Outline

The emphasis of the course is on stochastic modeling and optimization as tools for financial decision making. The objective is to help students develop basic skills in modeling, problem solving and quantitative analysis of risk-return tradeoffs.

Prerequisites:
Multivariate calculus, probability, deterministic and stochastic models.

Required text:
- [N] Supplementary notes will be distributed.

References:

Topics and Schedule (subject to change):
- Weeks 1-2: present value analysis, bond price-yield curve, duration, dynamic optimization (Part I of [L]);
- Weeks 3-4: mean-variance portfolio theory, Markowitz model (Part II of [L], notes); capital market line; capital asset pricing model (Part II of [L]);
- Weeks 5-6: lognormal distribution, Brownian motion and geometric BM, Itô’s calculus, stock price dynamics, Black-Scholes model (Part III of [L], notes);
- Weeks 7-8: Greeks, variations on the Black-Scholes model, American options; (Part III of [L], Hull);
- Week 9: binomial trees, finite difference method (Part III of [L], Hull);
- Week 10-11: delta hedging, VaR (Hull, notes);
• Week 11-12: martingales and applications, no-arbitrage, complete market, self-finance (Part III of [L], Hull, notes).

Evaluation:

• Homework assignment: 20%.
• Midterm exam: 40% ("aid sheet" format; Mar 10, 12).
• Final exam: 40% ("aid sheet" format).

Office Hours:
1-2pm, Tuesday and Thursday.

Office:
302 Mudd Bldg; Phone: 212 854 2934 (Fax: -8103), E-mail: yao@columbia.edu.