

HKU-CUHK-HKUST-Stanford Conference in Quantitative Finance

In Honor of Professor Tze Leung Lai

December 11-12, 2015

Venue for Dec. 11 (Friday)

LT6, Lady Shaw Building
Chinese University of Hong Kong

Venue for Dec. 12 (Saturday)

CPD-3.28, 3/F, The Jockey Club Tower
Centennial Campus
The University of Hong Kong

Organizing Committee

Bingyi JING, Wai Keung LI, Qiman SHAO
Hoi Ying WONG, Sam WONG, Hailiang YANG

This joint conference began on Jan 3-4, 2008, and has been held approximately once every two years since then. Its scope includes all areas of quantitative finance and also covers actuarial science, and features speakers from both academia and industry, fostering their interaction. The 2015 Conference touches on new frontiers, including data-driven financial analytics, and celebrates the 70th birthday of Professor Tze Leung Lai, who has made seminal contributions to this area.

CPD Approved By



The program is registered with GARP and is eligible for Continuing Professional Development (CPD) credits. GARP has determined that attending this conference qualifies for 14 GARP CPD credit hours (7 credit hours per day). If you are a Certified FRM, please log-on to your GARP profile and record this activity at <http://www.garp.org/cpd>.

Schedule for Dec. 11, 2015 (Friday)
LT6, Lady Shaw Building
Chinese University of Hong Kong

8:30 -- 8:50	Registration
8:50 -- 9:00	Opening
Session 1	Chair: Hoi Ying WONG
9:00 --9:40	Duan LI (Chinese University of Hong Kong) <i>Bettering Investment Performance by Integrating Historical Data and Market Implied Information</i>
9:40 -- 10:20	Ngai Hang CHAN (Chinese University of Hong Kong) <i>Non-stationary Time Series: Econometrics to Statistical Finance</i>
10:20 – 11:10	Photo Taking and Tea Break
Session 2	Chair: Philip YAM
11:10 --11:50	Tony SIT (Chinese University of Hong Kong) <i>Simulation-based Value-at-Risk for High-dimensional Nonlinear Portfolios</i>
11:50 -- 12:30	Ning CAI (The Hong Kong University of Science and Technology) <i>A Unified Framework for Pricing Asian Options under Markov Processes</i>
12:30 -- 14:00	Lunch Break (By Invitation Only)
Session 3	Chair: Chun Yip YAU
14:00 -- 14:40	Michael POWERS (Tsinghua University) <i>Berry-Esseen Bounds for Compound-Poisson Loss Percentiles: A Reinsurance Application</i>
14:40 -- 15:20	Alain BENSOUSSAN (City University of Hong Kong) <i>Dynamic Programming in Mathematical Finance</i>
15:20 -- 16:00	Tea Break
Session 4	Chair: Zhiliang YING
16:00 -- 16:40	Xunyu ZHOU (University of Oxford) <i>Time Inconsistency</i>
16:40 -- 17:20	Xin GUO (University of California, Berkeley) <i>Mean Field Game with Singular Controls</i>

Schedule for Dec. 12, 2015 (Saturday)
CPD-3.28, 3/F, The Jockey Club Tower
Centennial Campus, The University of Hong Kong

8:30 -- 9:30	Registration
Session 1	Chair: Hailiang YANG
9:00 --9:40	Yan XU (The University of Hong Kong) <i>Mean Variance Portfolio Optimization with Sparse Inverse Covariance Matrix</i>
9:40 -- 10:20	Yingying LI (The Hong Kong University of Science and Technology) <i>Solving the High-dimensional Markowitz Optimization Problem: When Sparse Regression Meets Random Matrix Theory</i>
10:20 -- 11:00	Tea Break
Session 2	Chair: Yan XU
11:00 --11:40	Chen LIN (The University of Hong Kong) <i>Business Network Centrality and Bank Acquisitions</i>
11:40 -- 12:20	Philip YU (The University of Hong Kong) <i>Cointegrated Market-Neutral Strategy for Basket Trading</i>
12:20 -- 14:00	Lunch Break (By Invitation Only)
Session 3	Chair: Ning CAI
14:00 -- 14:40	Siu Pang YUNG (The University of Hong Kong) <i>Wavelets Numerical Algorithms for Ruin Probability</i>
14:40 -- 15:20	Xianhua PENG (The Hong Kong University of Science and Technology) <i>Profitability of Intraday Return Predictability and Liquidity Provision</i>
15:20 -- 16:00	Tea Break
Session 4	Chair: Xianhua PENG
16:00 -- 16:40	Zhen WEI (MSCI) <i>Quantitative Income Investing in a Changing World</i>
16:40 -- 17:20	Sam WONG (5Lattice Securities Limited) <i>Parallel Computing and Statistical Trading Strategies</i>

Abstracts

Alain BENSOUSSAN

Department of Systems Engineering and Engineering Management
City University of Hong Kong

Dynamic Programming in Mathematical Finance

Mathematical Finance has introduced new type of stochastic control problems. In this context, the martingale method has been used to solve them. This gives the impression that probabilistic techniques are the only way to obtain a solution. We want to show that purely analytical techniques can be used for the same result. Not only it is useful to have additional techniques, but also analytical techniques allow for more constructive solutions. In particular, one does not need to rely on the martingale representation theorem to construct optimal stochastic controls. We will discuss the concepts and the main techniques. Two models will be considered, the classical consumer-investor model and a model describing the choice of projects for an entrepreneur. A credit risk problem will be solved in this framework. We shall also discuss a problem of optimal retirement.

Ning CAI

Department of Industrial Engineering and Logistics Management
Hong Kong University of Science and Technology

A Unified Framework for Pricing Asian Options under Markov Processes

A unified framework is proposed for pricing both continuously and discretely monitored Asian options under one-dimensional Markov processes. For each type (continuously monitored or discretely monitored), we derive the double transform of the Asian option price in terms of the unique bounded solution to a related functional equation. In the special case of continuous-time Markov chain (CTMC), the functional equation reduces to a linear system that can be solved analytically via matrix inversion. Thus the Asian option prices under a one-dimensional Markov process can be obtained by first constructing a CTMC to approximate the targeted Markov process model, and then computing the Asian option prices under the approximate CTMC by numerically inverting the double transforms. Numerical experiments indicate that our pricing method is accurate and fast under popular Markov process models, including the CIR model, the CEV model, Merton's jump diffusion model, the double-exponential jump diffusion model, the variance gamma model, and the CGMY model. This is joint work with Steven Kou from NUS and Yingda Song from USTC.

Ngai Hang CHAN
Department of Statistics
Chinese University of Hong Kong

Non-stationary Time Series: Econometrics to Statistical Finance

In the past three decades, non-stationary time series has been playing a pivotal role in financial econometrics. This talk will review some of the important developments of non-stationary time series from a statistical perspective. Their connections related to financial econometrics and statistical finance will also be discussed.

Xin GUO
Department of Industrial Engineering and Operations Research
University of California, Berkeley

Mean Field Game with Singular Controls

We introduce a mean field game framework with singular controls. To solve this singular control problem with multiple agents, we derive the Fokker-Planck equation for the singular control, which is a generalization of the mean field game with regular controls. Both single controls of a bounded velocity and of a finite variation will be discussed. Finally, we will present some applications to optimal execution and systemic risk. This is a joint work with Joon Seok Lee.

Duan LI
Department of Systems Engineering and Engineering Management
The Chinese University of Hong Kong

Bettering Investment Performance by Integrating Historical Data and Market Implied Information

Financial markets are heavily driven by investors' expectations of the future. Thus portfolio decisions should take into consideration the market implied forward-looking information, in addition to the backward-looking information from historical data. This talk proposes a formal framework in bettering investment performance by integrating historical data and market implied information using inverse optimization solution schemes.

Yingying LI

Department of Information Systems, Business Statistics and Operations Management
The Hong Kong University of Science and Technology

***Solving the High-dimensional Markowitz Optimization Problem:
When Sparse Regression Meets Random Matrix Theory***

To solve the high-dimensional Markowitz optimization problem, a new approach combining sparse regression and estimation of maximum expected return for a given risk level based on random matrix theory is proposed. We prove that under some sparsity assumptions on the underlying optimal portfolio, our estimated portfolio, the Response-estimated Sparse Regression Portfolio (ReSReP), asymptotically reaches the maximum expected return and meanwhile satisfies the risk constraint. To the best of our knowledge, this is the first time that these two goals are simultaneously achieved in the high-dimensional setting. The superior properties of ReSReP are demonstrated via simulation and extensive empirical studies. This is joint work with Mengmeng Ao and Xinghua Zheng.

Chen LIN and Zigan WANG

School of Economics and Finance
The University of Hong Kong

Banking Network Centrality and Acquisition Performance

How does a bank's network affect its investment decisions? Using several comprehensive commercial datasets, we construct the syndication network, underwriting network and social network of the banking sector and compute the network centrality measures for the banks. Presumably, network centrality facilitates information gathering and decision making. However, network centrality might also induce managerial entrenchment and rent extraction. We explore the impact of the business and social network centrality on M&A performance of the banks. Specifically, we examine the effect of network centrality affects the frequency, successful rate and payment method of the M&As. We also explore how network centrality affects the market reactions to the acquisition announcements, acquisition premiums, combined cumulative abnormal returns and long term synergies. We also analyze the economic channels of the findings.

Xianhua PENG

Department of Mathematics

The Hong Kong University of Science and Technology

Profitability of Intraday Return Predictability and Liquidity Provision

We investigate the profitability of institutional stock traders from two perspectives: (1) institutional traders' capability of predicting intraday stock price movements, and (2) the profitability of trading using limit orders. Using a high frequency data set of Nasdaq OMX Helsinki, we show that institutional traders who can successfully predict intra-day price movements in the first period are more likely to successfully predict intra-day price movements in the second period. A trading strategy based on the intra-day trading order flow of institutional traders who can successfully predict price movements in the first period lead to a substantially better performance in the second period, generating a Sharpe ratio ranging from 10-50 for different trading frequencies. Furthermore, we find that trading with limit orders leads to 1.2-5.7 Euro more profit per trade than trading with market orders. This is a joint work with Jiajun Guo and Jussi Keppo.

Michael R. POWERS

Department of Finance

School of Economics and Management

Tsinghua University

***Berry-Esseen Bounds for Compound-Poisson Loss Percentiles:
A Reinsurance Application***

The Berry-Esseen theorem of probability theory is used to establish bounds on percentile estimates for compound-Poisson loss portfolios. We begin by arguing that these bounds should not be based upon the exact Berry-Esseen constant, but rather upon a lower, asymptotic counterpart for which the Lyapunov fraction converges uniformly to 0. We then employ the bounds to select individual-loss reinsurance retentions under a single-period ruin-probability constraint. The new approach is illustrated using Chinese life insurance company data.

Tony SIT
Department of Statistics
Chinese University of Hong Kong

Simulation-based Value-at-Risk for High-dimensional Nonlinear Portfolios

Value-at-risk (VaR) is a commonly used standard risk measure for quantifying market risk. In practice, delta-normal approach is usually applied to approximate the VaR of a portfolio with options positions. However, the delta-normal approximation becomes less feasible for a high-dimensional portfolio with highly non-linear derivatives positions, especially when the derivatives involved lack of closed-form solutions. In addition to the error in estimating the high-dimensional delta, the analytical tractability of the delta-normal approach could be weakened by the complexity due to correlated non-linear products within the portfolio. This project proposes a model-free simulation algorithm to VaR that leverages cross-sectional information and applies variable selection techniques to simplify the full simulation approach, by formulating the VaR computation as a high-dimensional sparse regression problem. Numerical analyses demonstrate the performance of this new algorithm and that of the delta-normal method with market data. We show numerically that this new approach significantly outperforms the delta-normal approximation, and converges to the true background solution.

Zhen WEI
Morgan Stanley Capital International

Quantitative Income Investing in a Changing World

We discuss theories and facts of Quantitative Income Investing, highlight potential flaws in strategy implementation, and brief various extensions. Special attention is paid to the relationship between income strategies and interest rate/market regimes.

Sam WONG
5Lattice Securities Limited

Parallel Computing and Statistical Trading Strategies

Big Data regime is characterized by highly parallel and distributed computational infrastructures. This talk gives some examples how to use such parallel infrastructure to develop statistical trading strategies. Lam & Lam (2000) “Forecasting for the Generation of Trading Signals in Financial Markets” is used as the main reference for our discussion. We will also study the relationship between the buy-low-sell-high algorithm and the approach of volatility modeling.

Yan XU
School of Economics and Finance
The University of Hong Kong

Mean Variance Portfolio Optimization with Sparse Inverse Covariance Matrix

In portfolio risk minimization, the inverse covariance matrix prescribes the hedge trades in which a stock is hedged by all the other stocks in the portfolio. In practice with finite samples, however, multicollinearity makes the hedge trades too unstable and unreliable. By shrinking trade sizes and reducing the number of stocks in each hedge trade, we propose a “sparse” estimator of the inverse covariance matrix. Comparing favorably with other methods (equal weighting, shrunk covariance matrix, industry factor model, non-negativity constraints), a portfolio formed on the proposed estimator achieves significant out-of-sample risk reduction and improves certainty equivalent returns after transaction costs.

Philip L.H. YU and Rejie LU
Department of Statistics and Actuarial Science
The University of Hong Kong

COINMAN: Cointegrated Market-Neutral Strategy for Basket Trading

Cointegration among two or more variables can be found in many economic or financial data. A typical application is to form portfolios based on the cointegrated relationships found in a set of financial assets in an attempt to generate profits. However, some high-net worth investors may find these portfolios too risky, particularly during a bear market, and hence they lose interest in adopting them in their trading strategies. A plausible method to relieve such burden to the investors is to construct a cointegrated portfolio which is also market-neutral. We name such cointegrated market-neutral portfolio as COINMAN. In this paper, we will tackle the problem of identifying COINMAN. We will discuss how to determine the number of COINMAN portfolios available among a set of assets. Finally, we apply the proposed methodology to identify COINMAN portfolios consisting of the constituent stocks of Hang Seng Index in Hong Kong and the trading strategies based on COINMAN portfolios are more stable and produce profitable performance.

Siu Pang YUNG
Department of Mathematics
The University of Hong Kong

Wavelets Numerical Algorithms for Ruin Probability

In this talk, we shall exhibit some wavelets numerical schemes for computing ruin probability. Different type of claim size models will be examined. Due to the compact supports of wavelets, the computations are simplified into just finding the wavelets expansion coefficients.

Xunyu ZHOU
Department of Mathematics
University of Oxford

Time Inconsistency

In this talk I will present several classes of time-inconsistent dynamic optimization problems together with their economic motivations, and discuss about their solutions.