ECES 490/690: Special Topics: Financial Engineering III (Spring, 2009)

Instructor: Steven Weber

Course sequence overview. The Financial Engineering course sequence covers selected topics from finance from an engineering perspective. The goals of the course sequence are:

- Prepare students to be competitive applicants for jobs in the financial sector.
- Help students apply their math and programming skills to an area outside of electrical engineering.
- Give students the skills to make more informed decisions in their personal investments.

The course sequence will consist of three courses, roughly divided as follows:

- Fin. Eng. I (Fall, 2008): Time-value of money, portfolio management, Capital Asset Pricing Model
- Fin. Eng. II (Winter, 2009): Derivative securities, option pricing, betting strategies, auctions,
- Fin. Eng. III (Spring, 2009): Financial time-series analysis, heavy-tailed disbns, parameter estimation

Each of the courses may be taken individually, i.e., I is not a prerequisite for II, nor is II a prerequisite for III.

Course description. Financial Engineering III will cover the following topics:

- Monte-Carlo simulation for integral estimation
- Generation of random variables
- Statistical inference from simulations
- Heavy tailed random variables
- Brownian motion and Geometric brownian motion
- The Black-Scholes equation
- Financial Engineering
- Heavy tailed random processes: the Noah and Joseph effects

Prerequisites. Students must have taken ENGR-361: Probability and Statistics for Engineers and ECE-203: Programming for Engineers, earning a grade of C or better in each.

Class locations and times. Curtis 344, Tuesdays and Thursdays 12:30-1:50pm.

Textbook. Mathematics for Finance: An Introduction to Financial Engineering
Marek Capinski and Tomasz Zastawniak, Springer Undergraduate Mathematics Series, 2003

Class logistics.

- *Homework.* There will be four homework assignments, each due roughly two weeks after being assigned. The purpose of the assignments is to help cement understanding of the lecture material and highlight practical issues in algorithm implementation.
- *Exams.* There will be three short in-class exams and a final exam. Exams will cover lecture concepts and will emphasize problem, and will be similar to problems asked on the homework assignments. The in-class exams will last 30-45 minutes.

- *Participation.* You will be given a participation grade. There are 20 lectures in the Spring term, you get 1 point for each lecture you attend and **actively participate**. You get 2 points for free. So, you get to miss up to two classes without penalizing your participation score. You can also make up participation points by coming to office hours.
- *Vista.* I will send email to the class through Vista. I will also use Vista to post lecture notes and homework assignments and post your grades.

Grading. Your final course score will be computed as follows:

$$\begin{array}{rl} \text{Homework} & 40\% \\ \text{In class exams (3)} & 30\% \\ \text{Final Exam} & 20\% \\ \text{Participation} & 10\% \end{array} \tag{1}$$

Your final letter grade will be computed from your final courses score as follows:

95	100	A
90	94	A-
87	89	B+
83	86	B
80	82	B-
77	79	C+
73	76	C
70	72	C-
65	69	D+
60	64	D
0	59	F

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