasp of the	and a good grasp of the	some idea of the critical issue	and no awareness of the
	about	critical issue and	critical issue and	and techniques, which include	critical issue and techniques,
	programming	techniques, which include	techniques, which include	the ability to model linear time	which include the ability to
		the ability to model linear	the ability to model linear	series models, evaluate model	model linear time series
		time series models,	time series models,	adequacy, build time-varying	models, evaluate model
		evaluate model adequacy,	evaluate model adequacy,	conditional models, and detect	adequacy, build time-varying
		build time-varying	build time-varying	structural changes in the mean	conditional models, and
		conditional models, and	conditional models, and	and variance processes etc.	detect structural changes in
		detect structural changes	detect structural changes in	Also, students will explore	the mean and variance
		in the mean and variance	the mean and variance	high-frequency analysis and	processes etc. Also, students
		processes etc. Also,	processes etc. Also,	explore the microstructure	will explore high-frequency
		students will explore high-	students will explore high-	noise issue in financial	analysis and explore the
		frequency analysis and	frequency analysis and	analysis.	microstructure noise issue in
		explore the microstructure	explore the microstructure		financial analysis.
		noise issue in financial	noise issue in financial		
		analysis.	analysis.		

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.)

Financial Time Series Analysis and its Application Volatility Models (ARCH, GARCH, EWMA, and Risk Metrics Models) Market and Credit Risk VaR

### 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. Ruey S. Tsay, Analysis of Financial Time Series, John Wiley & Sons, New Jersey, 2005

### 2.2 Additional Readings

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

Nil