

UNIVERSITY OF PENNSYLVANIA  
The Wharton School

FNCE 7170/2170:  
**FINANCIAL DERIVATIVES**

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## Course Description

The course provides an introduction to financial derivatives and to the markets in which they are traded, as well as to the 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 concepts that are used 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 6110/1000. An introductory statistics class, i.e., STAT 6130/1010 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 module](#) in Canvas to check into classes and report absences.

## 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 TAs' 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.

The assignments will be posted on Canvas at least two weeks before their due date. You must complete the assignments on your own (the University's [Code of Academic Integrity](#) applies). 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.

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

# 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 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

### 8. Static Hedging and Yield Enhancement with Vanilla Options

Lecture notes and Textbook, Sections 12.2 and 17.1-17.2

### 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, 21.1<sup>1</sup> and 21.3

### 12. American Options

Lecture notes and Textbook, Sections 11.5-11.6, 13.5 and 15.12 (“American Call Options”)

### 13. Futures Options

Lecture notes and Textbook, Sections 18.1<sup>2</sup>, 18.2-18.5 and 18.9-18.10

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<sup>1</sup>Skip “Estimating Deltas and Other Greek Letters”.

<sup>2</sup>Skip “Options on Interest Rate Futures”.

**14. The Black-Scholes-Merton Model**

Lecture notes and Textbook, Sections 14.1-14.3, 15.5-15.9, 17.3 and 26.10

**15. The Black Model**

Lecture notes and Textbook, Sections 18.6-18.8

**16. The Volatility Surface**

Lecture notes and Textbook, Sections 15.11<sup>3</sup>, 20.1, 20.3-20.5, 20.7-20.8 and 27.1-27.2

**17. The Option Greeks and Dynamic Hedging**

Lecture notes and Textbook, Sections 19.1-19.13 and 21.1 (“Estimating Delta and Other Greek Letters”)

**18. Option Spreads**

Lecture notes and Textbook, Sections 12.3-12.5

**ADDITIONAL TOPICS AND APPLICATIONS****19. Monte Carlo Simulation and Path-Dependent Options**

Lecture notes and Textbook, Sections 21.6, 26.6, 26.11 and 26.13

**20. Volatility Indices and Volatility Derivatives**

Lecture notes and Textbook, Sections 15.1 (“The VIX Index”) and 26.16

**21. Corporate Applications**

TBD as time allows

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<sup>3</sup>Skip “The VIX Index”.