Fall 2007 **Stochastic Financial Theory** QF 5003

The course is designed to provide students with a mathematical background to study modern financial theory. This approach has become extremely important for financial analysts or "QUANT." We will study in a systematic way to price (evaluate) and hedge (eliminate) risks associated with the uncertainties of asset prices such as stocks, interest rates, credits, energy, loans, insurance, etc.

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Class Time: T7T8T9
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Prerequisities:
STAT 3875 (basic knowledge of probability and statistics.)
MATH 2030 Advanced Calculus
QF 3146 Financial Mathematics

Textbooks:

1. Steven E. Shreve, "Stochastic Calculus for Finance II: continuous-Time Models," Springer-Verlag, 2003.
2. 孫健, "金融衍生品定價模型" 中國經濟出版社, 2007.

References:

1. John Hull, "Options, Futures, and Other Derivatives," 6th Edition, Prentice Hall.
2. Alison Etheridge, "A Course in Financial Calculus," Cambridge University Press, 2002.
3. P. Jackel, "Monte Carlo Methods in Finance," John Wiley & Sons Ltd. 2002.
4. P. Glasserman, Monte Carlo Methods for Financial Engineering, Springer-Verlag, New York, 2003.

Course Contents:

1. Elementary probability and stochastic processes (convergence of integrals; change of measure; conditional expectation.)
2. Brownian motion (random walk; discrete-time models in finance; martingale property; variations; Markov property.)
3. The Black-Scholes model (stochastic calculus; Ito's lemma; market completeness; pricing partial differential equation; hedging strategy; Brownian bridge.)
4. Risk-Neutral pricing (Girsanov's theorem; martingale representation theorem; fundamental theorems of asset pricing.)
5. Conditional Expectation and PDEs (Feynman-Kac Formula)
6. Simulation and algorithms for financial models.

Grading:

Assignments 30%, Exams(midterm and final) 50%, Course Project 20%.