UNIVERSITY OF PENNSYLVANIA
The Wharton School

FNCE 7170:
FINANCIAL DERIVATIVES

Prof. Domenico Cuoco   Fall 2023

Office: 3257 SH-DH
Phone: 898-8290
E-mail: cuoco@wharton.upenn.edu

Course Description

The course provides an introduction to financial derivatives and to the markets in which
they are traded, as well as to the models and analytical tools that are used to value them
and to assess and manage their risk.

Derivatives markets have experienced a phenomenal pace of growth and innovation in
recent years. Accordingly, it is critical to have an understanding of the strategic opportunities
offered by these securities and of the risks they can pose if used improperly. In addition,
many of the techniques developed to analyze and manage derivatives can also be (and are)
applied to a wide range of financial decisions, to the point that it is impossible to understand
modern finance without understanding derivatives.

The main focus of the class will be on equity derivatives, although, as mentioned, the
concepts are broadly applicable.

Analytical tools play a critical role in the valuation and management of derivatives.
Although every effort will be made to introduce these tools as intuitively as possible and
the technical requirements are limited to basic calculus and statistics, the class is by its
nature quantitative and will require a steady amount of work. In addition, some computer
proficiency will be required for the assignments, although familiarity with a spreadsheet
program (such as *Microsoft Excel*) will suffice.

Prerequisites

The prerequisite for this class is the core finance class, i.e., FNCE 6110. An introductory
statistics class, i.e., STAT 6130 or equivalent, is strongly recommended but not required.

Textbook and Reading Material

The course will be based primarily on lecture notes (copies of the slides used in class) and
on the following required textbook:

John Hull, *Options, Futures, and Other Derivatives*, 11th edition, Pearson, 2022.

Errata, answers to the end-of-chapter questions and other supporting material for the
textbook can be found on the author's website.

The lecture notes will be posted on Canvas ahead of each class. Additional reading
material will also be posted on Canvas as needed.

Class Schedule and Attendance

The class will run on the MBA Academic Calendar.

You are expected to attend every class and to use the Wharton Attendance & Video Request app in Canvas to check into classes and to request that an absence be excused when warranted.

Office Hours and Canvas Discussions

I am available by appointment. Please email me and we will set up a time to meet in person or by videoconference.

The schedule of the TA's office hours will be posted on Canvas.

In addition, you are strongly encouraged to use the Discussions module in Canvas for questions relating to the course material and assignments or that might otherwise have general interest to the class. I will reply quickly to questions posted there.

Assignments and Grading

The final grade for the course will be based on class participation and three *individual* home assignments, with the following weights:

Assignment 1	20%
Assignment 2	30%
Assignment 3	30%
Class participation	20%

There will be no midterm or final exam.

Class participation will score both your attendance and your contribution to an active and productive class environment.

The assignments will be posted on Canvas at least two weeks before their due date. You must complete the assignments individually (the University's MBA Code of Ethics applies), but you are welcome to use the office hours or Canvas Discussions to address questions regarding the conceptual tools underlying the assignments or to request clarifications if needed.

An answer sheet for each assignment will be posted on Canvas after the assignment's due date. We will not go over the answer sheets in class, but you should review them and use the office hours or Canvas Discussions to clarify anything that is unclear. Grades for each assignment and summary statistics of the grade distribution will also be posted on Canvas.

Course Outline

Below is a tentative outline of the course, illustrating the planned progression of topics and the corresponding readings.

PRELIMINARIES

1. Introduction to Financial Derivatives
Lecture notes and Textbook, Chapter 1 and Sections 4.1–4.4

FORWARDS, FUTURES AND SWAPS

2. Introduction to Forwards and Futures
Lecture notes and Textbook, Chapter 2

3. Pricing Equity Forwards and Futures
Lecture notes and Textbook, Sections 5.1–5.9

4. Static Hedging with Equity Forwards and Futures
Lecture notes and Textbook, Chapter 3

5. Equity Swaps
Lecture notes and Textbook, Section 34.4

OPTIONS

6. Introduction to Vanilla Options
Lecture notes and Textbook, Chapter 10

7. Basic Properties of Vanilla Options
Lecture notes and Textbook, Chapter 11.1–11.4

8. Static Option Strategies
Lecture notes and Textbook, Chapter 12

9. The Binomial Model: Introduction
Lecture notes and Textbook, Sections 13.1–13.4 and 13.6

10. The Binomial Model: Calibration
Lecture notes and Textbook, Sections 13.7–13.10, 15.4 and 21.4

11. The Binomial Model: Accounting for Dividends
Lecture notes and Textbook, Sections 13.11 ("Options on Stocks paying a Continuous Dividend Yield" and "Options on Stock Indices") and 21.3 ("Known Dividend Yield" and "Known Dollar Dividend")[1]

12. American Options
Lecture notes and Textbook, Sections 11.5–11.7, 13.5 and 15.12 ("American Call Options") and 17.6

13. Futures Options
Lecture notes and Textbook, Sections 18.1[2], 18.2–18.5 and 18.9–18.10

14. The Black-Scholes-Merton Model
Lecture notes and Textbook, Sections 14.1–14.4, 15.1–15.2, 15.5, 15.7–15.9, 17.3–17.4 and 26.10

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[1]Skip Example 21.5 dealing with the American put, as American options will be covered in item 12 below.
[2]Skip "Options on Interest Rate Futures".

15. The Black Model
Lecture notes and Textbook, Sections 18.6–18.8

16. The Volatility Surface and the Practitioner BSM model
Lecture notes and Textbook, Sections 15.11[3], 20.1, 20.3–20.5 and 20.7–20.8

17. Monte Carlo Simulation and Stochastic Volatility
Lecture notes and Textbook, Sections 21.6[4] and 21.7 ("Antithetic Variable Technique")

18. The Option Greeks
Lecture notes and Textbook, Sections 19.3, 19.4[5], 19.5, 19.6[6], 19.7–19.9, 19.12, 21.1 ("Estimating Deltas and Other Greek Letters") and 21.6 ("Calculating the Greek Letters")

ADDITIONAL TOPICS AND APPLICATIONS

19. Market-Making and Dynamic Hedging
Lecture notes and Textbook, Sections 19.1–19.2, 19.4 ('Dynamic Aspects of Delta Hedging", "Where the Cost Comes From" and "Transaction Costs"), 19.6 ("Making a Portfolio Gamma Neutral") and 19.10–19.11

20. Volatility Indices and Volatility Derivatives
Lecture notes and Textbook, Sections 15.11 ("The VIX Index") and 26.16

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[3]Skip "The VIX Index", as this will be covered in item 20 below.

[4]Skip "Calculating the Greek Letters", as this will be covered in item 18 below.

[5]Skip "Dynamic Aspects of Delta Hedging", "Where the Cost Comes From" and "Transaction Costs", as these will be covered in item 19 below.

[6]Skip "Making a Portfolio Gamma Neutral", as this will be covered in item 19 below.