List of Topics

Here is a potential list of topics for the course.

Monte Carlo Methods from a FinTech Perspective

Prelim

- Time value of money
- Probability basics (classical and frequentist)

Options basics

- Put-call parity, synthetic replication, etc
- Binomial model & BSM models
- Option market-making and delta hedging
- Risk-neutral Monte Carlo, exotic option payoffs, complex price dynamics, etc
- Monte Carlo variance reduction techniques (antithetic, stratified, control variates)
- Longstaff-Schwartz least squares Monte Carlo for American/Bermudan options

FinTech from a Monte Carlo Perspective

Subjective Probability and the Bayesian Algorithm

- Subjective probability: probability as a degree of belief
- The Bayesian algorithm
- Conjugate priors and posteriors
- Monte Carlo for posterior sampling from non-conjugate models
- Exchangeability

Statistical Decision Theory and Probabilistic Programming

- Utility, loss, and proper scoring functions
- Bandit models
- Optimal hedged Monte Carlo (OHMC)