Math 530: Mathematics of Finance (Spring 2016)

Professor: Ryan Hynd (rhynd@math.upenn.edu)

Office: 4N42 DRL

Class schedule: Mondays and Wednesday 12–1:30pm

Location: DRL 4C8

Office hours: Tuesdays 4–5:30pm or by appointment

Grader: Ferris Zhu (feiyuzhu@sas.upenn.edu)

Description: The class is about mathematical modeling in finance. The core material will involve the Black–Scholes option pricing model. However, we will discuss additional topics, and you will write a paper based on another mathematical model in finance.

Black–Scholes theory topics
The Binomial Model
Brownian motion and stochastic calculus
Risk neutral pricing for European options
Barrier options
Asian options
American options

Textbooks: Two books by Steven Shreve
Stochastic Calculus for Finance I: The Binomial Asset Pricing Models (Chapter 1)
Stochastic Calculus for Finance II: Continuous-Time Models (Chapters 1-5, 7-8)
* Steven Shreve is giving an AMCS colloquium here at 2pm on February 26 in 337 Towne Hall.

Software: We will use MATLAB to simulate stochastic processes and to approximate solutions of partial differential equations that arise in the Black–Scholes model.

Grading breakdown: 50% for HW, 10% for a mid-term exam, 15% for a final exam, and 25% for a research paper. Having good attendance is a requirement for passing this course.

HW policies: An assignment will be due most weeks. You may work with your classmates, but you will need to write your solutions individually. I will be reluctant to accept late HW.
Research paper policies: Students will work together in groups of 3–4 and submit a research paper jointly. However, each student in a group will be responsible for writing one section of the paper. I will help to select groups, based on students’ interests, and I will help guide groups in choosing their research topics.

Topics for your research paper may be found from perusing material on:
Term structure of interest rates
Market making
Limit order book
Optimal execution
Pricing convertible bonds
Statistical arbitrage
Valuation of credit derivatives
Portfolio optimization
Quantitative risk management
*A topic not listed above is fine as long as a few of your classmates are also interested.

Tentative course deadlines and important dates:
A list of modeling topics you are interested in, due February 22
Midterm Exam: February 29
Spring Break: March 7–11
Research proposal, due March 21
Research paper draft, due April 11
Research Paper due date: April 27
Final Exam: May 2