

MATH4511 Quantitative Methods for Fixed Income Derivatives

Course Outline- Fall 2024

1. Instructor(s)

Name: Lixin Wu

Contact Details: 2358-7435/malwu

2. Teaching Assistant(s)

Name: Xia Wencan

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3. Meeting Time and Venue

Lectures:

Date/Time: Tues, Thur, 1030 - 1150

Venue: Rm 5583

Tutorials:

Date, Time/Venue:

T1A, Wed 07:00PM - 07:50PM, Rm 2463

T1B, Wed 09:30AM - 10:20AM, Rm 4580

4. Course Description

Credit Points: 3

Pre-requisite: Multivariable calculus and probability

Exclusion: NIL

Brief Information/synopsis:

Bond, bond markets and interest-rate derivatives markets. Yields, forward rate and swap rates. Yield-based risk management and regression-based hedging. Mortgage mathematics. Binomial models for equity and fixed-income derivatives. Forward contracts and forward prices. Arbitrage pricing and general valuation principle. Lognormal models and Black formula for caps and swaptions. Selected securities (Repos and Total Return Swaps).

5. Intended Learning Outcomes

Upon successful completion of this course, students should be able to:

No.	ILOs
1	Understand the fixed-income markets and popular securities
2	Know bond mathematics and related risk management methodologies
3	Understand arbitrage pricing principle for derivatives pricing.
4	Be able to apply the Black formula to interest-rate derivatives.

6. Assessment Scheme

- Examination duration: 3 hrs
- Percentage of coursework, examination, etc.:

<u>Assessment</u>	<u>Assessing Course ILOs</u>
20% by coursework	1, 2, 3, 4
30% by midterm exam	1, 2, 3, 4
50% by final exam	1, 2, 3, 4
- The grading is assigned based on students' performance in assessment tasks/activities.

7. Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Deliver excellent performance in homework, midterm and final exam. Through the course work, demonstrate a correct and comprehensive understanding of the theories taught.
B	Good Performance	Have a good understanding of the theories. Have a good performance on most course work.
C	Satisfactory Performance	Have an adequate understanding of the theories. Have a fair performance in course work.
D	Marginal Pass	Have acquired the basic concepts of the theories. Have delivered a performance in course work to achieve a basic understanding of the theories.
F	Fail	Have delivered a very poor overall performance in course work. Demonstrate the failure to understand the basic concepts of the theories. Considered necessary to retake the same course, if possible.

8. Student Learning Resources

Lecture notes provided by the instructor plus recommended reading.

9. Teaching and Learning Activities

Scheduled activities: 3 hrs (lecture)

10. Course Schedule

Keyword Syllabus:

- Introduction to global financial markets
- Bonds, bond markets and interest-rate derivatives markets
- Yields, forward rates and swap rates
- Mortgage mathematics
- Yield-based risk management and regression-based hedging
- Forward contracts and forward prices
- Binomial models for equity and fixed-income derivatives
- Arbitrage pricing and the general valuation principle
- Brownian motions and the Ito's Lemma
- Black model and Black formula
- Black formula for caps and swaptions
- Repo and total return swaps