ECON 5050
FINANCIAL MARKET AND DERIVATIVES

# COURSE SYLLABUS

**2023**

**INSTRUCTOR: YILIN WU**

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| **OFFICE LOCATION:** | Room 855 |
| **OFFICE HOURS:** | Thursday 1:10-3:10 pm. Outside this time period please do contact me to set an appointment and we will meet at any point during the week in my office |
| **OFFICE PHONE:** | 02-3366-8448 ext 68354 |
| **E-MAIL ADDRESS:** | yilinwu@ntu.edu.tw |
| **COURSE WEB PAGE:** | NTU COOL |
| **CLASS HOURS:** | Thur. A.M. 9:10-12:10 |
| **CLASS ROOM:** | 社科502 |
| **TEACHING ASSISTANT** | 呂政泓 |
| **TA OFFICE ROOM** | Room654 |
| **E-MAIL ADDRESS OF TA:** | r09323014@ntu.edu.tw |

## A. OVERVIEW OF THE COURSE

The course provides a broad overview of the fields of derivatives and financial market. It is divided in three parts. Part I is devoted to the basic knowledge of bonds and stocks and valuation of forwards and futures.

After that, in Part II, we turn to the problem of option valuation. We first deal with simple no arbitrage restrictions that can be imposed on the price of European and American call and put options. These are the slope and convexity restrictions, useful bounds that are model-free. We then cover in detail the Binomial Option pricing Model. This part of the course is fundamental in everything that follows. It contains the two main concepts in what concerns derivatives valuation: the concept of dynamic replication and the principle of risk neutral valuation. Once the Binomial Option Pricing Model is well understood the transition to the Black-Scholes Model is rather straightforward. Finally, we dwell in an important empirical flaw of the Black-Scholes Model, the volatility smile. We study the consequences of this important empirical regularity for option valuation. We then cover one important applications of option valuation: the valuation of corporate securities.

Part III, the last part of the course, is devoted to fixed income derivatives valuation. We study the valuation of swap contracts, the futures on interest rate and then options on interest rate.

## B. PREREQUISITES

1. Basic knowledge of standard statistics and mathematical equations. Basic knowledge in statistics such as variance and covariance will be very helpful. For those who have not taken a course in statistics but are willing to work hard, do not worry! I will cover in class the technical concepts necessary for understanding the class material.

## C. Course Objectives

Whether you are considering a career in finance or any other area of business, when you complete this course, you will be equipped with a variety of financial concepts that are useful for investors and all business professionals.
Specifically, course learning objectives are:
(1) Understand and explain the differences between the various financial derivative securities (Futures, Forwards and Options).
(2) Understand the terminology, risks and costs associated with financial derivatives.
(3) Explain the mechanics of the Futures market and evaluate the various hedging strategies using Futures.
(4) Analyze the role and relationship between forward and futures prices.
(5) Explain the mechanics of the Options market; analyze the various trading strategies involving options and compute payoff for different strategies.
(6) Determine the price of options using binomial trees.
(7) Calculate the European call and put options using the Black-Schloes Formula
(8)Define and interpret the different Greek measures used to define the risk of options.
(9) Determine the swap rate according to the comparative advantage argument under both no intermediation and intermediation
(10) Value a Plain Vanilla Interest Rate Swap in Terms of fixed-rate bonds and floating-rate bonds.

## D. Learning Outcomes

Having successfully completed this module you will be able to:
(1) Be able to describe and explain the fundamental features of a range of key financial derivative instruments
(2) Have a good understanding of derivative securities
(3) Acquire knowledge of how forward contracts, futures contracts, swaps and options work, how they are used and how they are priced
(4) Be able to decide which securities to use for hedging and/or speculative purposes

### E. TEXTBOOK(S)

1. **Textbook: Derivatives Markets, Pearson, 2021, by Robert L McDonald, Third Edition, ISBN-13: 9780137612864**

## F. GRADING

1. **Weekly Problem sets**
    a. The problem sets from Hull's textbook and other sources will be assigned on a weekly basis during the semester. The main purpose of the problem sets is to increase your understanding of the material and to help you prepare for the exams.
    b. The problem sets ***will not be collected and graded***. The problem sets and solutions will be posted on the blackboard.

2. **Three sets of Homework**
    a. You are permitted to discuss homework sets with other students.
    b. You are to **ON-LINE** submit your own solutions --which may represent a synthesis of personal analysis and discussions with others.
    c. Homework sets are due **at the beginning of class** (Am 9:10) as indicated in the schedule and no late homework sets are accepted and will be given a grade of 0%.
    d. Solutions will be posted on the NTU COOL after the due date.

3. **Quizzes**
    a. The 5-minute quizzes are closed book, but you are permitted to bring a calculator.
    b. There will in general not be any makeups for the quizzes.
    c. There will be around 3 quizzes. If you miss only one quiz, it will count as your lowest score and be dropped.
    d. Solutions will be posted on the NTU COOL and will be discussed on the next class.

4. **Midterm and Final Exam**
    a. A typical exam format would include a mixture of quantitative and qualitative problems and questions covering lecture notes, text chapters and assignments.
    b. The examination is closed book, but you are permitted to bring a calculator and a "crib sheet" with notes and/or formulae. You may use two sides of an 81/2x11 page.
    c. Exams are scheduled according to school so that you can plan around these dates. Please do not ask to be excused from exams as makeup is rarely given.
    d. If you want to submit a regrade request, please do it within one week after the graded exam is handed back to do so. You have to hand back (1) your exam and (2) a brief memo detailing your concerns. The exam will be regraded in full.

5. **Grade Structure**

    a. Midterm 35%

b. Final 35%
c. 3 Homework 20%
d. 3 Quizzes 10%
e. As you can see from the grade distribution, you have to work hard THROUGHOUT the course in order to receive a good grade.

6. **Course Schedule and Reading List**

**Lecture Note 1:** *Introduction to Derivatives Securities* **09/07**

- Hull 8th ed. Ch. 1
- McDonald 3rd ed. Ch.1

**PART I: FORWARDS AND FUTURES**

**Lecture Note 2:** *An Introduction to Financial Forwards and Futures and Commodity Forwards and Futures* **09/07**

- Hull 8th ed. Ch. 2
- McDonald 3rd ed. Ch.2

**Lecture Note 3:** *Risk Management with Forward and Futures* **09/14**

- Hull 8th ed. Ch. 3
- McDonald 3rd ed. Ch.4

**Lecture Note 4:** *Determination of Financial Forward and Futures Prices* **10/05**

- Hull 8th ed. Ch. 5
- McDonald 3rd ed. Ch.5

**Lecture Note 5:** *Determination of Commodity Forward and Futures Prices* **10/19**

- Hull 8th ed. Ch. 5
- McDonald 3rd ed. Ch.6
- Homework 1 is assigned

**PART II: OPTIONS**

**Lecture Note 6:** *An Introduction to Options* **10/26**

- **Quiz on Lecture Notes 1-5**
- Hull 8th ed. Ch. 9
- McDonald 3rd ed. Ch.2
- **Homework 1 is due**

**Lecture Note 7:** *Trading Strategies Involving Options* **10/26**

- Hull 8th ed. Ch. 11
- McDonald 3rd ed. Ch.3

**Lecture Note 8:** *Put-Call Parity and Other Option Relationships* **11/02**

- **Quiz on Lecture Notes 6-8 (Up to where we cover)**
- Hull 8th ed. Ch. 10
- McDonald 3rd ed. Ch.9
- **Homework 2 is due**

**Midterm Exam** **11/16**

- Midterm exam on Lecture Notes 1-8, related text chapters and problem sets.

**Lecture Note 9:** *Binomial Option Pricing* **11/23**

- Hull 8th ed. Ch. 12
- McDonald 3rd ed. Ch.10-11

**Lecture Note 10:** *The Black-Scholes Formula* **11/30**

- Hull 8th ed. Ch. 13-14
- McDonald 3rd ed. Ch.12, 18, 20, and 21

**Lecture Note 11:** *The Greek Letters* **11/30**

- Hull 8th ed. Ch. 18
- McDonald 3rd ed. Ch.12-13

**Lecture Note 12:** *Volatility Smiles* **12/07**

- Hull 8th ed. Ch. 19
- McDonald 3rd ed. Ch.21

**Lecture Note 13:** *Using Option Pricing Theory to Value Corporate Securities* **12/07**

- Hull 8th ed. Ch. 15
- McDonald 3rd ed. Ch.16

## PART III: FIXED INCOME DERIVATIVES

**Lecture Note 14:** *Term Structure* **12/14**

- Hull 8th ed. Ch. 4
- McDonald 3rd ed. Ch.7

**Lecture Note 15:** *Swap* **12/14**

- Hull 8th ed. Ch. 7 and 32
- McDonald 3rd ed. Ch.8
- **Quiz on Lecture Notes 9, 10, 11, 12, 13, and 15**

**Final Exam** **12/21**

- Final exam on Lecture Notes 1-15, related text chapters and problem sets.
- **Homework 3 is due on 12/28**