

The Wharton School  
Financial Derivatives (206/717)

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Fall 2016

### Financial Derivatives

FNCE [717/206]-401 TuThu 10:30am 107 SHDH

FNCE [206]-001 TuThu 1:30pm JMHH F50

## 1 Course Description

The phenomenal growth in the global markets for exchange-traded Options and Futures contracts on financial assets (foreign exchange, fixed income and equity securities, and stock indices) and on commodities has been quietly accompanied by equally phenomenal and much more profitable growth in Over-the-Counter (OTC) markets for swaps, related options, credit derivatives, structured products and the process of securitisation. The exchange-traded products are traded by individuals and institutional investors. Most OTC derivatives are traded between financial institutions, hedge funds, several other products are tailored to institutions. 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 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 the 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. In order to provide a useful treatment of these topics in an environment that is changing rather 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.<sup>1</sup> The final part of the course employs cases. We may have one guest lecture.

Three individual homework assignments, two midterms, and a concept-testing, multiple-choice final exam (this exam is required of Undergrads but is optional for MBAs, and it's described fully below) help determine your grade.

**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. **Auditors must talk to me at the end of the first lecture.**

<sup>1</sup>Note 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.

## 2 Office Hours

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

*Office Hours:* My *posted* hours are on

Mondays	1:30 to 3pm
Fridays	11am to Noon

When I have to move my office hours I will always indicate an alternative time in an email I broadcast via Canvas!

I try to keep an open door policy on Fridays from 1:30 to 3pm but it's wise to call (215 898 6206) to fix a time, and to avoid wasting your time in case I have other obligations that day.

*Dial-a-Question:* Call (215) 898 6206 or e-mail me at [krishna@upenn.edu](mailto:krishna@upenn.edu) for answers to brief questions: I might be able to save you the trip to my office.

*Weekly TA Office Hours:* I have TAs for this course who will hold Office Hours in the cubicles in the Finance Department (2400 SHDH). Their hours will be posted on CANVAS as soon as their class schedules are fixed. Their times may change: if they do you'll be notified in my weekly memo emailed to you.

## 3 Department of Notifications

1. *Weekly Memos.* I send an e-mail late every Thursday night to give guidance on: what we covered that 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 (other than the cases and readings available from StudyNet), Sample Problem Sets and Exams, Examples I worked out in class, even Weekly Memos and other class-related material are posted here.
3. *E-Mails:* When sending me e-mail, please use [krishna@upenn.edu](mailto:krishna@upenn.edu) and do avoid hitting the *Reply to All* button to a general e-mail that I have sent to all students, for obvious reasons.  
You should be on the course's e-mail list-server very 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!
4. *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..
5. *Seating Plan :* After the first class, please stay in the seat you choose for the remainder of the semester. And you must plant your name-cards on your desk.

## 4 Text

**Recommended:** MacDonald, *Derivatives Markets*, 3rd Edition, Pearson. I refer to this as **TEXT** henceforward. It is available from the bookstore. I will annotate my lecture notes (slides) and other handouts to indicate companion reading in the Text.

**Required: CoursePack: StudyNet** I will make available on Study Net copyrighted material that are required reading assignments in the remainder of the semester. The cases that we discuss towards the end of the course will be accessible here. You will find other readings on StudyNet.

Here are two very desirable books that I have placed on Lippincott Reserve:

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](http://www.bookfinder.com)) for yourself and buy a copy to endear yourself to a friend.
2. Siegel, Daniel R and Diane F Siegel, *Futures Markets*, The Dryden Press, 1990. I have placed several copies on Lippincott reserve, and interested students can come by my office to borrow a copy. Somewhat dated but an excellent book which I would recommend to anyone who goes into the futures business. My notes will draw on some material from this book.

Here are a couple of standard texts:

1. Hull, *Options, Futures and Other Derivatives*, Pearson Prentice Hall 8th ed. Comprehensive, but not an intuitive read.

And here's a selection from the many books that combine reporting 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 and strongly analytical treatment of every game of chance? See this one.

## 5 Course Requirements

The course grade will be based on

1. Three homework assignments (Problem Sets) to be done individually, no discussion among any of you, the work you submit must be entirely your own. Of course, you can drop by the TAs' 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 for 5 points each. But here is an important point to keep in mind:

The first problem set deals with Futures and applications, the second with Options and applications, and the third is a capstone that brings the ideas from the first two to a more synthetic, case-like exercise. I will begin posting on Canvas the first two Problem Sets in PRELIMINARY form 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 make the version FINAL. This way, you can slowly work at the problem sets and avoid the crush before the due date!

**Weight, 15%**

2. Two mid-terms exam — the first on *Monday 17 Oct, 6–8pm* and the second on *Wednesday 30 Nov, 6–8pm* both closed-book and closed notes (you may bring a single sheet of  $8\frac{1}{2} \times 11''$  paper with one side left blank)

**Total Weight, 60%**

3. One final exam — on a lapidary date and time fixed **Thursday 15 Dec, 6–8pm** by the University Registrar and not by me — 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; designed so that you can calmly review your material and solidify your understanding.

The final is NOT an optional exam for undergrads!

**MBAs ONLY: PLEASE NOTE!!!** I will compute your “offered” course letter grade as a provisional grade and e-mail it to each of you individually on 9 Dec – if you're satisfied with that letter grade you can elect to skip the final exam on Dec 15. If you elect to take the final exam then your final letter grade will reflect your performance on the final relative to all (including the UGs) that take the final. This “option” is **not** available to undergraduates.

**Weight, 24%**

**To summarise:** The UGs' course grade will depend on HW assignments, 2 midterms and the mandatory final.

For the MBAs: the MBA grades will be determined by the HWs, 2 midterms, and on the performance in the *optional* final.

## 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. 30 Sep	HW 1	By 4:30pm in 2400 SHDH
	11 Oct Tue	No Class
2. 17 Oct Wed	<i>Mid-Term 1</i> , 6-8pm, Room TBA	Closed Book, Closed Notes(formula sheet OK)
3. 18 Nov	HW 2	By 4:30pm in 2400 SHDH
4. 30 Nov	<i>Mid-Term 2</i> , 6-8pm, Room TBA	Closed Book, Closed Notes(formula sheet OK)
5. 8 Dec	HW 3	By 4:30pm in 2400 SHDH
7. Dec 15	<i>Final Exam</i> , 6-8pm	<b>Closed Book &amp; Notes</b>

All exam-related absences must now receive **prior approval** from the Grad Division for MBAs; or from the UG advisors and me, for UGs. **NB**

**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. The TAs and I will hold Office Hours throughout each week, so 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 (proto)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.

## 9 Topic Sequence

The following is tentative – it is only by attending class (or by following along with a colleague’s or Canvas’s help) that you will know precisely where I am. I try never to skip part of a topic, but I may leave some material for you to read from the text. Each week, my Thursday e-mail will direct you to readings in the text or in Canvas – for which you will be responsible.

For approximately the first third of the course (~ 8lecs) I will concentrate on *FORWARDS, FUTURES & SWAPS, with applications*; For the second third of the course (~ 9 lecs) we’ll study *OPTIONS, with applications*, mainly on equities and equity indexes; and the final third (~ 9 lecs) will be devoted to *CASES & APPLICATIONS*, including product design, exotic options, credit products, and so on. In the first two-thirds of the course we lay the foundations – and please note that in that process we will include a large number of examples and applications! The final third is really special applications and derivative structures, mostly done with cases.

Topic	Description	Remarks
	INTRODUCTION	Syllabus & IntroLec Notes
1.	Forward & Futures Markets	Lec Notes, Text, and RDGS
2.	Forwards & Futures Pricing	Lec Notes, Text
3.	Commodity Futures	Lec Notes, Text
4.	Hedging w Applications	Lec Notes, Text, RDGS
5.	Swaps Inclgd Equity Swaps	Lec Notes, Text, RDGS Lec Notes, Rdgs
6.	Options Markets	Lec Notes
7.	Payoffs for Basic Strategies	Lec Notes
8.	No Arbitrage Pricing	Lec Notes, Text
9.	Optimal Exercise of Options	Lec Notes, Text
10.	Valuation by Replication	Lec Notes, Text
11.	Multiperiod Binomial Pricing	Lec Notes, Text
12.	Zoom to Black Scholes	Lec Notes, Text, RDGS
13.	Empirical Evidence	Lec Notes, RDGS
14.	Alternatives to Black Scholes	Lec Notes, Text, RDGS
15.	Cases, Applications including Credit Products, Securitisation, Product Design & Exotic Options Guest Speaker(s)	Course Pack from Repro TBD

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