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, dynamic volatility matrix estimation and some empirical studies on risk management will be addressed.

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Prerequisites: **QF5003 Stochastic Financial Theory**

Textbooks:

1. Steven E. Shreve, “Stochastic Calculus for Finance II: continuous-Time Models,” Springer-Verlag, 2003.
2. 韓傳祥, “金融隨機計算,” 新陸書局, 2012.

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 (barrier options, lookback options, Asian options, dimension reduction PDEs)
3. Monte Carlo simulation.
4. American derivative securities (stoppingtimes, American put and call options, free boundary problems, least-squares and duality methods)
5. Change of numeraire (numeraire, foreign and domestic risk-neutral measures, forward measures, importance sampling)
6. Term structure models (affine-yield models, Heath- Jarrow-Morton model, forward LIBOR model)
7. Volatility/correlation estimation.
8. Introduction to Levy processes.

Grading:

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