

# Finance 648: Derivatives

Spring 2024 Term 1  
Professor Paymon Khorrami  
The Fuqua School of Business  
Duke University

---

## Course Description

---

Derivatives are one of the most nebulous areas of finance. They are often complex, they can be used to generate huge gains and losses, and some observers blame them for recent financial crises. And yet they have been growing rapidly and are used by virtually everyone. This course develops the basics of derivatives: how to use them, how to hedge them, and how to price them. We cover both simple derivative contracts, such as forwards, futures, and swaps, as well as more complex derivatives, such as put and call options and credit derivatives. There are two broad objectives:

1. We will discuss how derivatives can be used for risk management purposes. Why and how do we do risk management? What is the right way to use derivatives? To make this material broadly accessible, concepts are explained whenever possible through applications and examples rather than advanced mathematics.
2. We will analyze pricing and hedging of derivative securities through the principles of no-arbitrage and the law of one price. To this end, we will develop the binomial tree model and the Black-Scholes-Merton option-pricing model. We discuss several important applications, such as risk management, exotic options, the pricing of corporate securities (corporate bonds, callable bonds, equity, etc.), and others. This material is more analytical. I will show you the mathematical tools you need.

---

## Reading

---

*Required:* Assignments, teaching notes, and some other information will be posted on Canvas. The cases and some additional articles are in the course-pack.

*Optional:* Most lectures are supplemented with recommended readings from

Robert L. McDonald, 2009, *Derivatives Markets* (3rd edition)

which is available at Amazon. You can also use the 2<sup>nd</sup> edition. This book is not required but can be helpful if you are looking for a deeper understanding of the material. If you are interested in having another derivatives textbook, I can recommend:

John C. Hull, 2011, *Options, Futures and Other Derivatives* (8th edition).

Some additional optional readings will be posted occasionally on Canvas.

---

## **Prerequisites**

---

The only strict prerequisite is FNCE 645 (Financial Management) or equivalent previous coursework. For some topics, it will be very useful to concurrently take FNCE 647 (Investments). Students without this course may require additional time reviewing the material and/or working on the assignments. Some parts of the course are analytical in nature, so some prior exposure to calculus, statistics, and probability will be helpful.

---

## **Course Requirements**

---

There will be 6-8 assignments, one (short) midterm, and one final exam.

The assignments are group work, with each group working independently of all other groups. You will be able to choose your own teams, with up to 4 members each. At the end of the course, you'll be asked to complete a team evaluation. Your score of the team assignments will be adjusted according to the team evaluation at the end of the course. It may sound like 6-8 assignments is a lot, but each of them are relatively short. I like to have you guys practicing the material from the course as we go, so I believe it is better to give more, shorter assignments rather than fewer, longer assignments.

The midterm will be assigned via Canvas and turned in online.

The final exam will be in person with more details below.

---

## **Final Exam**

---

The final exam scheduling is TBD. The format of the final exam will be some Multiple Choice questions, some True/False/Uncertain questions, some Short Answer questions, and Longer Questions on selected topics from the course. The content of the exam will be slightly easier than assignments. I will provide many sample exams for practice.

The final exam is open-book: you can consult any materials distributed during the course. You may also use a laptop or tablet to view your notes during the exam. You must solve the final exam individually without consulting anyone. You will need a calculator, but you can also use Excel on your computer.

The final exam takes place during the official exam period for the MBA program. I have no control over this schedule. As far as make-up final exams are concerned, I follow the school's policy on this issue. This policy treats three sets of circumstances differently.

- Unforeseen events. If unforeseen events arise that prevent a student from taking a final exam on the scheduled day, that student may be allowed to take the exam on the early exam day. Examples of such circumstances are: illness, injury, childbirth, criminal acts, etc.
- Foreseeable but exceptional events. If foreseeable but exceptional events arise that affect the student's ability to take a regularly scheduled final exam, then an alternative exam time on the reading day before the scheduled exam period may be offered to the student (I reserve the right to verify with any third party the details of the exceptional circumstances. Any discrepancy between the student's story and that obtained from the third party constitutes a violation of Fuqua's Honor Code.) Examples of such circumstances are: court hearings, weddings of close family members, etc.
- Foreseeable but non-exceptional circumstances. In all other circumstances, students are required to take the final exam at the date and time scheduled by Fuqua's Registrar. The following are examples of such circumstances: non-urgent medical appointments, job interviews with alternative dates available, wedding for friends or family in which the student does not serve a formal role, college reunions, etc.

---

## Grading

---

Assignments – 40%

Midterm – 10%

Final exam – 50%

As you can see, this adds up to 100%, but I reserve the right to add or subtract up to 3% for the excellent or sub-par quality of your participation in class (e.g., attendance, asking questions, answering questions).

If, at any point, you have disputes about your homework assignment grading, you must raise them with me and the TA. I will try to do my best to carefully re-examine your submission in such cases. In re-grading an assignment, it is possible in principle that your grade declines (if I find sufficient mistakes upon careful re-examination). Therefore, you and your team members should carefully consider raising such issues. Moreover, *any such requests submitted after the final exam is taken will not be considered, with no exceptions.*

Finally, I will follow Fuqua's recommended grade distribution for elective courses.

---

## Office Hours

---

Unless announced otherwise, I will hold office hours at 3pm-5pm every Thursday, unless otherwise specified, in Fuqua office W407. You can also send me an email to schedule another time to meet. My email address is [paymon.khorrami@duke.edu](mailto:paymon.khorrami@duke.edu).

---

## Teaching Assistant and Review Sessions

---

The teaching assistant is Eduardo Salomon Diaz, a second-year MBA student who performed very well in the class last year. He will be hosting some review sessions, time and place TBD (probably virtual). You may also reach out to him with questions at [eduardo.salomon@duke.edu](mailto:eduardo.salomon@duke.edu).

---

## Honor Code

---

The Fuqua School of Business Honor Code is enforced in FNCE 648. By accepting admission to the school, you have agreed to abide by the Honor Code. If you are convicted of an Honor Code violation for cheating, lying, or stealing, which is related to your performance in this course, you will earn an "F" in this course and will be reported to the Judicial Board. The Honor Code requires that I define the manner in which assignments are to be completed. If you believe the following is ambiguous or incomplete, please let me know.

Team assignments must be the original and complete work of only the students in that team, all of whose names must appear on the write-up. You may not use any materials containing solutions or partial solutions of the assignments, which includes solutions prepared by current and former students at Fuqua and elsewhere. You may not discuss the assignment with anyone other than the members of your team prior to handing in your solution. Substantial contributions by each group member on each assignment are expected.

Exams must be the original work of the student whose name appears on the exams. No assistance, other than that detailed above, may be given, received, or used during the exams. You may not communicate with any other individual regarding the exams.

---

## Course Outline and Tentative Class Schedule

---

The schedule may change, depending on progress. **IN PARTICULAR, THERE IS A GOOD CHANCE I WILL CHANGE THE DUE DATES OF THE HOMEWORKS A BIT.**

\* indicates required material

Complete Pre-Assignment before the first class.

### **Lecture 1:** *Introduction to Derivatives and Risk Management*

Readings:

- \*Teaching Note 1
- \*Article: "A Framework for Risk Management"
- \*Article: "The Six Mistakes Executives Make in Risk Management"
- \*Case: Enron Weather Derivatives  
McDonald, Chapters 1-2, 4

### **Lecture 2:** *Forwards, Futures, and Swaps*

Readings:

- \*Teaching Note 2  
McDonald, Chapters 5-6

HW1 due beginning of class (Enron).

### **Lecture 3:** *Forwards, Futures, and Swaps, continued*

Readings:

- \*Teaching Note 2  
McDonald, Chapters 5-6, 8

HW2 due beginning of class (CIP).

### **Lecture 4:** *Introduction to Options*

Readings:

- \*Teaching Note 3  
McDonald, Chapters 3, 9

HW3 due beginning of class (Amaranth, Greece).

### **Lecture 5:** *Binomial Trees and Option Pricing: Basics*

Readings:

\*Teaching Note 4  
McDonald, Chapter 10

HW4 due beginning of class (Box Trade).

**Lecture 6:** *Binomial Trees and Option Pricing: Advanced*

Readings:

\*Teaching Note 4  
McDonald, Chapters 10, 14

MIDTERM on Canvas between Lecture 6 and 7.

**Lecture 7:** *American Options, Real Options*

Readings:

\*Teaching Note 5  
McDonald, Chapter 17

**Lecture 8:** *Black-Scholes-Merton Formula and "The Greeks"*

Readings:

\*Teaching Note 6  
McDonald, Chapter 12

HW5 due beginning of class (Nick Leeson, Binomial Trees).

**Lecture 9:** *Hedging and Market-Making using The Greeks*

Readings:

\*Teaching Note 7  
\*Case: Pine Street Capital  
McDonald, Chapter 13

HW6 due beginning of class (Pine Street Capital).

**Lecture 10:** *Volatility and Tail Risk*

Readings:

\*Teaching Note 8  
McDonald, Chapter 24

HW7 due beginning of class (Some Trades, Implied Volatility).

**Lecture 11:** *Corporate Securities*

Readings:

\*Teaching Note 9  
McDonald, Chapter 16

**Lecture 12:** *Margin, Regulation, and Arbitrages*

Readings:

\*Teaching Note 10  
\*Article: "Margin Accounts"

HW8 due beginning of class (Debt Overhang).

FINAL EXAM