Master of Science in Quantitative Finance

Course Code: QF605

Course Title: Fixed Income Securities

Instructor : Dr. Tee Chyng Wen

Title : Associate Professor of Quantitative Finance (Practice)

Date Submitted : 30 Oct 2024

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

None

COURSE AREA

(1) MSc in Quantitative Finance Core

GRADING BASIS

Graded

COURSE UNIT

1.0 CU

FIRST OFFERING TERM

Academic Year: AY2024/2025

Academic Term: Term 2

COURSE DESCRIPTION

This course acquaints students with the main modeling streams in fixed income securities and enables them to use models in this area in practical applications. Fundamental mathematical modeling techniques will also be taught. Since the financial crisis, the fixed income market has deviated drastically from the standard textbook settings. This course is designed to bring students up to speed with the state-of-the-art quantitative modeling in this domain. Both linear and nonlinear products will be covered, with a strong emphasis on efficient pricing, valuation, and risk management.

LEARNING OBJECTIVES

By the end of this course, participants will be able to:

- The fundamental concept of interest and the instruments traded in the market
- The difference between linear and nonlinear products, and the standard market models for them
- Gain experience in knowing and understanding existing popular interest rate models
- Model new derivatives under different processes and instrument settings
- Understand the risk management of fixed income securities and interest rate derivatives
- Understand the importance of collateralization, how it is managed in the industry,
- Gain knowledge on short rate models and Heath-Jarrow-Merton framework.

ASSESSMENT METHODS

The various key assessment components are as follows:

Class Participation	10%
Weekly assignments	20%
Project	20%
Final Exam	50%

ACADEMIC INTEGRITY

Academic integrity is of utmost importance for all work presented and submitted for grading. As such, work presented must be one's own with appropriate citation from sources used, including the Internet.

INSTRUCTIONAL METHODS AND EXPECTATIONS

Seminars
Weekly seminars provide a quantitative and qualitative overview of fixed income securities and focus on applicable concepts and models currently employed in the industry, or under active research and development by market participants.

Assignments
Question pack will be provided for each seminar for students to practice on concepts taught in the class.

Examination
This will take the form of a (closed-book) written exam for a duration of **three hour**.

CLASS TIMINGS

The course is taught in one 3-hour session per week over ten weeks. There will be a 15-minute break at the mid-point in each class.

RECOMMENDED TEXT AND READINGS

A self-contained course pack will be provided for this course. Additional examples with worked solutions will also be circulated for further practice. If you would like to read up more on this topic, see:

1. Bruce Tuckman and Angel Serrat, "Fixed Income Securities". Wiley, 3rd edition (2011).
2. Antoon Pelsser, "Efficient Methods for Valuing Interest Rate Derivatives". Springer Finance, (2000).
3. Mark Joshi, "The Concetps and Practice of Mathematical Finance", 2nd Edition. Cambridge University Press (2008).
4. Martin Baxter and Andrew Rennie, "Financial Calculus: An Introduction to Derivative Pricing". 17th Edition, Cambridge University Press (1996)

WEEKLY LESSON PLAN

Week	Topics	Assignments/Activities
1	**Introduction to Interest Rate: Bond Market & LIBOR Market**	
2	**Interest Rate Derivatives & Swap Market**	Practice Question Set 1
3	**Multi-curve Framework and OIS Discounting**	
4	**Bond Risk, Hedging and Risk Management**	Practice Question Set 2
5	**Change of Numeraire and Convexity Correction**	
6	**LIBOR Market Model & Swap Market Models**	Practice Question Set 3
7	**Stochastic Volatility Models**	
8	**Short Rate Models: Ho-Lee and Hull-White**	Practice Question Set 4
9	**Heath-Jarrow-Morton Framework**	
10	**Markov Models**	