

MACF 401 (MAST 729G)
Mathematical & Computational Finance I
Fall 2014

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Office Hours: TBA

Class Schedule: Tuesday and Thursday, 11:45-13:00.

Texts: *Stochastic Calculus for Finance I: The Binomial Asset Pricing Model*, by Steven Shreve, Springer, 2005. (Required)
Quantitative Finance: An Object-Oriented Approach in C++, by Erik Schlogl, Chapman & Hall/CRC, 2014. (Recommended)

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.

Course Evaluation: Weighted average of Assignments (20%), Midterm Examination (35%), and the Final Examination (45%). Some assignment problems will require Programming. MACF program students are strongly encouraged to use C++ or Java for these problems, as these are the industry standards for Quantitative Finance.