Introduction to Computational Finance (a tentative plan for Spring 2013)

- This course provides students with a necessary background in financial economics (return and risk, risk premium, equity and fixed-income derivatives, asset pricing and hedging, value at risk, market microstructure), related mathematical models (Black-Scholes theory and its extensions, tree models and jump-diffusion models, sequential trade models, strategic trade models), and statistical inference procedures (volatility modeling including ARCH/GARCH and stochastic volatility, likelihood methods and Markov chain Monte Carlo strategies).

- Computation using R (or Matlab perhaps) will be a useful part of the course.

- About **stochastic calculus**: Nowadays stochastic calculus becomes a crucial requirement for quantitative analysts (referred to as "quants" or "strategists") in financial industry. However, time constraint does not allow us to give a comprehensive and rigorous treatment to stochastic calculus in this course. A compromised course plan will be adopted: First, materials in discrete-time finance will be taught without the need for stochastic calculus. Second, for continuous-time finance, we will focus on how to apply stochastic calculus correctly and give some heuristic arguments for why should it work. Rigorous justification will be left to the references and other courses in stochastic calculus. Finally, basic elements in stochastic calculus will be presented with illustration of their applications in finance, including Brownian motion and its properties, Ito's stochastic integrals, Girsanov transformation and Ito's formula, stochastic differential equations, etc.

- A combination of lecture notes and textbook/references will be used.