

ACT 460F/STA 2502F 2013
STOCHASTIC METHODS IN ACTUARIAL SCIENCE AND FINANCE

1. INSTRUCTOR

Damir Kinzebulatov
The Fields Institute
100 St. George Street, office 6026
dkinzebu@fields.utoronto.ca
http://www.math.toronto.edu/dkinz/ACT_460F_STA_2502F.html

2. OUTLINE

This course is an introduction to stochastic models used in Financial Mathematics and Actuarial Science. The course will cover the basics of Stochastic Calculus, focusing on Brownian motion, Ito calculus and stochastic differential equations. Along with the Black-Scholes theory, no-arbitrage pricing of some exotic equity derivatives and interest rate derivatives will be explored.

Prerequisites: ACT 370 and STA 347

3. TOPICS

- Binomial models. Arbitrage.
- European and American options. Replication.
- Monte-Carlo option valuation.
- Continuous limit of random walks, Brownian motion.
- Itô integral. Itô lemma.
- Stochastic differential equations.
- Dynamic hedging. Black-Scholes equation. Delta and delta-gamma hedging.
- Feynman-Kac PDE.
- Options on dividend-paying assets.
- Interest rate models.

4. OFFICE HOURS

Tuesdays 12-1, SS 6026

5. TEXTBOOKS

The following textbooks are recommended but not required:

- [1] S.Lin Introductory Stochastic Analysis for Finance and Insurance. Wiley
- [2] S.Shreve Stochastic Calculus For Finance, I, II. Springer
- [3] J.Hull Options, Futures and Other Derivatives. Prentice Hall

6. SAMPLE PROBLEM SETS

Sample problem sets will be posted on course website and Blackboard. They are not graded, however, you are strongly encouraged to attempt them.

7. TAs

Your TAs are Jason Ricci and Qin Zhen. They will hold office hours before the term test, but not regular Stats Aid Centre hours.

8. GRADING SCHEME

Undergraduate students (ACT 460F): final exam (50%), term test (35%) and weekly quizzes (15%).

Note that quizzes are group quizzes students will work in small groups of 2-4 students to solve the problem with the help of notes.

Graduate students (STA 2502F): final exam (30%), term test (30%), weekly quizzes (10%) and a project (30%).

The project consists of a written and a verbal component. The written component consists of an approximately 20 page report on a topic related to the course and involving some computer implementations. The verbal component involves the student presenting their report and answering related questions.