Summer 2013 Stats 237 Theory of Investment Portfolios and Derivative Securities

Meeting Information:

Tuesday Thursday 11am-12:15 pm.

Room: Skilling Auditorium

Webpage math.stanford.edu/~camilier/stats239summer13

Join Coursework (coursework.stanford.edu).

All course materials will be posted on Coursework.

Instructor: Isabelle Camilier

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Office hours:

Wed 3:30-5pm and Th 3:30-4:30 pm or by email.

Course Assistant:

Alex Papanicolaou

Course Description

In this course, we focus on investment portfolios, asset returns, their volatilities, and measures of market risk. We cover option pricing, geometric random walk and Brownian motion as models of risky assets, self-financing replicating portfolios, Black-Scholes pricing of European options, implied volatility and the Greeks. We also address valuation of American options in discrete time and numerical methods for pricing financial derivatives. We introduce to Markowitz's portfolio theory and various pricing models - including capital asset pricing model.
Prerequisites

At least one probability class. You should be familiar with random variables: discrete random variables (such as binomial random variables), continuous random variables (especially Gaussian random variables) and computing expectations.

Textbooks (optional)

- Options, Futures and other derivatives by Hull
- Arbitrage Theory in Continuous time by Bjork.
- Investment Theory (Luenberger).
- Statistical models and methods for financial markets by Lai and Xing (chapters 3 and 8).

Assignments

Grades will be based on the following:

Homework (60%) Four assignments.

Final exam (40%) take-home exam.

Software

You may use Matlab or R (www.cran.r-project.org) to solve some of the assignments.

Syllabus

Week 1 Introduction.

Week 2 Discrete time models.

Weeks 3-7 Continuous time finance. Option pricing.

Weeks 7-8 Investment models (Markowitz's portfolio theory, CAPM).

Schedule


July 9: Option pricing in binomial trees. Pricing American options. **HW1 due.**

July 11: Convergence towards continuous time models. Continuous time models.


July 18: Black-Scholes PDE. Black-Scholes formula. **HW2 due.**

July 23: Black-Scholes pricing, continued.

July 25: Greeks.

July 30: Implied volatility and time-series. (Lai&Xing 8.2).

August 1: Stochastic volatility. (Lai&Xing 8.3). **HW3 due.**

August 6: Investment portfolios. Markowitz's portfolio theory

August 8: Capital Asset Pricing Model (CAPM). Estimation, empirical studies. (Lai&Xing 3.3).

August 13: Multifactor pricing models. (Lai&Xing 3.4).

August 15: Last day of classes. Review. **HW4 due.**