

MACF 401 (MAST 729/MAST 881), Sec. F
Mathematical & Computational Finance I
Winter 2020

Instructor: Dr. C. Hyndman, Office: LB 921.15 (SGW), Phone: 514-848-2424, Ext. 5219
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Office Hours: TBA

Class Schedule: Tuesday-Thursday, 16:15-17:30 in H 562, SGW Campus.

Text: *Stochastic Calculus for Finance I: The Binomial Asset Pricing Model*, by Steven Shreve, Springer, 2005. (Required).

Outline: This course is an introduction to mathematical and computational finance. The focus is on the general theory through a thorough study of Binomial Models. The topics covered include:

- The binomial no-arbitrage price model: one-period, multi-period;
- State prices: change of measure, Radon-Nikodym derivatives, capital asset pricing model; utility maximization and optimal investment
- European and American derivative securities: call and put options, stopping times; exotic derivative securities
- Random walks: first passage times, reflection principal; perpetual American put option
- Interest-rate derivatives: binomial model for interest rates, bonds, fixed income derivatives, forward measure; Ho-Lee and Black-Derman-Toy models
- Forward and Futures contracts
- Hedging: the Greeks, Delta hedging.
- Convergence of the Binomial Model to the Black-Scholes model. The Black-Scholes Formula
- Numerical methods
- Other topics (time permitting)

Evaluation: Weighted average of Assignments (35%), Midterm Examination (25%), and the Final Examination (40%).

Some assignment problems will require programming. Students are encouraged to use an object oriented programming language such as C++ or Java for programming exercises on assignments, as these are the industry standards for Quantitative Finance. Some programming examples presented in class may be implemented using either R or Matlab for ease of exposition.

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

Academic Integrity and the Academic Code of Conduct

This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: concordia.ca/students/academic-integrity." [*Undergraduate Calendar, Sec 17.10.2*]