

40091 Seminar in Actuarial Mathematics (2)

Knowledge

The actuarial math seminar centers on the development and application of basic principles of financial engineering. Students will learn the principles of various option pricing methods, including the binomial and Black-Scholes models. They will learn the underlying mathematics that supports these models. This includes an elementary comprehension of Brownian motion, Ito processes (semimartingales) and stochastic calculus.

Comprehension

The students will learn both the underlying theory of Black-Scholes option pricing and be able to apply stochastic models to actually calculate arbitrage-free prices of a variety of call and put options.

Application

Students will demonstrate understanding of the basic theory by calculating prices of options based on stocks, currency exchange rates, futures, and interest rates. They will study sensitivity of option prices to the various parameters involved in such calculations, including dividend rate, interest rate, underlying asset price, and volatility.

Analysis

Students will gain analytical skills by deriving basic models for option prices. These include both discrete-time (binomial) and continuous-time (semi-martingale) models.

Synthesis

Students will learn how pure mathematics (discrete and continuous-time stochastic processes, stochastic differential equations, deterministic partial differential equations, etc.) arise naturally in the study of option pricing. Through the study of Ito calculus and the Feynman-Kac Theorem, they will gain an appreciation of the power of abstract mathematics to model real-world phenomena.

Evaluation

Students are evaluated based on homework assignments and midterm and final examinations. Both homework and examinations will include the numeric solution of applied problems as well as the derivation of theoretical results.

Class Activities

Students are required to present both theoretical derivations of important theorems and numerical solutions of practical problems in class. Their presentations are critiqued both for mathematical correctness and for clarity of presentation.

Out of class Activities

Out of class activities include the solution of numerical applied problems and proof of theoretical results.