Mathematical Finance
Introduction

Instructor: Yu Wang[1]

[1]WISE
Xiamen University

WISE Double Degree, Spring 2024/25

Outline

About the Instructor

- Name: Yu WANG
- Email: yuwang@xmu.edu.cn
- Lecture: 105, Nanqiang Building, 09:00-12:00, Sunday
  B205, Xuewu Building, 14:30-17:30, Sunday
- Class's QQ Group: **985506294 (Siming)**
  947528460 (Xiang'an)
- Office: Economics Building D118, Main Campus
- Office Hours: Tuesday 14:30-17:30 (Make an appointment pls.)
- Teaching Assistant: TBC

Requirements

- According to the rules of University and WISE, students are required to attend all lectures - so please attend and make sure you have an appropriate attendance record for each class. (Refer to the University's Attendance Record System)

- You are expected to make every effort to be on time to class. If for some reason you must be late, try not to disturb others while entering the classroom - take an empty seat near the door.

- Be aware of the information of this course whenever and wherever it is announced. If you miss any information, then you should bear all the relevant consequences.

Warnings!

- According to recent years' experience, the following warnings should be emphasized to you:

1. It is impossible to arrange a replacement of mid-term exam. So, please try hard to avoid asking for a leave from the exam. If you have any important reason to ask for a leave, you mid-term result is replaced by your final exam result. （期中考试只有一场，请假的按期末考试成绩记，没请假的零分！）

2. It is also impossible to arrange a resit or replacement of final exam. If you miss the final exam, you get 0 for the final exam. If you fail to pass the course, then you need to retake the course in next year. （期末考试只有一场，没有补考，可以重修！）

3. If you have any issues related to this course, you must fix all the issues as soon as possible and make sure all issues have been fixed before the announcement of your course' final results in the system. Once the course' final results has been announced, it is impossible to change the results. （任何与课程有关的问题必须尽快解决。一旦课程成绩在系统录入并公布后，无法更改！）

Academic Integrity

No form of academic dishonesty will be tolerated. This includes, but is not limited to

- plagiarism,
- cheating on exams,
- misrepresentation,
- presenting as your own the work of another, etc.

Any student caught in an act of academic dishonesty will be prosecuted to the full extent allowed under the University's code of conduct.

(This shall be in addition to automatically receiving a grade of F on the assignment/exam in question).

Course Description

- This course provides an introduction to the mathematics of some important financial models, and devotes more to financial derivatives and the relevant mathematical models. The aim is to equip students with essential knowledge and mathematical methods in order to better understand the way modern financial markets operate.

- This course mainly focuses on the three major areas of mathematical finance:
  1. Option pricing based on the no-arbitrage principle in discrete and continuous time setting;
  2. Markowitz portfolio optimization and the Capital Asset Pricing Model (CAPM);
  3. Basic stochastic interest rate models in discrete setting.

- The first two above are Nobel Prize winning theories, building on mathematical models of bond and stock prices; the last above is also based on the Principle of No Arbitrage.

Course Prerequisites

Students taking this course are expected to be equipped with elementary knowledge of calculus, probability and linear algebra which includes:

- Calculus: derivatives and partial derivatives, finding maxima or minima of differentiable functions of one or more variables, Lagrange multipliers, the Taylor formula and integrals.

- Probability: random variables and probability distributions, in particular the binomial and normal distributions, expectation, variance and covariance, conditional probability and independence. Familiarity with the Central Limit Theorem would be a bonus.

- Linear Algebra: solve systems of linear equations, add, multiply, transpose and invert matrices, and compute determinants.

Textbooks/References

Main:

- *Mathematics for Finance: An Introduction to Financial Engineering*, by Marek Capinski and Tomasz Zastawniak, Springer Undergraduate Mathematics Series, 2nd ed. (2011).

Additional:

- *An Elementary Introduction to Mathematical Finance*, by Sheldon M. Ross, Cambridge University Press; 3rd edition (February 28, 2011).

- *Stochastic Calculus for Finance*, by Steven Shreve, Springer (April 21, 2004).

Course Assessments and Grading (Tentative)

- The assessment methods and grading of this course are shown in the table below:

Assessment Methods	Weight
Class Attendance and Participation	10%
Homework and/or Project Assignments	20%
Mid-term Exam and/or Quizzes	30%
Final Exam	40%
Total	**100%**

- Besides, students will be provided continuous exercises and/or question sets to help them better grasp the contents of this course, although these exercises and/or question sets will not be counted in their final results.

Content outline of the course

- Chapter 1 A Simple Market Model
- Chapter 2 Risk-Free Assets
- Chapter 3 Portfolio Management
- Chapter 4 Forward and Futures Contracts
- Chapter 5 Options: General Properties
- Chapter 6 Binomial Model
- Chapter 7 General Discrete Time Models
- Chapter 8 Continuous Time Model
- Chapter 9 Interest Rates

We will try to cover as many contents of the textbook as possible, though it is hard.

How to study this course?

Suggestions from instructor:

- Attend the lectures
- Self-study
- Take advantage of internet resources (Google, Bing or Baidu search)
- Discuss with classmates
- Consult the lecturer and TA (Email or Office hours)

Your Feedback on this Course

- Treat me as a friend not just a teacher.
- Your feedback on this course is valuable!
  Any suggestions and comments are welcome!
- Let's work together!
  to improve the course quality;
  to make teaching and learning more efficient.