MACF 402 (MAST 729H)
Mathematical & Computational Finance II
Winter 2015

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Office Hours: To be announced.

Class Schedule: Tuesdays and Thursdays, 16:15-17:30.


Outline: This course is a continuation of MACF401 focusing on computational aspects, implementation, continuous-time models, and advanced topics:

- Calibration of Binomial models and implementation of the pricing algorithms from MACF 401.
- Computer simulation: pseudo-random numbers, simulating asset paths, statistical tests, time-scale invariance;
- Brownian motion and stochastic calculus: elements of continuous time finance, the Black-Scholes model, short-rate models, and bond prices
- Finite-difference techniques: heat equation, discretization, stability and convergence, Crank-Nicolson;
- Monte-Carlo methods: Monte-Carlo for Option Valuation, Monte-Carlo for Greeks, variance reduction techniques; antithetic variates in option valuation, control variates in option valuation, Longstaff-Schwartz method for American option valuation;
- Volatility: implied volatility, historical volatility, Monte-Carlo estimates, maximum likelihood, stochastic volatility;
- Hedging: discrete hedging, continuous hedging, delta at expiry, Monte-Carlo methods;
- Exotic derivatives: barrier options, lookback options, Bermudan options, Asian options;
- Risk management: loss probabilities and value at risk, credit risk
- Other topics

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