

QF 5140 Continuous-Time Finance

(連續時間財務)

This course aims to introduce financial models in continuous-time and discuss their computational methods with applications. Numerical methods include numerical partial differential equation methods, fast Fourier transform methods, and Monte Carlo simulation methods. GPU based parallel computing and portfolio optimization will be discussed. We then apply these results for empirical studies. For example, dynamic volatility matrix estimation, option hedging performance, VaR/CVaR estimation in risk management, and model calibration to implied volatility surfaces.



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Class Time: Tu. 7-9 (will be changed to Tu 2-4.)
Classroom Location: 台積館 206

Textbooks:

1. 韓傳祥, “金融隨機計算,” 新陸書局, 2012.
2. Lecture Notes provided.

References:

1. Steven E. Shreve, “Stochastic Calculus for Finance II: continuous-Time Models,” Springer-Verlag, 2003.
2. P. Jackel, “Monte Carlo Methods in Finance,” John Wiley & Sons Ltd. 2002.
3. P. Glasserman, “Monte Carlo Methods for Financial Engineering,” Springer-Verlag, New York, 2003.

Course Contents:

1. Numerical PDE method (finite difference scheme).
2. Fourier Transform Method (Fast Fourier Transform).
3. Volatility/correlation estimation.
4. Monte Carlo simulation.
5. Pricing some exotic options (barrier options, lookback options, Asian options, dimension reduction PDEs).
6. American derivative securities (stopping times, American put and call options, free boundary problems, least-squares and duality methods).
7. Variance Reduction Method.
8. VaR/CVaR estimation in risk management. (historical simulation, importance sampling)
9. Term structure models (affine-yield models, Heath- Jarrow- Morton model, forward LIBOR model)
10. Credit risk modeling. Joint Default Probability Estimation.
11. Portfolio Optimization. (Entropy-based importance sampling).
12. GPU computing.
13. Applications of empirical studies.

Grading:

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

Useful Links:

VLab, NYU <http://vlab.stern.nyu.edu/>

VIP, NTHU <http://140.110.28.133/VIP/>

VIX's View <http://www.spvixviews.com/>

CBOE <http://www.cboe.com/>

CBOE TV <http://www.cboe.com/tradtool/webcast.aspx>

Nvidia - Computational Finance

http://www.nvidia.com.tw/object/computational_finance_tw.html

Nvidia-NTHU Joint Lab on Computational Finance

<http://my.nthu.edu.tw/~finteck/CFLab>

Yahoo Finance <http://finance.yahoo.com/>

期交所 <http://www.taifex.com.tw/chinese/home.asp>

證交所 <http://www.twse.com.tw/ch/index.php>