Math 194

The Mathematics of Finance

Winter 2008

In this course we examine the mathematics of some of the basic *derivative securities* encountered in financial markets. A prototype for such a derivative is the *European put option*, which is a contract giving its owner the right (but not the obligation) to sell a share of a specific stock at a fixed price (the *strike price*) on a fixed date. The buying of such an option provides the owner with a hedge against some of the risk associated with owning the stock—if on the fixed date the price of the stock exceeds the strike price, the option is worthless, but if the stock price falls below the strike price, the owner can exercise the option and sell the stock at a better-than-market price. Economists R. Merton and M. Scholes won the Nobel Prize for their work on pricing such European put (and call) options, when the stock price is modeled by an exponential Brownian motion. (Scholes' collaborator F. Black died before the Nobel was awarded; Merton refined and extended the early work of Black and Scholes.)

In this course we will study a discrete version of the Black-Scholes-Merton (BSM) model, the Cox-Ross-Rubinstein (CRR) model. The mathematics of the CRR model is simpler than that needed for the BSM model, but all of the key ideas necessary for the analysis are present in our analysis of the CCR model. The model and its analysis are based on probability theory learned in Math 180A, and will also make use of linear algebra (Math 20F) and differential equations (Math 20D) learned in prerequisite courses.

- We will be using the first three chapters of the text *Introduction to the Mathematics of Finance* by R.J. Williams. These chapters can be downloaded from links provided on the course website. The complete text can also be purchased in the bookstore (or online) should the student so desire.
- Lectures will be on Monday, Wednesday and Friday, from 2:00 to 2:50 PM, in U413.
- Discussion sections with your TA meet on Tuesdays according to the following schedule:
  - **Section A01:** 1:00 PM to 1:50 PM in Warren Lecture Hall (WLH), room 2114
  - **Section A02:** 2:00 PM to 2:50 PM in Warren Lecture Hall (WLH), room 2114

- Your course grade will be based on your performance on the two midterm exams and the final exam. These exams will be weighted as follows:
  - Midterm 1: 20%
  - Midterm 2: 25%
  - Final: 40%

- There will be NO MAKEUP EXAMS given.
- In addition there will be weekly homework assignments which in total will account for the remaining 15% of your grade. The assignments (and eventually their solutions) will be posted on the course website. Solutions should be clear and cogent, and neatly presented. These assignments will be due at the beginning of lecture on the due date. (Homework can be handed in early, in the homework dropbox on the sixth floor of APM, to your right as you step off the elevator, opposite room 6402A.) Late homework WILL NOT be accepted.
- The midterm exams will be given in class on February 1 and February 29.
- The final exam is scheduled for Monday, March 17, from 3:00 to 6:00 PM.
- The +/− grading system will be used for course grades.
- TURN OFF cell phones in lecture, discussion sections, and exams.
- Academic dishonesty will not be tolerated, and violations will be reported to the Academic Integrity Coordinator.

Instructor: P. Fitzsimmons, Office: AP&M′ 5715, email: `pfitzsim@ucsd.edu`, phone: 534-2898, Office hours: MWF 10:00–11:00 AM and 1:00–1:45 PM, or by appointment.

TA: M. Kinnally, Office: AP&M' 5768, email: `mkinnall@math.ucsd.edu`, Office hours: M Noon–2:00 PM, T Noon–1:00 PM, Th Noon–1:00 PM.

This handout and other course information is available on the World Wide Web at the URL

`http://math.ucsd.edu/~pfitz/winter08/194/`