WASHINGTON UNIVERSITY IN ST. LOUIS
John M. Olin School of Business
FIN 452/537 – Advanced Derivative Securities
Massimo Guidolin
Spring 2006

Class room: 108 Simon Hall
Meeting times: M-W 8:30 – 10:00
Office: 268 Simon Hall
Phone: (314) 935-7257
Email: guidolin@wustl.edu
Office hours: By appointment.

Course description

This is an applied course in derivative securities. It focuses on the implementation of models for pricing and hedging derivatives in the equity, currency, and fixed-income markets. You will learn to write programs in a programming environment such as Gauss to implement the Black-Scholes model, binomial and trinomial models, finite-difference methods, and Monte-Carlo methods. The course will be especially useful to students who wish to pursue careers in derivatives trading, fixed-income, risk-management, and other quantitative areas. Also students who are interested in research topics related to asset pricing might boost their ability to code the rational pricing algorithms employed by efficient markets. The course is designed to be a self-contained introduction to computer programming, numerical methods, continuous-time mathematics, and option-pricing theory.

Textbooks

i. Required: *Implementing Derivatives Models*, by Les Clewlow and Chris Strickland, Wiley, 1998 (reprinted 2004).
ii. Optional: *Derivatives Securities*, by Robert Jarrow and S. Turnbull, South-Western College Publishing Co., 2000.

Software

You will do your programming in Gauss. This is a powerful software package designed for numerical computation that is widely used on Wall Street. Gauss interface makes programming considerably simpler compared to traditional program languages such as C, C++, or Fortran. Gauss has been installed in the PC lab and the Olin network. If you want to install Gauss on your own personal computer, you can purchase a full featured student version for $395 at http://www.aptech.com/AS_prodMF.html.

Prerequisites

MBA courses FIN 524 (Options and Futures) and FIN 524B (Derivatives Securities) or BSBA course FIN 451 (Options, Futures, and Derivative Securities).
In general, be prepared that this course is rather technical, quantitative, and challenging. It will require substantial commitment on your part.

Course Website (Blackboard)

This class has a website, which can be reached from https://blackboard.olin.wustl.edu. All course materials will be posted there, including syllabus, homework assignments, data sets, solutions, research articles, announcements, etc.

Occasionally, I might use the website for logistical matters, such as to announce schedule changes, make clarifications, answer common questions, correct typos, etc. Please check this website periodically.

Grading and Coursework

1. There will be group 4 homework assignments, a midterm, and a final project. Assignments, the midterm, and the final project all involve implementing derivatives models in Gauss. Your course grade will be determined by

Homework assignments	32%
Midterm exam	35%
Final	33%

2. You will do homework assignments in groups up to three people. They will be graded as P+, P, P-, or F, which correspond to 5, 4, 3, and 0 points, respectively. Note that late submissions will get F.

3. The midterm and final are individual, take-home, and open-book. I will normally assign 36-48 hours to work on them. Please make space in your busy schedules for that to be possible. Only one midterm and one final will be handed out, no personalized make-up tests will be possible.

4. You need to form your own groups. I want an email from each group by Jan 28, stating who is in the group. I will assign each group a name (Group A, Group B, etc.). You will submit you assignments electronically via the Digital Drop Box (DDB) tool in Blackboard, before the start of class on the day it is due.

5. Each assignment should be submitted as a single file. Typically, to solve a homework assignment, you will need to write several Gauss programs. In this case, you will zip all files necessary to run you solutions into a single archive (using, for example, WinZip) and then submit it to DDB. You should name your submission as Assignment1_GroupA.zip, etc. Do NOT use spaces and special symbols in file names.

In addition, please turn in a print out of your assignment in class.

Questions and Office Hours

i. You can ask questions by email or in person. Email is strongly encouraged. I will also be available for questions and comments after each class.

ii. You are your best resource: for me, it will be very difficult (sometimes impossible) to give detailed (and useful) replies to articulated questions concerning the fine details of YOUR own Gauss codes. Therefore you should avoid thinking that by carefully sequencing the questions you will in the end get me to work on your own assignments.

iii. I also welcome your comments on every aspect of the course. You feedback is very important!

Honor Code

This course and its associated coursework are being administered under the policies of the John M. Olin School of Business Honor Code. All students are expected to conform to this code.

In particular, with respect to homework assignments, you are only allowed to place your name on group work if you have had substantial input in that work. With respect to the exams, you are not allowed to discuss them with anyone other than me.

Additional Comments

About me: I am a Senior Economist at the Research Division of the Federal Reserve Bank of St. Louis. I was previously an assistant professor with the Economics department of the University of Virginia. My research interests cover several areas, including Derivatives, Financial Econometrics, and Asset Pricing implications of dynamic general equilibrium models, please see http://research.stlouisfed.org/econ/guidolin/index.html for a sample of my publications and research interests.

Course Meeting Schedule

The course meets on Mondays and Wednesday s from 8:30 – 10:00 in Room 108. This is a cross listed BSBA/MBA course and it follows the MBA calendar, which calls for a two-week break (Spring Break + Travel Week) the second and third weeks of March and for overall 22 meetings (not including exams). We will not have class on 03/06--3/17 (Travel week and Spring Break).

Important Dates:

02/08 -- Assignment 1 is due;
02/20 -- Assignment 2 is due;
03/01 -- Assignment 3 is due, Midterm Review;
03/22 – Midterm Exam;
04/12 -- Assignment 4 is due;
04/26 – Final Exam is handed out.

Topics and Readings (tentative)

Note: "CS" denotes chapters from Clewlow and Strickland, while "JT" denotes chapters from Jarrow and Turnbull. Additional reading (such as research papers) might be assigned later on and will be posted on the course web site.

1. Introduction to Gauss. – "A Gauss Primer" by Curt Wells.

2. Review of Basic Concepts in Asset Pricing Theory: Martingale Pricing – JT 4, JT 6.

3. Introduction to Continuous Time Finance. Brownian Motion. Ito's Lemma. – JT 8.

4. Black-Scholes Analysis. Option Greeks. – CS 1, JT 10.

5. Binomial Trees. – CS 2, JT 5.

6. Trinomial Trees and Finite Differences. – CS 3.

7. Monte Carlo Simulations. – CS 4.

8. Exotic and Path Dependent Options. – CS 5, JT 19, JT 20.

9. Extensions of Black-Scholes. Stochastic Volatility Model. – JT9, JT11, JT12 + handout.

10. Interest Rate Derivatives and Term Structure Models. – CS 6-10, JT 15, JT 16, JT17.