

North Carolina State University
Department of Economics
Fall 2008

**ECG 590I – Asset Pricing
SYLLABUS**

Class Day and Time: Tu&Th 1:30 - 2:45 PM Cox Hall, Room 209

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Office Hours: Tu & Th 3:00pm-4:30pm, in fact usually until 5:00pm (but no promises), and if necessary by appointment

Prerequisites:

- Multivariable calculus (partial differentiation and multiple integration) – the kind of material covered in NCSU’s math courses MA231 or MA242. Better would be advanced calculus, such as MA425, or any real analysis course beyond that.
- Ordinary differential equations – see MA301.
- Linear algebra – see MA305.
- Probability theory – see MA421.

No economics or finance background is required, but you would find at least one course in basic economics (such as EC201) useful. Those of you enrolled in the Financial Mathematics program should consider taking a course in microeconomic theory (EC301 or ECG700) at some point to acquire more understanding of how markets work. If you are interested in studying the behavior of interest rates, a course in macroeconomic theory (such as EC302 or ECG703) is essential. However, for this course – ECG590I – you can do well without any of that material.

Required textbooks:

(1) Hull, John C., *Options, Futures, & Other Derivatives*, 7th edition, Pearson Education, 2006, ISBN 0-13-149908-4.

(2) Hull, John C., *Student Solutions Manual: Options, Futures, & Other Derivatives*, 7th edition, Pearson Education, 2006, ISBN 0-13-149906-8.

The Text and the Student Solutions Manual will be available at the University textbook store. They will be sold in a package, which is cheaper than buying them separately.

For this course, you can buy the 6th edition of both the text and the student solutions manual. Most of the differences between it and the 7th edition do not pertain to the material covered in our course. The 7th edition’s Chapters 17 and 18, which we cover in this course, were Chapters 15 and

16 in the 6th edition. I believe the problem sets at the ends of those two chapters are the same in the two editions except for the different chapter numbers.

Electronic material: The following two textbook chapters are available from the electronic reserve of the NCSU library:

- Huang, Chi-Fu and Robert H. Litzenberger, *Foundations for Financial Economics*, Prentice Hall, 1998, Chapter 3: Mathematics of the portfolio frontier, pp. 59-82.
- Neftci, Salih N., *An Introduction to the Mathematics of Financial Derivatives*, second edition, 2000, Academic Press, Chapter 2: A primer on the arbitrage theorem.

Course Description:

This course is an introduction to the pricing of assets. The emphasis is on the mathematical methods used to derive pricing formulas, but some time is devoted to explaining the major types of paper assets that can be priced with the methods we study. Real assets, such as factories and machines, also can be priced with the same methods. Details of their pricing are covered in other courses (e.g., IE711).

Many of you are taking MA546 (probability and stochastic processes) simultaneously with this course. There is a small amount of overlap and a great deal of complementarity between the two courses. MA546 is about the mathematics of things evolving over time as they are subjected to random shocks. This course is about particular objects that do that kind of evolving - asset prices. The goal of this course is to introduce you to the major types of asset prices and give you an understanding at an intuitive level of the relation between asset prices and the mathematics that governs their evolution. The two courses together give you the necessary background for MA547, which provides a rigorous discussion of the mathematics of asset pricing.

There will be several homework assignments consisting mostly or even entirely of questions taken from the Questions and Problems section at the end of each chapter in the text. The assignments will not be graded but will be discussed in class. The homework assignments are to provide practice in using the material and to foster discussion of any questions or confusions you may have. The Student Manual has the answers to all the Questions and Problems in the text, so you can check your answers against the Student Manual. You won't learn anything unless you try to work out the assigned questions before you consult the Student Manual. There are far more questions in the Questions and Problems sections than we have time to discuss in class. I recommend that you try to do as many of them as possible outside class and then revise your answers until you get the answers in the Student Manual. It generally is beneficial to work in groups so that you can discuss everything with your classmates. That usually is helpful for everybody.

Grading:

Midterm Exam (Middle of October)	33%
Final Exam (Tuesday, Dec 9, 1:00pm - 4:00pm)	67%

If you do much better on the final than on the midterm, I will give your final exam extra weight according to my judgement. Numerical scores convert to letter grades as follows (note that I do not use pluses and minuses):

80-100	A
60-79	B
40-59	C
20-39	D
0-19	F

The date for the midterm is somewhat tentative and will be determined later according to the needs of the class or the instructor. The exams will be cumulative in nature.

Exam questions will be taken from material covered in:

- the lecture notes and related classroom discussion,
- the textbook,
- handouts, if any,
- the homework assignments.

Both exams are "open-book, open-notes," which means you can bring your textbook and class notes to the exams and consult them whenever you wish. In fact, my only restriction on reference material is that you cannot communicate in any way with anyone else while you are taking an exam: no talking, no emails, no cell phones, etc. In real life you will be able to refer to books and other material when you are working out problems, so you may as well be able to do it here, too. HOWEVER, you should study as if you were not going to have access to your book or notes. Otherwise, you are likely to get lazy and not really master the material, figuring you can always look it up if you don't remember something. That is a great way to guarantee that you don't remember many things and in fact don't even understand them. You then spend way too much time during the exam looking up the material you should know how to use without consulting anything except your own brain. Think of the text and notes as no more than emergency assistance in case you forget a formula or the details of a derivation that you need.

Exams are given only on one day. I do not give exams early or late except in extraordinary circumstances.

Advice on How to Study

First, the material in this course is much like mathematics. In fact, much of it *is* mathematics. As with any course in mathematics, the only way to learn the material is to practice using it. Reading the book and coming to class are not sufficient. You must try to solve problems using what you know and what is in the textbook, without referring to the answers that are in the Study Guide or that other students already have worked out.

Second, you typically will have to spend about four hours or more studying outside of class for every hour you spend in class. That is true of all the courses in the Financial Math program and the Economics graduate program. For this course, which is 2.5 hours of class per week, you should expect to spend at least 10 hours a week studying outside of class. If you are taking four courses, that means 10 hours in class and at least 40 more hours outside class, for 50 hours a week. That is only my estimate. You may find you need even more time to master the material.

Third, a useful attitude in studying is to imagine that you are going to teach the material to a class. Think about the kind and amount of preparation you would do if you were going to stand

up in front of 35 intelligent and motivated students who will not tolerate a shoddy performance on your part. You will need to understand everything, and you will need to understand it at more than just a superficial level so you can answer questions from the students. With that in mind, study accordingly. If you study that way, you will have no trouble passing the course because you will know the material thoroughly.

Course Outline

1. **Introduction to various derivatives:** Hull, chapter 1.
2. **Present value:** (no reading)
3. **Forward and Futures Prices:** Hull, chapters 2 and 5
4. **Hedging using futures:** Hull, chapter 3
5. **Demand, Supply and Equilibrium:** (no reading)
6. **Interest rates:** Hull, chapter 4
7. **Basics of options, including trading strategies:** Hull, chapters 8, 9, 10
8. **Risk aversion:** (no reading)
9. **Arbitrage Theorem:** Neftci
10. **Binomial trees:** Hull, chapter 11
11. **Elements of asset pricing** (stochastic differentiation, Wiener and Poisson processes, Ito's lemma): Hull, chapter 12
12. **Introduction to Black-Scholes:** Hull, chapter 13
13. **Implied volatility:** Hull, chapter 18
14. **Greek letters and hedging:** Hull, chapter 17
15. **Capital Asset Pricing Model and portfolio management:** Huang and Litzenberger