Mathematics in Finance

Department of Information Risk and Operations Management
RM 391 Spring 2010
Unique #: 04025

COURSE INFORMATION

Professor: Stathis Tompaidis
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Class times: Friday 11-2 pm, GSB 5.154
Office hours: Tuesday 10-11, Friday 2:30-3:30 pm, and by appointment.

Description: This is a doctoral-level course, intended to prepare students for research in Finance. The course will provide an introduction to continuous time Finance. The topics covered include Derivative Pricing, Optimal Portfolio Choice, and Equilibrium Asset Pricing. If time permits, we will also cover Real Options, and Numerical Methods. In the beginning of the course we will also cover elements from Stochastic Calculus that we will use throughout the class.

Prerequisites: There are no formal course prerequisites, but this course is the continuation of FIN 395.3, "Asset Pricing Theory". I will assume that you are familiar with the material in that course.

Grading: will be based on homework assignments, a midterm and a final takehome exams.

50% homeworks
25% midterm (take-home)
25% final (take-home)

All work is individual. You will receive 6-8 homework assignments throughout the semester. Assigned homework should be turned in through Blackboard by the beginning of class on the listed due date. No late homework will be accepted.

Textbook: There will not be a textbook for the course, but I will rely on the following books. I will also provide notes for each topic.

- *Stochastic Calculus for Finance II*, by Shreve
- *Continuous Time Finance*, by Merton
- *Introduction to the Economics and Mathematics of Financial Markets*, by Cvitanic and Zapatero

List of Topics

The list of topics below should give you an idea of the content of the course. The list may be modified during the semester.

(1) Mathematical Review
    a. Random variables, probability spaces, distributions, Filtrations, measurability, conditional expectation.
    b. Martingales, Brownian motion, Ito calculus
    c. Stochastic Differential Equations, Feynmac-Kac formula

(2) Derivative Pricing in the Black-Scholes Price System
    a. European Options
    b. American Options
    c. Exotic options

(3) Portfolio Choice (partial equilibrium)
    a. Dynamic programming/Hamilton-Jacobi-Bellman equation
    b. Duality/Martingale methods

(4) Equilibrium Asset Pricing

(5) Term Structure models

(6) Real Options

(7) Computational Methods