HE3016 Principles of Mathematical Finance  
Nanyang Technological University  
Division of Economics

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Aim

The objective of this course is to provide a rigorous framework for understanding finance and investments from the household perspective. The materials to be covered include the basics of financial markets, the time value of money, the principles of risk and return, theories of portfolio selection, valuation of stocks, bond pricing, and options (what they are and how to use them). The course is geared toward nonbusiness majors who are interested in a rigorous course in finance with emphasis on personal life-cycle finance.

Objectives:

(1) To understand interest rates and bonds.

(2) To know the nature standard forward and futures contracts and their pricing methods.

(3) To become familiar the notion of a derivative, and in particular to know the definition of European and American options.

(4) To understand the notion of no-arbitrage pricing.
(5) To apply the binomial tree method for approximating values of derivatives.

(6) To understand the notion of risk neutral valuation and to derive the Black-Scholes formula and to price European options using it.

(7) To produce feasible sets of portfolios and investor’s indifference curves and to apply this for finding optimal portfolios

(8) To understand the notion of the Market Portfolio.

(9) To understand the beta coefficient of investments and to analyse investments using the CAPM.

(10) To understand the notions of Unique Risk and Market Risk.

**Prerequisites**

At minimum, you have taken HE1005 Introduction to Probability and Statistical Inference. This course builds on students’ background knowledge in economics and statistics. Although efforts will be made to keep the use of advanced mathematics to a minimum, knowledge of calculus is assumed and is crucial for the understanding of the course materials. Knowledge of spreadsheet software is a must.

**Texts**


**Additional References**

**Requirements and Grading**

There will be weekly homework assignments, one midterm and one final. The course grade will be determined by a project (20%), the midterm (20%) and the final (60%). The weekly problem sets will be posted on blackboard. While the problems sets will not be graded or collected. Their solutions will be discussed in tutorials and they are part of the material that you will be tested on for both examinations. You are encouraged to work in groups for the homework.

If you miss the midterm examination, please produce a medical certificate and submit it to the division of economics. Also notify me via email. In this instance, your final grade will be solely determined by your performance on the final exam.

If you miss an exam without a medical certificate that is acceptable to the division of economics, you will score zero points for the exam. There are no exceptions to this rule.

**Lectures**

It is expected that all students attend all lectures and the weekly discussion sessions. If you miss any classes for any reasons, it is your duty to get the required notes from your classmates. Please check the course blackboard website everyday for any class announcements.
Office Hours

Students are encouraged to take advantage of the instructor’s office hours to clarify material covered in class and other matters related to the course. If you are unable to meet during regular office hours you should setup an appointment with me via email.

The best way to contact me outside of office hours is via email. However, please be aware that I cannot reply to questions that require lengthy answers about material covered in the course. If you have such questions, please come to my office and I will be happy to help you. I will try to respond to your short questions within 48 hours. Please be aware that I do not respond to emails over the weekends.

Exam Schedule

The final exam date is completely determined by the registrar’s office. I have no control over this. The midterm exam will be held on the 7th lecture in class. The project is due in class in the 11th tutorial class in which you are assigned.

Academic Dishonestly/Misconduct

All cases of academic misconduct and dishonesty will not be tolerated. They will be reported to the relevant authorities immediately. Please consult the economics division or your student handbook to find out more about what constitutes academic misconduct/dishonestly.
Course Outline

Please note that this is a preliminary outline. It is subject to changes. Lecture slides/note will be posted on the course blackboard page.

1. Interest rates, bonds and yield curves. (2 lectures)
2. Forward and Futures contracts. (3 lectures)
3. Options. (3 lectures)
4. Binomial trees and risk neutral valuation. (3 lectures)
5. The stochastic process followed by stock prices. (2 lectures)
6. The Black-Scholes pricing formulas. (2 lectures)
7. Portfolio theory. (2 lectures)
8. The Capital Asset Pricing Model. (3 lectures)