QF 5140
Continuous-Time Finance

（連續時間財務）

This course provides a probabilistic way in depth to establish no arbitrage asset pricing theory for contingent claims under several financial markets. We focus on financial interpretations of mathematical modeling for risky asset dynamics. Applications of Monte Carlo simulations in financial engineering will be discussed along with the development of this course. Beyond classical financial models, Levy process and its pricing and hedging theory will be addressed.

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Prerequisities: **QF5003 Stochastic Financial Theory**

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,” 7th 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. Stochastic differential equations for finance (the Markov property, interest rate models, multi-dimensional Feynman-Kac theorems, SDE discretization schemes)
2. Pricing some exotic options (knock-out barrier options, lookback options, Asian options, control variate method, dimension reduction PDEs)
3. American derivative securities (stopping times, American put and call options, free boundary problems, least-squares and duality methods)
4. Change of numeraire (numeraire, foreign and domestic risk-neutral measures, forward measures, importance sampling)
5. Term structure models (affine-yield models, Heath-Jarrow-Morton model, forward LIBOR model)
6. Introduction to Levy processes (Poisson process, compound Poisson process, jump processes and their Integrals, stochastic calculus for jump processes, change of measure, pricing and hedging a European Call in a Jump model, PIDE)

Grading:

Assignments 40%, Exams(midterm and final) 40%, Course Project 20%.