FIN-523
Derivative Pricing
Module 2, 2022-2023

Course Information

Instructor: Aoxiang Yang, PhD
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Teaching Assistant: Ziying Chen, PhD Candidate
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Classes:
Lectures: Tuesday & Friday 10:30-12:20
Venue: PHBS Room 311

Course Website:
https://cms.phbs.pku.edu.cn/claroline/course/index.php?cid=ROOM311&viewMode=STUDENT

Course Description

Course Overview:

This course covers the pricing and uses of common derivatives including forwards, futures, swaps, and options. These contracts are actively traded in financial markets for hedging, speculation, or arbitrage purpose. This course emphasizes a practical understanding of trading and portfolio management. To this end, we make use of the online trading platform Interactive Brokers (IB). A solid understanding of derivatives is essential for a finance-related career. This course emphasizes both analytical skills as well as financial modeling. By the end of this course, you will have a good knowledge of how these contracts work, how they are used, and how their values are determined. Since derivatives are quantitative in nature, you should be prepared to carry out algebraic, statistical, and numerical exercises.

Course Prerequisites:

There are no hard requirements. But it will be assumed that students have mastered basic financial concepts and have already taken math courses such as calculus and linear algebra. Stochastic calculus is recommended but not required. This course might partially overlap with several other courses provided by PHBS, such as Stochastic Finance, Investment, Financial Modelling, Financial Risk Management, and Asset Valuation Theory. But we will focus uniquely on derivatives, and we will see lots of real-world price data.

Textbooks, Software & Other Course Materials

- Textbook (recommended): Fundamentals of futures and options markets (7th Edition), by John Hull. This book is recommended, but not required. All classes and exams are based on lecture slides and problem sets which generally go deeper than the textbook.
- I will post Harvard Case Studies on derivatives-related topics through our course webpage as our class progresses. The material is optional, not required.
- Interactive Brokers for performing simulated trades.
- Microsoft Excel for building pricing models.

Learning Outcomes

Students should learn the properties, risk, and theoretical valuation of derivative securities. They should learn how to trade those securities and what risk and return characterize the various types of trades. Essential to learning is doing the actual trades. By carrying out "real" trades through Interactive Brokers, students will connect real life applications to theories. This enables a deeper understanding of the risks involved in derivatives trades.

Grading Details

The grade for the class will be determined using the following weighting:

Final Exam	40%
Midterm Exam	30%
Problem Sets	15%
Trading Assignments	10%
Class Attendance and Participation	5%

The course is graded on a curve. In accordance with PHBS grading policy, no more than 30% can receive a grade of A+, A and A-. No more than 90% can receive a grade of B or above. But 100% can receive a grade of B- or above.

Midterm and Final Exams

- Midterm exam. Location: in-class. Time: (specific date TBD) 10:30-12:20
- Final exam. Location: TBD. Time: January 4 10:30-12:20

- Both exams are closed book
- The final exam is cumulative
- You can bring a one-page cheat sheet to both exams
- You should bring a calculator to both exams
- There are no valid reasons for the absence for the final or midterm exams. Please note the dates and times for the exams. If you must be absent for exams, you need to get an approval from 114

Problem Sets

- There will be problem sets on average once per week. Thus, 6-8 problem sets are expected in total
- You are welcome to form groups at the beginning of the module (TA will keep a record of group information) and submit a solution to each problem set and trading assignment as a group. You can also submit a solution to each problem set and trading assignment individually.
- Problem sets are posted on the course webpage. You are required to email your problem

set and trading assignment solutions to the TA before the deadline.

Trading Assignments

We will use Interactive Brokers (IB) to finish 2 trading assignments. I will send every student an invitation for a sign-up for an account via email. You just need to follow the instruction to finish your sign-up. Your simulated trading accounts will have a one-million-dollar balance of paper money. We will use it to do various things, including basic things such as placing a limit order or market order and trading ETFs and futures. We will also do more involved exercises such as delta hedging, which requires you to rebalance your portfolio each day for several consecutive days.

Class Attendance and Participation

Class attendance is required. Class participation is expected and encouraged. Most classes are lecture formats. However, the instructor might call on volunteers to answer questions. The 5% for "Class Attendance and Participation" will take both class attendance and participation into account.

Academic Integrity

It is important for a student's effort and credit to be recognized through class assessment. Credits earned for a student work due to efforts done by others are clearly unfair. Deliberate dishonesty is considered academic misconducts, which include plagiarism; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; or altering, forging, or misusing a University academic record; or fabricating or falsifying of data, research procedures, or data analysis.

All assessments are subject to academic misconduct check. Misconduct check may include reproducing the assessment, providing a copy to another member of faculty, and/or communicate a copy of this assignment to the PHBS Discipline Committee. A suspected plagiarized document/assignment submitted to a plagiarism checking service may be kept in its database for future reference purpose.

Where violation is suspected, penalties will be implemented. The penalties for academic misconduct may include: deduction of honor points, a mark of zero on the assessment, a fail grade for the whole course, and reference of the matter to the Peking University Registrar.

For more information of plagiarism, please refer to PHBS Student Handbook.

Tentative Course Schedule

The specific topics covered during each lecture may change as the class progresses. Some topics might take more than one lecture to finish. Any significant change will be announced on the course website and/or in class. Textbook Chapter below is based on Fundamentals of futures and options markets (7th Edition), by John Hull.

Day		**Topic**	**Textbook Chapter**
1	Introduction	Classes: forwards, futures, swaps, and options (exchange vs. OTC) Uses: hedging, arbitrage & speculation	Chapter 1
2		Bond yields and continuous compounding Financial indices and ETFs	Chapter 4 Problem Set #1
3	Forwards, Futures, and Swaps Pricing	Definitions, payoffs, and hedging	Chapter 2, 3
4		Stocks, indices, and commodities	Chapter 5 Problem Set #2 Trading Assignment #1
5		Foreign exchanges	Chapter 5, 7
6		Interest rates	Chapter 4, 6, 7 Problem Set #3
7	Options Pricing	Definitions, payoffs, styles, and basic properties	Chapter 9
8		Midterm Exam	
9		Put-Call Parity & option strategies	Chapter 10, 11 Problem Set #4
10		One-period binary model and risk-neutral probability	Chapter 12
11		Large Binomial trees in EXCEL and parameter calibration	Chapter 12, 18 Problem Set #5
12		Black-Scholes model: risk-neutral approach vs. no-arbitrage approach	Chapter 13, 15, 16, 18
13		Option delta, delta-hedging & other Greeks	Chapter 17 Problem Set #6 Trading Assignment #2
14		Option-implied volatility, the VIX index, and volatility smile	Chapter 19
15		Risky debt and credit default swaps	Chapter 23 Problem Set #7
