Math Finance

MATH-UA.0250-001

Courant Institute of Mathematical Sciences,
New York University

Spring Semester, 2019

Class: Tuesday, Thursday, 5:00 to 6:15 pm, Room 102, WWH

Instructor: Jonathan Goodman, his web page, email: goodman@cims.nyu.edu
phone: 212-998-3326, office: 529 Warren Weaver Hall
office hours: 2 to 4 pm Monday or by appointment
(call or email for a time)

Course home page

Details and schedule

Resources

Assignments

Course description

Goals

- Understand the basic ideas of financial modeling and decision making
- Acquire knowledge and skills that can help in job and career search
- Gain experience with tools of applied math: linear algebra, multi-variate calculus, elementary probability, lightweight computing
- Learn about the finance industry

Prerequisites

- Multi-variate calculus: partial derivatives and their use for local linear and quadratic models of multi-variate functions, Lagrange multipliers, multiple integrals
- Linear algebra: linear systems of equations, matrix algebra, eigenvalues and eigenvectors of symmetric matrices, solvability conditions and bases for subspaces.
- Probability: random variables, probabilities and probability density, expectation, variance, and covariance, conditional and marginal probability.

Programming

The course will include lightweight programming in R. Students are not assumed to know R or even have experience programming. R is a scripting language similar to Matlab and Python but somewhat different from Java and C++.

Material

Introduction to the mathematics of finance. Bond math: the yield curve, interest continuous and discrete interest, coupon bonds. Hedging and replication applied to forward contracts and swaps. Complete markets, risk neutral probabilities. The binomial tree model and option pricing. Mean and variance portfolio optimization (Markowitz theory). Continuous time models and the Black Scholes formula.

Academic integrity (cheating)

The NYU CAS academic integrity policy applies in this class. Unless explicitly stated in writing on the assignment, all homework in this class is individual. Students may not hand in work they have acquired from another source. Students are may not allow their homework to be copied for the purpose of cheating. This applies to written work and coding. Please contact the instructor if you feel it is impossible to keep up with the class without cheating.