

The Wharton School
Financial Derivatives (206/717)

Mr Krishna Ramaswamy
Fall 2019

Financial Derivatives

FNCE 206-401	TuThu 10:30am	Room TBA
FNCE 717-401	TuThu 10:30am	Room TBA
FNCE 206-402	TuThu 1:30pm	Room TBA
FNCE 717-402	TuThu 1:30pm	Room TBA

1 Course Description

This course deals with Derivatives – financial & commodity 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 (partly) cover some of these topics. In this course we go beyond aspects of computing the derivative values and hedging them, and 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 new 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, sometimes barely internalised but brought out at inappropriate times to impress – should have a clear expectation of the way I conduct the course. That's why it is very important to attend the first lecture (Tues 27 August 2019).

Just FYI: The deliverables for the course are (a) Two **2-hour** Midterm Exams held during the semester, (b) **one in-class** laptop-enabled quiz, and (c) **a small group project**; (d) four homework assignments are distributed and simply graded Pass if a complete effort is submitted on time. There is no exam in the Finals period.

If you're registered and unable to attend the first session you must send me an email krishna@upenn.edu indicating a reason, and plan on meeting with me in my office 3259 SHDH the day prior to or just after the class on Tues 27 August.

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, perhaps 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 may have one guest lecture.

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 class, you can enroll in the course – just talk to me at the end of the first class. A facility with Excel and other computer languages will come in handy. **Auditors must talk to me at the end of the first lecture.**

2 Office Hours

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

Office Hours: My *posted* hours are on

Wednesdays 1:30 to 3:30pm.

Some of you might be unable to come to these hours; these students should contact me by e-mail (krishna@upenn.edu) to *get an appointment*, preferably on

Wednesdays 11am to 12 Noon.

Fridays 11am to 12 Noon.

I do observe my Office Hours so please use the posted hours if you can.

Quick Questions: E-mail me at krishna@upenn.edu for brief answers to simple questions: I might be able to save you the trip to my office. If a useful answer looks to be lengthy I will ask you to meet with me.

Weekly TA Office Hours: **Jayeeta Datta** is the TA for this course and will hold Office Hours in the cubicles in the Finance Department (2400 SHDH). Her hours will be posted on CANVAS as soon as class schedules are fixed.

Our times may change but only occasionally: if they do you'll be notified either in my weekly email or on Canvas. *Prior to both midterm exams that are held on Mondays* I will hold a general review session, possibly Sunday afternoon or evening, in JMHH.

3 Department of Notifications

1. *Weekly Memos.* I send an e-mail usually on Thursday night to give guidance on: what we covered that

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.

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 to 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 couple of past exams, Examples I worked out in class, additional class Notes even Weekly Memos and other class-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 – best to send me an email – so I can get you on the list-server asap and enable access to Canvas..
4. *Seating Plan* : After the first class, please stay in the seat you choose for the remainder of the semester. And you must plant your Wharton-provided name-cards on your desk.

4 Text

Recommended: McGraw-Hill: Hull, *Fundamentals of Futures, Options and Derivatives*. I refer to this as **TEXT** henceforward. It is available from Amazon among other places.. Its coverage mirrors what we do and serves as background. I will place 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.

Hull has several other versions, some unrevised, of his *Derivatives Texts*; you can work them too. A more advanced treatment is in his book, *Options, Futures and Other Derivatives*.

Required: I will make available via Canvas copyrighted material (cases primarily) that are required reading in the second half of the semester. The cases that we discuss will be accessible in Canvas.

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 class 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. Sorkin, Andrew R, *Too Big To Fail*, Viking, 2009. A sobering read.
4. Chew, Lilian, *Managing Derivatives Risks*, Wiley, 1996. A practitioner-oriented book. Well written but perhaps best read after you've finished this course.
5. Das, Satyajit, *Traders, Guns and Money*, Financial Times/Prentice Hall, 2006. Lighter but very relevant fare.
6. 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? See this one.

5 Course Requirements

The course grade will be based on

1. **Two homework assignments (Problem Sets)**, to be done individually, no discussion among any of you, the work that you submit must be entirely your own. Of course, you can drop by the TA's or my hours 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, the second with Options and applications. *Important Note:* I will 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 work at the problem sets and avoid the crush before the due date. The two problem sets are worth 4 points each.

Total Weight, 8%

2. **Two mid-terms exam, Midterm 1 on MONDAY 7 October, 6-8pm and Midterm 2 on Monday 18 November, 6-8pm** both closed-book and closed notes. *I will supply a formula sheet the week before the exam*; the same formula sheet will be available in the exam-book. SO... you do not have to bring a "cheat"-sheet.

Total Weight, 60%

3. **One In-Class Laptop-Implemented Quiz on Tuesday 3 December** – closed book closed notes and the formula sheet supplied by me – this date is *lapidary* (i.e. *written in stone!*) — a very basic set of questions on all (i.e. it's a cumulative test) the course material, some true-false questions and the rest multiple choice, a few involving minimal use of simple arithmetic.

Weight, 20%

4. **A small group project involving derivatives:** valuation or hedging strategies, or derivatives-employing investment strategies. More details will follow. I will suggest ideas based on your group's interests, you will ferret out related articles, collect some data and inform yourselves and us (the TA & me) on that topic in a brief (5-7 page) report. **Weight, 10%**

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
1. 19 Sep (Thu)	HW 1	In Class
2. 07 Oct (Mon)	<i>Mid-Term 1, 6-8pm</i>	Closed Book, Closed Notes
(NB) 29 Oct (Tue)	<i>No Lecture</i>	In-Class Help Session for HW2
3. 07 Nov	HW 2	In Class
4. 18 Nov (Mon)	<i>Mid-Term 2, 6-8pm</i>	Closed Book, Closed Notes
5. 03 Dec	In-Class Quiz	Laptop Needed
6. 05 Dec (Thu)	Last Class	Group Project Report Due

All exam-related absences must now receive **prior approval** from the UG advisors and me, for UGs. **There's NB no make-up date for midterms.** The make-up for the In-Class Quiz, if you miss taking it for a valid reason you give prior to 3 Dec, will be held in the Spring 2020 semester.

There is NO exam in the Final Exam Period.

Please Note: All requests for regrades — **even discussions of the grading** — should be directed to me NB at most a week after the graded item is returned, in my Office Hours, and *never discussed with* my TAs.

7 Review Sessions for Doubt-Clearing

Weekly review sessions are so sparsely attended that I've decided that the TA and I will hold them *only just prior* to the mid-terms and the final. So please use our office hours and call me with any questions you have. You should have ample opportunities for doubt-clearing. (Their office hours will be posted on Canvas and in your weekly e-mail!) And we will help you work through problems posted (with solutions) on Canvas.

8 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 even in class, 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 and try the problems. See!

I'll upload to CANVAS the *Weekly Lecture Notes* (these I project in class); it is very important that you bring a copy to class. I also make available *Notes to these Lectures & Practice Problems*. And *occasionally* I will distribute additional handouts in class. Whenever possible, these handouts will also be uploaded to Canvas. If you miss a lecture, then

1. the *quickest* way to get any in-class hand-out is to get it from a colleague and xerox it; or
2. to look for that handout, whose date will appear in its file-name, on Canvas. Whenever possible, I will create a PDF version that you can double-click on and print.