

The Wharton School
Financial Derivatives (217/717)

Mr Krishna Ramaswamy
Fall 2021

Financial Derivatives

FNCE 717-001 MW 8:30am JMHH F60
FNCE 217-001 MW 10:15am JMHH F60

The course, originally called Speculative Markets was redesigned in 1985; I've now taught it off and on each year since then. It develops the intuition and skills for all finance majors and for those whose expect their future to require the use of derivatives – increasingly ubiquitous in financial institutions.

The course will be in person and on campus, my much-preferred mode! The course is analytical in a way that accommodated my teaching style, in which I ask questions in the walking around Socratic way but stayed anchored to projected slides, and develop the material with practical application in mind, trying to instil an understanding of concepts that will enable students to deal with the situations in their careers rather than rely on rote-learned ones. I *like to think* that most of my students appreciated it, and that there was some important collective learning in the process that Zooming cannot provide. Learning always is a co-production – it requires both the instructor and the student to *invest* in order to achieve the best outcome.

That said, I realise that for several – esp foreign students until the rules and travel restrictions revert to pre-pandemic times – there will be periods of Zooming or catching up with video-taped lectures. My best advice is that you make every attempt to minimise the Zooming, and avoid the videotape catch-up whenever you can. The experience I had last year with Zooming in this analytical course was depressing for me and possibly for the audience as well!

SO... we won't let this Covidian environment keep you from learning!

A detailed Course Syllabus follows. *BUT*, here's a list of three things you must read now – and it includes some crucial FAQs!

1. Q: Are the MBA & UG sections identical? ANS: No. **First**, because the course calendar of the two courses diverge I cannot keep the course content in lecture-sync! **Second**, the needs of the MBAs and UGs are substantially different, so I can exploit the contextual prior knowledge of derivatives markets among the MBAs in discussions, but I must bring out these ideas to help the UGs reach a skill & knowledge level they are expected to have in their careers. Therefore: **I urge you to attend the section in which you are registered.** [The only exception to this is non-Wharton grad students who can sit in the UG section, which is to their advantage...I can make sure that they continue to get the Grad course credit.]
2. Q: Er... Um... How do testing and grades work? ANS: **There is no final exam. Two Homework Assignments, a Small Group Project and the Two Midterms make up the grade** (see p5). The material is analytical so the tests are the same across MBAs and UGs. I tote up the performance at semester's end, and compute a tentative letter grade two ways: (i) Separately by MBA & UG sections and (ii) in a Combined Pool. The Final Grade is the HIGHER of the two tentative letter grades.
3. Q: Yes, yes... but what do the final outcomes look like?! ANS: **A grade of A-Minus or better is received by upwards of 50% of the students.** In keeping with the elective nature of the course: the lowest grade in the past has been a C-Plus or B-Minus, earned unhappily by students who are ill-prepared and who make no effort at the assignments – if they haven't dropped my course!

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1 Course Description

THE GROWTH in global markets for exchange-traded Options and Futures contracts on financial securities (foreign exchange, fixed income and equity securities, and stock indices) and on commodities has been accompanied by equally phenomenal and much more profitable growth in Over-the-Counter (OTC) markets for swaps, related options, credit derivatives, structured products, and by the process of securitisation. Exchange-traded products are traded by individuals and institutional investors; but most OTC derivatives are traded between corporates, investment banks, hedge funds, and sovereigns. These *derivative securities* are used to meet a variety of objectives. For example, the markets in options on stock indices and in futures contracts on Treasury securities allow money managers to control the risk of their portfolios and alter the distribution of the returns on their portfolios. And options and futures contracts on interest rates, currencies and commodities permit corporate treasurers to manage risk. These markets also permit individuals and hedge funds to speculate on price movements and relative price relationships among assets and commodities. In many instances derivatives offer a convenient way in which users can lower their transactions costs relative to a more cumbersome, perhaps dynamic, alternative strategy in the underlying assets.

Many features of common financial contracts are equivalent to bundled, temporally-adjusted portfolios of bonds, futures, options and their underlying securities. A solid grasp of options and futures helps us to understand and deconstruct more complex arrangements with relative ease. While the techniques for the valuation of options and futures might at first glance appear advanced and difficult, they are easily and conceptually digestible. And in the process of learning these valuation techniques we uncover many practical aspects of the use of options and futures.

My objective in this course is to provide students with the *intuition and the necessary skills to value financial derivatives and to use them*. Intuition matters: it is by developing that skill that one can work with complex derivatives positions with relative ease. In order to provide a useful treatment of these topics in an environment that is changing rapidly, it is necessary to stress the fundamentals and to study some important applications. I will focus – in the applications – on the following markets: equity and especially equity index markets, crude oil derivatives, and some fixed income applications.¹ The final part of the course employs cases. We will have at least one guest lecture, probably via Zoom.

Pre-requisites: *Basic knowledge of statistics from the core course is expected.* You should have had Core finance; but if you're willing to put in the hours to learn the relevant ideas of risk and return and the minimum understanding of institutional arrangements necessary to follow the Zoomlec, you can enroll in the course – just chat with me at the end of the first Zoomlec. A facility with Excel and other computer languages will come in handy. **Auditors** must talk to me at the end of the first lecture.

¹Note that this will avoid overlap in applications involving interest rate and credit risk modeling, and currency hedging – these are properly the province of other electives.

This course deals with Derivatives including options, futures and swaps. There are several elective courses taught in the Finance Department and in other departments at Wharton and at the University that cover some of these topics. We'll go beyond aspects of computing the derivative values and learning how to hedge them: we spend time on the questions of WHY and HOW applications of derivatives come about, and we also cover institutional material related to these markets. *Intuition matters*: it's better to develop that intuition to help tackle derivatives-worthy situations than to use canned programs that implement formulas. Students who have prior exposure to options valuation – a sexy topic in which street jargon can't cover for deep knowledge – should have a clear expectation of the way I conduct the course. That's why it is very important to attend the first lecture (30 Aug for MBAs and 1 Sep for UGs).

Just FYI: The deliverables for the course are (a) Two **2-hour** Midterm Exams held during the semester, (b) a **small group project, max 3 to a group**, that really has two parts – the first dealing with hedging with futures and the second dealing with valuation and hedging with options; and (c) **two homework assignments** graded (we look for a complete effort, submitted on time). *There is no exam in the Finals period.*

If you're registered but unable to attend the first session you must send me an email krishna@upenn.edu.

2 Department of Notifications

1. *Weekly Memos.* I send a weekly e-mail usually on Thursday night to give guidance on: what we covered that past week, what to read for the following week, as well as sample problems, Answers to Frequently Asked Questions regarding the homework assignments, Practice Problems, Reminders and such. Please read them carefully, and delete them at your peril!
2. *Canvas:* I make extensive use of it.
 - All handouts (including lecture slides) are posted there; you should print a copy and bring it to class and follow my slides.
 - All cases and **copyrighted material** will be posted on Canvas (any charges will be billed to your account).
 - Sample Problem Sets, a few past exams, Examples I worked out in class, additional Notes even Weekly Memos and other course-related (non-external copyright) material will be posted here.

You should be on the course's e-mail list-server shortly after you register. If you drop the course, please send me an e-mail so you can be dropped from the list and shielded from the dreadful stuff I send your former classmates: that may take a few days, so please be patient!

3. *Non-Whartonites:* **If you're not from Wharton**, then please do let me know your e-mail address – See! best to send me an email – so I can get you on the list-server asap and give you access to Canvas..

3 Text

Recommended: Pearson: Hull, Fundamentals of Futures, Options and Derivatives, 9th Ed., cloth or eBook orderable via the Bookstore. I refer to this as **TEXT** henceforward. It is also available from Amazon among other places. Its coverage mirrors what we do and serves as background. There's a copy on Lippincott's Reserve desk. My Canvas uploaded notes do not follow the Text chapter and verse, but many students benefit from a second source. You can easily connect with the topics I cover and the section/chapter/page coverage in the book.

Required: I will make available via Canvas copyrighted material (cases primarily) that are required reading in the second half of the semester. The *few* cases that we discuss will be accessible in Canvas, and the UGs will pay a small fee on StudyNet.

I will place Supplementary Notes, a few Sample Exams, articles and other (uncopyrighted) readings on Canvas.

There are other books that you might find useful. My notes draw from some of their sections, and they are described briefly below.

1. Cox, John C and Mark Rubinstein, *Options Markets*, Prentice-Hall, 1985. This is an excellent book, around which the treatment of options in this course was originally designed. *A well-thumbed copy belongs on every finance major's bookshelf*. It doesn't have chapter-ending problems. But it does have the most useful, intuitive treatment of the basic ideas of finance — corporate finance, even — that you will find *anywhere*. If you find a remaindered or used copy, buy it (see www.bookfinder.com) for yourself and buy a copy to endear yourself to a friend.
2. Back, Kerry, *A First Course in Derivative Securities*, Springer Verlag. A very useful source on valuation and hedging, complete with VBA code, more technical perhaps but better explained than the advanced books by Hull.
3. James, Peter, *Option Theory*, Wiley Finance series. A very practical book with tight but technical intuition well suited to those who like the math and programming; quite comprehensive. May be out of print.

And here's a selection from the many books that combine journalese reporting on financial derivatives with commentary, and provide illustrative, humorous but sometimes sadly accurate examples from the world of derivatives and recent events: the list is in no special order.

1. Michael Lewis, *The Big Short*. Norton, 2010. A must read!
2. Cohan, William D, *House of Cards*, Doubleday, 2009. On Bear Stearns. A ripping yarn.
3. Chew, Lilian, *Managing Derivatives Risks*, Wiley, 1996. A practitioner-oriented book. Well written but perhaps best read after you've finished this course.
4. Das, Satyajit, *Traders, Guns and Money*, Financial Times/Prentice Hall, 2006. Lighter but very relevant fare.
5. Epstein, Richard, *The Theory of Gambling and Statistical Logic*, Academic Press, 1977. Feel it's all gambling and speculation and connected to Vegas, and want a complete, fun but strongly analytical treatment of every game of chance, and like Probability Models? Get this one.

4 Hours

Office: 3259 SHDH; 'phone (215) 898-6206.

I'm available *on demand*...pretty much 24/7!!! Just email me and we can set up a time to meet if needed, or to on the 'phone or Zoom. I am hoping to set up a Zoom room and time convenient to all, if that is easier for you.

TAs? I'll have two TAs who will cover fixed (TBA) office hours in addition...some likely in person, and a couple per week by Zoom. You will have access to either the TAs or to me every weekday, for at least

an hour! Prior to the midterms the TA and I will hold extended review sessions on past exams posted on Canvas.

Quick Course Procedure Questions: Simply e-mail me at krishna@upenn.edu for brief answers.

5 Course Requirements

The course grade will be based on

1. **Two homework assignments (Problem Sets)**, to be done individually, the work that you submit must be entirely your own. Of course, you can drop by my Canvas/Zoomhours to ask Qs. Solutions for the first two will be posted after their due dates; each will be graded for *timely submission and completeness of effort*. But here are things to keep in mind:

The first problem set deals with Futures and applications, including basic swaps, the second with Options and applications. I begin posting on Canvas the first two Problem Sets in **PRELIMINARY VERSION** as soon as I start teaching the related topic; as the classes progress, I will update and add problems to the preliminary version; and then, a week before the Prob Set is due I will mark the version **FINAL**. This way, you can slowly and steadily work at the problem sets and avoid the crush before the due date. The two problem sets are worth 10 points each. The average score is usually about 7.5, the range for submitted assignments is 5-10.

See!

Total Weight, 20%

2. **Two mid-terms exam, Midterm 1 on TUE 12 OCT, 6-8pm and Midterm 2 on THU 2 DEC, 6-8pm** both *in person*.

Total Weight, 50%

3. **A small group project involving derivatives:** A two-part valuation and hedging project more details to follow. I will provide data, you will ferret out related articles, collect some additional data as needed and inform yourselves on that topic, and summarize your work in a brief (5-6 page) report. **Weight, 25%**

4. **Warm Calling Class Participation** [Heads-up] I will pick out 3-4 of you on some topic, and email you 2-3 days prior to a class when I will call on you based on readings that I will tell you to do!. VERY LOW KEY, no stress at all! If you are willing to be called on without the heads-up, so much the better. . . just let me know before the semester and even at the beginning of a week. **Weight, 4%**

5. **Course Grade: There is no final exam. The two Homework Assignments, the Small Group Project and the Two Midterms make up the grade.** The material is analytical and the tests are the same across MBAs and UGs. I tote up the performance at semester's end, and compute a tentative letter grade two ways: (i) Separately by MBA & UG sections and (ii) in a Combined Pool. The Final Grade is the HIGHER of the two tentative letter grades. I follow no "Wharton" curve. Please come to the first class to remove all confusion on how the course grade is computed.

6 Mark Your Calendars

Please mark the following important dates into your schedule for the term: these dates are **lapidary** *i.e.*, *written in stone!*

Date	Event	Remarks
09 Sep	Prelim Version HW1 On Canvas	Updated each Week
04 Oct	Final Version HW1 Posted	Reminder: Individual Assignment
08 Oct	HW1 DUE	Submit by 9pm Eastern
12 Oct TUE	Midterm 1	6-8pm Eastern
14 Oct	Prelim Version HW2	posted in Canvas
21 Oct	Project Description	posted in Canvas
15 Nov	Final Version HW2	Group Members decided please
22 Nov	HW2 Due	posted in Canvas
02 Dec THU	Midterm 2	Submit by 9pm EST
09 Dec	Project Due	6-8pm EST but see below
		Submit by 4pm EST

NB: DO read these notes!

- There is NO exam in the Final Exam Period.
- PLEASE try to take the Midterms at the appointed times! If you are in a different time zone OR you need another time, PLEASE send me an email a FULL WEEK before the date of the exam.
- **Please Note:** All requests for regrades — **even discussions of the grading** — should be directed to me at most a week after the graded item is returned by email, with a brief note explaining why. **NB**
- I like to distribute the project description later in the term after we have covered some options material. . . that way, everyone is on a level playing field in terms of time to due date!
- Remember: Warm Calling Participation 4%, HWs 10% each, Midterms 25% each, Project 25%!

7 Readings & Lectures

In my weekly e-mails I will indicate what you need to read before and after the lectures, and the practice problems you should work out.

In my lectures, I approach each topic as a typical decision, then proceed to indicate how the firms involved engage themselves in organising a solution, perhaps one that requires existing markets and intermediaries such as brokers and financial institutions. That way, you learn every facet of the derivatives business, and understand how many of these markets (for example, the swaps market) develops. This method of instruction is very much like the case method, but it excludes the surplus of unnecessary readings around a case and concentrates on the essential bits – after I finish each topic the formulas will effectively have been derived, it is decidedly more efficient! When it is necessary to bring in some concepts in finance that you may have seen earlier, I do it quickly; and I work out an additional example or two. The topics covered throughout the semester have a thread running through them, so when you're forced to miss coverage along the way it is best to catch up as soon as you can.

You should read the assigned material from the Text with a view to grasping the concepts being discussed, and make every attempt to follow the mathematical treatment; while I do not test on the math and no “derivations” are done in Zoomlec or tested, it will help you in connecting with my lectures. My Weekly Memo will direct you to do the readings and work at some problems. In general, it is best to skim the text once *before* you see the material in the lecture, and afterwards review the material and the text carefully See!

and try the problems.

I'll upload to CANVAS the *Weekly Lecture Notes* (these I project in Zoomlec); it is very important that you print and keep a copy as you follow the lecture – and take notes if you wish! I also make available *Notes to these Lectures & Practice Problems*. And *occasionally* I will distribute additional handouts on Canvas.