

EF5080: ADVANCED TOPICS IN FINANCIAL ENGINEERING

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

Advanced Topics in Financial Engineering

Subject Code

EF - Economics and Finance

Course Number

5080

Academic Unit

Economics and Finance (EF)

College/School

College of Business (CB)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

EF5050 Derivatives and Risk Management

EF5210 Option Pricing

EF5213 Spreadsheet Modelling in Finance

Precursors

Nil

Equivalent Courses

EF5221 Seminar in Financial Engineering

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims to expose students to current topics in financial engineering. The focus is on the advanced pricing techniques for interest rate derivatives.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Understand modern interest rate models, and assess their practicalities in real interest rate market.		x		
2	Master the advanced numerical and analytical pricing techniques of interest rate derivatives, and design complex algorithms and solution for exotic products.		x	x	
3	Develop integrated solutions to tackle real-life problems in the pricing of interest rate derivatives.		x	x	x

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)

LTAs	Brief Description		CILO No.	Hours/week (if applicable)
1	Lectures and class discussions	Discuss the current topics in financial engineering, particularly, the advanced pricing techniques for interest rate derivatives.	1, 2, 3	-

Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Classwork (presentation, discussion & reports, etc)	1, 2, 3	100

Continuous Assessment (%)

100

Examination (%)

0

Assessment Rubrics (AR)

Assessment Task

Classwork (presentation, discussion, reports, etc.) (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Demonstrate the capability to comprehend the advanced pricing techniques in the area of financial engineering and be able to apply those techniques in in-class discussion and also for tackling relevant problem-solving questions.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Classwork (presentation, discussion, reports, etc.) (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Demonstrate the capability to comprehend the advanced pricing techniques in the area of financial engineering and be able to apply those techniques in in-class discussion and also for tackling relevant problem-solving questions.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Basic

Failure

(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Term structures of interest rates, Vasicek Model, CIR Model, Jamshidian Model, No-arbitrage Models, Hull-White Model, Black' s Model, Heath-Jarrow-Morton Model, Ritchken-Sankarasubramanian model, LIBOR Market Model

Reading List

Compulsory Readings

Title	
1	O.A. Vasicek, "An equilibrium characterization of the term structure", Journal of Financial Economics, 5, (1977), p177-188.
2	F. Jamshidian, "An exact bond option pricing formula", Journal of Finance, 44 (March 1989), 205-209.
3	J. Hull and A.White, "One-factor interest-rate models and the valuation of interest-rate derivative securities", Journal of Financial and Quantitative Analysis, vol 28, (June 1993), page 235-254.
4	J. Hull and A.White, "Valuing Derivative Securities using the Explicit Finite Difference Method", Journal of Financial and Quantitative Analysis, vol 25 (June 1990), page 87-100.
5	J. Hull and A.White, "Bond option pricing based on a model for the evolution of bond prices", Advances in Futures and Options Research, vol 6, (1993), page 1-13.
6	J. Hull and A.White, "Pricing interest-rate derivative securities", Review of Financial Studies, vol 3, no. 4 (1990), page 573-592.
7	J. Moraleda and T. Vorst, Pricing American interest rate claims with humped volatility models, Journal of Banking and Finance 21 (1997), pp 1131-1157.
8	P. Ritchken and L. Sankarasubramanian, "Volatility structures of forward rates and the dynamics of the term structure", Mathematical Finance, vol 5, 1 (1995), page 55-72.
9	A. Li, P. Ritchken, and L. Sankarasubramanian, "Lattice models for pricing American interest rate claims", Journal of Finance, vol 50, 2 (1995), page 719-737.
10	D. Heath, R. Jarrow, and A. Morton, "Bond pricing and the term structure of interest rates : a new methodology for contingent claims valuation", Econometrica, vol 60, (January, 1992), page 77-105.
11	L. Clewlow and C. Strickland, "Pricing interest rate exotics by Monte Carlo simulation", Chapter 17 in: Monte Carlo: Methodologies and Applications for Pricing and Risk Management. Risk Books, London, U.K (1998).
12	A. Brace, D. Gatarek, and M. Musiela, "The market model of interest rate dynamics", Mathematical Finance, vol 7, (April, 1997), page 127-147.
13	J. James and N. Webber, Interest Rate Modelling, Wiley (2000).

Additional Readings

Title	
1	Nil