FALL COURSE ANNOUNCEMENT

MATH 5760/6890-1: Introduction to Mathematical Finance I

Instructor: Jingyi Zhu, 581-3236, zhu@math.utah.edu, LCB 335

Time and Place: T,H 12:25 - 1:45 pm, AEB 306

Office Hours: T,H 10:30 am - 12:00 pm, F 10:00 - 11:00 am, or by appointment.


Prerequisites:
Good knowledge of probability, differential equations, and some knowledge of numerical analysis. Contact the instructor if you are concerned about your mathematical backgrounds.

Outline:
This is the first part of a year long course on mathematical finance. In the Fall semester, we will examine the fundamental principles of financial derivatives from both financial and mathematical perspectives, and demonstrate how the mathematical tools from stochastic calculus, partial differential equations and numerical methods join forces to become an essential part of modern finance. The emphasis of the course is a mathematical understanding of the intrinsic relationships among various financial instruments. This can be accomplished on a theoretical level by combining approaches of arbitrage-free pricing, risk-neutral world, and equivalent martingale measures in one framework. The central theme of the Fall semester is the classic Black-Scholes-Merton model, and we plan to give a thorough treatment, in preparation for more advanced topics towards the end of the semester, and more extensive materials in the Spring semester. One of the most intuitive and transparent approaches is the binomial tree model, which is the only tool used in Shreve’s book listed above. It contains most of the essential ideas, concepts of the Black-Scholes-Merton methodology, and it can be naturally extended to more advanced continuous-time models. We will end the semester with an introduction to interest rates, with discussion of some basic models. We will try to include as much real Wall Street examples as possible to make this a rewarding experience for those who plan to pursue in this direction, as well as those who are just intrigued. Anyone with either finance or mathematics backgrounds who are interested in the other side of the subject are particularly welcome.
CourseWork:
Prior knowledge of stochastic calculus is useful but not assumed. The discussion of those crucial mathematical materials such as Itô's Lemma will be informal, with a heuristic flavor, and the focus will be on the significance in their particular applications, rather than mathematical rigor. Over the course of the semester, students will be given weekly homework assignments (60%), and an in-class final exam (40%). The final exam will be given on Wednesday, December 17, 10:30 am - 12:30 pm.

Other References:


Syllabus:

- Introduction to financial derivatives
- Binomial models (one-period and multi-period)
- Basic no-arbitrage principle, state prices, martingale
- Black-Scholes-Merton model
- American options and early exercises
- Random walks and Brownian motion
- First passage and barrier options
- Introduction to bond mathematics and interest-rate securities