

**Fall 2009: IEOR E4707 Financial Engineering: Continuous-Time Models
Columbia University**

Syllabus and Course Logistics

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Course Website: www.columbia.edu/~mh2078/CtsFE09.html

Class Time: Mondays: 2.40 to 5.10pm

Location: 303 Mudd

Prerequisites

1. IEOR E4701: Stochastic Models for Financial Engineering
2. IEOR E4702: Statistical Tools for Financial Engineering
3. IEOR E4706: Foundations of Financial Engineering

If a student intends to take the course without having taken the above pre-requisites then they should make sure that they have taken equivalent courses elsewhere. It is particularly important that they have taken an MS level course in applied probability that covered Brownian motion and martingales. It is also necessary that they have had some previous exposure to financial engineering.

Textbooks: Course notes will be provided. There are no required textbooks but excellent references include:

1. *A Course in Derivative Securities: Introduction to Theory and Computation* (Springer) by Kerry Back.
2. *Stochastic Calculus for Finance II: Continuous-Time Models* (Springer) by Steven E. Shreve.
3. *Introduction to the Economics and Mathematics of Financial Markets* (MIT Press) by Jakša Cvitanić and Fernando Zapatero.

Assignments

There will be approximately 8 to 10 assignments, due in class one week after they have been assigned. Late assignments will NOT be accepted! Students are welcome to work together on them but each student MUST write up his or her own solution. The assignments are a vital part of the course and will be used to introduce new securities and ideas that could not be covered in class time. Most of the assignments will require some computing. While students are free to use whatever software they prefer, classroom demonstrations and assignment solutions will generally use Excel / VBA and perhaps Matlab. Over the course of their studies, students are strongly encouraged to become proficient in these languages. (The Back textbook listed above contains a good introduction to VBA.)

Exams

A mid-term exam will be held in the middle of the semester and the final examination will be held in finals week. Any student who is unable to take an exam must have a very good reason for doing so, e.g., a medical emergency. Such students will take a makeup exam that will be MORE difficult than the regular exam. They will also need to obtain approval from the dean's office to take such an exam. Exam regrades may be requested by:

1. Explaining in a written statement why you think you should obtain more marks.
2. Submitting this statement and the exam to either the TA or course instructor no later than one week after the exam was returned to the class. (This means that if you failed to collect your exam within a week of it being returned to the class, then you cannot request a regrade!)

It should be kept in mind that when a regrade is requested the entire exam will be regraded and it is possible that your overall mark could go down as well as up. **We will also photocopy a subset of the exams before returning them to the class.** This is intended to deter the very, very few people (hopefully there are no such people in this class!) who might be tempted to rewrite parts of their exams before requesting a regrade.

Grading

An *approximate* overall grading scheme is: Assignments 15%, Midterm 35%, Final 50%.

Syllabus and Tentative Course Schedule

- Topic 1: Discrete-time theory, martingale pricing. (3 lectures)
- Topic 2: Introduction to stochastic calculus (2 lectures)
- Topic 3: Black-Scholes, the Greeks and the volatility surface (3 lectures)
- Topic 4: Foreign exchange (FX) models and quanto modeling. (2 lectures)
- Topic 5: Intro to advanced topics including local and stochastic volatility models, jump-diffusion and Levy processes, barrier pricing and transform methods. (2 lectures)