City University of Hong Kong
Course Syllabus

offered by School of Data Science
with effect from Semester A 2024/25

Part I   Course Overview

Course Title: Predictive Analytics and Financial Applications

Course Code: SDSC6016

Course Duration: One Semester

Credit Units: 3

Level: P6

Medium of Instruction: English

Medium of Assessment: English

Prerequisites:
(Course Code and Title)   Nil

Precursors:
(Course Code and Title)   Nil

Equivalent Courses:
(Course Code and Title)   Nil

Exclusive Courses:
(Course Code and Title)   Nil

Part II   Course Details

1. Abstract

This course focuses on the application of predictive analytics to financial data.   We will review some central tools used in economic and financial forecasting, including predictive regressions, time series models, variable and model selection, forecast combinations, shrinkage methods, and vector autoregression.   We will explore how these tools can be applied to predict the returns to financial assets, including global equities and commodities, paying special attention to the different types of forecasts – point forecast, interval forecast, or density forecast.   We will also introduce modern predictive methods, such as penalized regressions and neural networks, and their applications to making predictions in financial markets.   Students are expected to gain working knowledge of how to apply predictive analytics to economics and financial problems.

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.	**Explain** the workhorse predictive analytics used for financial data.	25%	√		
2.	**Apply models of** financial asset returns using predictive regressions, time series models, and machine learning algorithms.	20%	√	√	
3.	**Apply** predictive analytics to forecast financial asset returns.	30%	√	√	
4.	**Evaluate** different predictive models and their usage.	25%	√	√	
		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. 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		
Lectures	Students will engage in formal lectures covering different predictive analytics and their applications to issues in economics and finance. Students are expected to actively participate in class discussions.	√	√	√	√		2 hours/week
Tutorials	Students will participate in tutorials in which discussions revolve around implementation of various predictive techniques discussed in class.		√	√	√		1 hour/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	4			
Continuous Assessment: 70%							
Midterm Test	√	√	√			30%	
Homework assignments		√	√	√		40%	
Examination: 30% (duration: 2 hours)							
Examination	√	√	√	√		30%	
						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. Midterm Test	The midterm test provides students with an opportunity to reflect what they have learned and covers the topics taught before the midterm.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Homework assignment	The midterm test provides students with an opportunity to reflect what they have learned and covers the topics taught before the midterm.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	The final examination covers all the topics taught in the course.	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. Midterm Test	The midterm test provides students with an opportunity to reflect what they have learned and covers the topics taught before the midterm.	High	Moderate	Basic	Not even reaching marginal levels
2. Homework assignments	The homework assignments allow students to practice what is learned from the lectures and assess the degree of their understanding.	High	Moderate	Basic	Not even reaching marginal levels
3. Examination	The final examination covers all the topics taught in the course.	High	Moderate	Basic	Not even reaching marginal levels

The examination, midterm test, and homework assignments will be marked according to the respective marking schemes. The marking schemes will be designed at the time they are set. The grades will then be awarded according to the marks attained.

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.)

- Predictive regressions
- Time series models
- Trends and seasonality
- Variable selection
- Model selection
- Model and forecast combination
- Shrinkage
- Point forecast
- Interval and density forecasts
- Forecasting the stock market using machine learning techniques
- Vector autoregression

2.   **Reading List**

2.1.   Suggested Readings

(Suggested 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.	Forecasting in Economics, Business, Finance, and Beyond, Francis X. Diebold

2.2.   Online Resources

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

1.	Online learning material is provided via University computer network.