

The Wharton School
Financial Derivatives (206/717)

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Fall 2020

Financial Derivatives

FNCE 717-401 MW 10:30am Online Zoomworld
FNCE 206-001 MW 1:30pm Online Zoomworld

I have modified the course I had designed and started in 1985 (!) and now taught pretty much each year since then, to reflect these Covidian times. I've lived, as you all have, with the daily uncertainty and the periodic changes in the announced plans in the way the course will be conducted. It appears now that the final plan is firm: the course will be fully online with no possibility of interaction on campus. I deeply regret this, for the course is an analytical one that accommodated my teaching style, in which I asked questions in the walking around Socratic way but stayed anchored to projected slides, and developed the material with practical application in mind, all the while trying to instil in students that deep understanding of concepts that will enable them to deal with new situations in their careers rather than relive rote-learned ones. I always felt that that method promoted learning and a curiosity that led students who were engaged to the relevant readings after class. *I like to think* that most of my students appreciated it, and that there was some important collective learning in the zoomlecroom. Learning to me has always been a co-production – it requires both the instructor and the instructed to *invest* in order to achieve the best outcome.

I am not going to let this Covidian environment that has forced us into Zoomworld to defeat us. It is clear that I will have to work harder and make myself more available and tailor the material to your collective needs, to raise your intellectual curiosity and fatten you with skills in readiness for the fun world of finance and derivatives.

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. 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 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 online lecture (Wednesday 2 Sep 2020).

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**, and (c) **two 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.

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 may have one guest lecture.

As the course will run online and depend heavily on Canvas as the interface with everyone in the zoomlec including me, I'll depend on all of us having Zoom enabled connections via Canvas.

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.**

2 Hours

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

Quick Questions: Simply e-mail me at krishna@upenn.edu for brief answers to simple questions: If a useful answer looks to be lengthy I will ask for an online chat at an agreeable time!

Prior to the midterms I will hold an extended review session.

3 Department of Notifications

1. *Weekly Memos.* I send an 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

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.

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 zoomlec 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 a Zoomlec 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 – best to send me an email – so I can get you on the list-server asap and enable access to Canvas..

4 Text

Recommended: McGraw-Hill: Hull, *Fundamentals of Futures, Options and Derivatives*, 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. 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 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 journealese 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. Sorokin, 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, 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. *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 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.

Total Weight, 20%

2. **Two mid-terms exam, Midterm 1 on Tuesday 13 October, 6–8pm and Midterm 2 on Thursday 3 December, 6–8pm** both *virtual*. I m working out precisely HOW the exam will be administered, using Canvas or other platform! *Please be patient, it's a learning curve for me too!*

Total Weight, 50%

3. **A small group project involving derivatives:** valuation or hedging strategies, or derivatives-employing investment strategies. I will supply alternative project ideas, more details will follow. I will provide data based on your group's interests, 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** 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. If you are willing to be called on, so much the better. . . just let me know before the semester and even at the beginning of a week. I want this to be non-confrontational in the Zoomworld. **Weight, 5%**

6 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 and try the problems. See!

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.