

Math 194

## The Mathematics of Finance

Winter 2010

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 CRR 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.
- Lectures will be on Monday, Wednesday and Friday, from 11:00 to 11:50 AM, in Warren Lecture Hall 2111.
- Discussion sections with your TA meet on Wednesdays according to the following schedule:
  - **Section A01:** 6:00 PM to 6:50 PM in APM 2301
  - **Section A02:** 7:00 PM to 7:50 PM in APM 2301

- 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 January 29 and February 26.
- The final exam is scheduled for Monday, March 15, from 11:30 AM to 2:30 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.

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**TA:** M. Kelly, Office: AP&M' 6414, email: [mbkelly@math.ucsd.edu](mailto:mbkelly@math.ucsd.edu).

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

<http://math.ucsd.edu/~pfitz/winter10/194/>