MATH 449 / MATH 524 / FINN 422

Spring '2024

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Course Description

This course is designed to develop quantitative skills that students require to implement financial theories. As an ever-increasing number of financial services firms are applying sophisticated mathematical models in their trading, pricing, risk and asset management functions, the need for more specialized and advanced courses has emerged where students and working professionals can acquire the knowledge they need to competently and responsibly perform these functions. This course can be considered as a first course in this stream.

Pre-Req

MATH 230 OR ECON 230 OR DISC 203 OR EE-MS OR MS DES

Learning Outcomes

- Basics of quantitative finance
- Elementary stochastic calculus, Ito lemma and its uses, Stochastic differential equations
- Introduction to Options and Option Pricing
- Fixed income securities
- Interest rates and Term structure of interest rates
- Modeling Financial Risk
- Numerical methods and simulations to price financial instruments

Grading Policy

- Assignments : 35%
- Midterm : 20%
- Final : 25%
- Project : 20%

Tentative Schedule

Lecture 1: Introduction
Lecture 2: Random Walks
Lecture 3: Review of Probability and Brownian Motion
Lecture 4: Weiner Process: Properties and Simulation
Lecture 5: Option Basics and Strategies
Lecture 6: The Binomial Model
Lecture 7: Ito Stochastic Calculus
Lecture 8: Black Scholes Equation: Derivation
Lecture 9: Black Scholes Equation: Derivation and Extensions
Lecture 10: Black Scholes Equation: Solution I
Lecture 11: Black Scholes Equation: Solution II
Lecture 12: Fixed Income Securities - Introduction
Lecture 13: Risk Associated with Fixed Income Securities
Lecture 14: Stochastic Interest Rates
Lecture 15: Yield Curve Fitting
Lecture 16: The Bond Pricing Equation
Lecture 17: Interest Rate Derivatives
Lecture 18: Swaps and Swaptions
Lecture 19: Introduction to Risk Management
Lecture 20: Financial Time Series I
Lecture 21: Financial Time Series II
Lecture 22: Measures of Risk
Lecture 23: Credit Risk Models
Lecture 24: Finite Difference Methods: Introduction
Lecture 25: Finite Difference Methods: Heat Equation
Lecture 26: Finite Difference Methods: Black Scholes Equation
Lecture 27: Monte Carlo Simulation I
Lecture 28: Monte Carlo Simulation II