Finance 465, Derivatives Markets I

Spring 2011 , Evanston
Prof. Viktor Todorov

Office	Andersen 4-441
Office hours	Tuesday, 11.00-12.30 or by appointment
Phone	847-467-0694
Fax	847-491-5719
E-mail	v-todorov@northwestern.edu

This course provides an analytical overview of futures, options, swaps and other derivatives, most of which are now commonplace. We will discuss examples of how derivatives are used to solve particular problems, as well as the underlying pricing methodologies. We will make extensive use of Excel.

The mathematics will be basic (e.g. continuous compounding, solving two equations in two unknowns, elementary probability calculations), but the subject is inherently analytical. Expect numerous numerical examples. You should review basic probability.

1 Readings

- **Required Textbook:** McDonald, Robert, Derivatives Markets, second edition. This book is also used in Derivatives II.

2 Grading

Grades will be based on exams (midterm and final exam), homework, and class participation.

2.1 Exams

- Midterm. There will be one in-class midterm exam on **Thursday, May 5**. The midterm cannot be rescheduled. However it is optional (see the grade formula below).
- Final Exam: ???. Room ???.

2.2 Class Participation

You are to display your name card at all times. This grade is determined by the quality of your participation. Here are things which will count as class participation:

- Making comments and asking questions in class which are instructive and helpful for the class as a whole.
- Direct feedback to me which helps me do a better job of teaching. (This includes constructive feedback on problem sets, lectures.)
- Copies of articles or materials which are helpful for the class.

2.3 Problem Sets

There will be eight homework assignments, one due approximately each week. Only your top six scores will count towards your final grade. The homework assignments will be made available on the blackboard. The homework assignments can be done in groups of up to four people. If you prefer to work alone, that is okay. Please hand in one set of answers per group. Solutions will be posted to the web page the day after the homework is due. **All problem set submissions must be placed in my finance department mailbox or handed directly to me before the start of class. No late homework is accepted.**

Homework submissions should be self-explanatory. Spreadsheet printouts which require interpretation to grade will receive no credit.

2.4 Grade Formula

The grade will be determined by the following formula:

$$0.05 \times X_P + 0.20 \times X_{PS} + 0.75 \times \max(0.4X_M + 0.6X_F, X_F)$$

where X_P is the participation grade; X_{PS} the problem set grade; X_M is the midterm grade; X_F is the final grade.

Notice that if you do better on the final than on the midterm, only your final exam grade will count.

2.5 Regrading

I adhere to the Kellogg policy on regrading, which is posted at the student affairs website: `http://www.kellogg.northwestern.edu/stu_aff/policies/registration.htm`. Note in particular that you have 10 days to request a regrade and the entire work is subject to a regrade, not just the contested portion. *The request must be in writing.* This is a firm policy.

3 Class Logistics

3.1 Getting in Touch

- **Office Hours:** I have office hours (posted above), and I will make appointments at other times if necessary.
- **Electronic Questions:** I am happy to answer questions about lectures and homework *if those questions are posted on the blackboard.*
- **Personal Questions:** You can use e-mail for questions of a personal nature (e.g., you want to make an appointment). Such e-mails should have a subject containing the preface "Fin-465:". I will filter e-mails using this preface.

3.2 Etiquette

The purpose of etiquette rules is to ensure that no one interferes with the learning of another. I do understand that recruiting sometimes interferes with class. Thus,

- I plan to start promptly and I expect you to be on time.
- If, because of some unusual circumstance you come in late, please enter as surreptitiously as possible.

- If it is necessary for you to leave early, please sit next to a door. Please ask someone to switch seats before class starts if this is necessary.
- You may leave the room briefly if it is an emergency (if you have any doubts, it's not an emergency).
- Computer use in class is generally forbidden. I may allow you to use computers at specific times, for example, when going over problem set solutions.

3.3 Computers in Class

As a general rule, you may not use notebook computers or other handheld computing or communication devices in class, unless you sit in the last row. From time to time I may permit everyone to use computers for specific limited purposes. *At no time are you permitted to perform any e-mail related activities or electronic messaging in class.*

3.4 The Honor Code

In addition to the usual expectations created by the honor code, there are three aspects I want to interpret and emphasize for this class:

- *You must have a full understanding of any written material you submit with your name on it.* I encourage you to work in groups, as I believe this is the best way to learn. You may hand in group problem sets. However, if you are not completely familiar with the contents of a document bearing your name, I will regard this as an honor code violation.
- *With the exception of material which I put on blackboard, you may not use any material from previous offerings of this course in preparing material to be graded.* For example, you may not look at problem set answers from previous quarters. I do have prior exams posted, and you are free to use them as a resource.
- *There is to be no collaboration of any sort on exams.*

4 Course Outline

I will cover topics in the order listed, but we may move faster or slower than indicated in the outline. However, the midterm and final exam date will not change. If you miss class, be sure to ask a classmate for notes and updates, and also check the web page for announcements and handouts.

Week 1: Introduction to Derivatives

a. Review of continuous compounding (McDonald, Appendix B)
b. Definitions and purposes (McDonald, Chapter 1)
c. Payoff and Profit Diagrams (McDonald, Chapter 2, 3 and 4)

Week 2: Introduction, continued

a. Corporate Securities (McDonald, Chapter 16.3)
b. Introduction to forwards and futures

Week 3: Forwards and Futures

a. Pricing (McDonald, Chapter 5.1-5.3)
b. Financial Futures (McDonald, Chapter 5.4-5.7)

Week 4:
- Commodity Futures (McDonald, Chapter 6)
- Swaps

Week 5:
- Distribution-free properties of options
  a. put-call parity (McDonald, Chapter 9.1-9.2),
  b. arbitrage restrictions on option prices (McDonald, Chapter 9.3)

Week 6:
- Midterm
- Binomial option pricing (McDonald, Chapter 10)
  a. Valuing European Options
  b. Valuing American Options and the Value of Early Exercise

Week 7:
- Binomial option pricing (continued)
- More binomial option pricing (McDonald, Chapter 11)

Week 8: More binomial option pricing (continued)

Week 9: The Black-Scholes Model

a. Basic Formula (McDonald, Chapter 12.1-12.2, 12.4)
b. Greeks (McDonald, Chapters 12.3)
c. Delta-hedging (McDonald, Chapter 13.1-13.3)

Week 10: Beyond Black-Scholes: Pricing and Hedging Volatility Risk (McDonald, Chapter 12.5, 23.1-23.3)