



HKU-Stanford Conference in Quantitative Finance

December 10 – 11, 2010
T6, Meng Wah Complex, HKU

****Final Announcement****

Invited Speakers

- Zehao Chen (Bosera Fund)
- Eric C.K. Cheung (Statistics and Actuarial Science, HKU)
- Ka Chun Cheung (Statistics and Actuarial Science, HKU)
- Hanzhi Ding (Citi)
- Y.K. Kwok (Mathematics, HKUST)
- Tze Leung Lai (Statistics, Stanford U & HKU)
- Robert Phelps (Asia Pacific Risk, Risk CoE Development ASPCCR, HSBC)
- Elias Shiu (U of Iowa)
- Dragon Tang (Business and Economics, HKU)
- Zhen Wei (Merrill Lynch)
- Lixin Wu (Mathematics, HKUST)
- Matthew Yiu (HK Monetary Authority)
- Siu Pang Yung (Mathematics, HKU)
- Jin Zhang (Business and Economics, HKU)

Organizing Committee:

*Tze Leung Lai, Stanford U & HKU,
Wai Keung Li, HKU, Siu Pang Yung, HKU, Jin Zhang, HKU*

Sponsors:

*Stanford U, Centre for Financial Innovation and Risk Management (HKU),
Department of Statistics and Actuarial Science (HKU), and Institute of Mathematical Research (HKU)*

All are welcome

December 10 (Friday)

All Sessions: Meng Wah Complex T6

- 09:30 – 09:35 *Welcoming Address and Introductory Remarks*
Eric C. Chang, Dean, Chair Professor and Director of the Centre for Financial Innovation and Risk Management, University of Hong Kong
- Chair:* **Eric C. Chang**, University of Hong Kong
- 09:35 – 10:25 **Elias Shiu**, University of Iowa
The Changing Insurance Business and Quantitative Finance
-
- 10:25 – 10:35** *Coffee Break*
-
- Chair:* **Elias Shiu**, University of Iowa
- 10:35 – 11:25 **Ka Chun Cheung**, University of Hong Kong
Conditional Comonotonicity and Its Applications
- 11:25 – 12:15 **Y.K. Kwok**, Hong Kong University of Science & Technology
Efficient Option Pricing Using the Fast Fourier Transforms
-
- 12:15 – 13:30** *Lunch Break*
-
- Chair:* **S.P. Yung**, University of Hong Kong
- 13:30 – 14:20 **Lixin Wu**, Hong Kong University of Science & Technology
Inflation Derivatives: From Market Model to Foreign Currency Analogy
- 14:20 – 15:10 **Eric C.K. Cheung**, University of Hong Kong
A Two-Dimensional Risk Model with Proportional Reinsurance
-
- 15:10 – 15:30** *Coffee Break*
-
- Chair:* **Y.K. Kwok**, Hong Kong University of Science & Technology
- 15:30 – 16:20 **Jin Zhang**, University of Hong Kong
Equilibrium Asset and Option Pricing Under Jump Diffusion
- 16:20 – 17:10 **S.P. Yung**, University of Hong Kong
Stop-Loss Functions and Insurance Layer Functions in Optimal Insurance Problems

December 11 (Saturday)

All Sessions: Meng Wah Complex T6

09:30 – 09:35 *Opening Remarks*
N. Mok, Chair Professor and Director of the Institute of Mathematical Research,
University of Hong Kong

Chair: **N. Mok**, University of Hong Kong

09:35 – 10:25 **Robert I. Phelps**, HSBC
Detecting Asset Bubbles

10:25 – 10:35 *Coffee Break*

Chair: **W.K. Li**, University of Hong Kong

10:35 – 11:25 **Matthew S. Yiu**, Hong Kong Monetary Authority
*Liquidity Crunch in Late 2008: High-Frequency Differentials between
Forward-Implied Funding Costs and Money Market Rates*

11:25 – 12:15 **T.L. Lai**, Stanford University
Modeling Default Probabilities in Credit Risk Management

12:15 – 13:30 *Lunch Break*

Chair: **Jin Zhang**, University of Hong Kong

13:30 – 14:20 **Hanzhi Ding**, Citi
On the Oil and Gas Industry in China

14:20 – 15:10 **Dragon Tang**, University of Hong Kong
The Price Impact of CDS Trading

15:10 – 15:30 *Coffee Break*

Chair: **T.L. Lai**, Stanford University

15:30 – 16:20 **Zehao Chen**, Boser, China
*New Challenges and Practical Considerations to Quantitative Portfolio
Management in A-Share Market*

16:20 – 17:10 **Zhen Wei**, Merrill Lynch
Quantitative Asset Allocation based Products for Institutional and Retail Investors

17:10 – 17:20 *Closing*

Abstracts

Zehao Chen (Bosera, China)

New Challenges and Practical Considerations to Quantitative Portfolio Management in A-Share Market

Eric C.K. Cheung (Statistics and Actuarial Science, HKU)

A Two-Dimensional Risk Model with Proportional Reinsurance

In this talk, we consider an extension of the two-dimensional risk model introduced by Avram, Palmowski and Pistoris (2008, IME). To this end, we assume two insurers in which the first is subject to claims arising from two independent compound Poisson processes. The second insurer, which can be viewed as a different line of business of the same insurer or as a reinsurer, covers a constant proportion of the claims caused by one of these two compound Poisson processes. An explicit formula for the Laplace transform of the time until at least one insurer is ruined is derived. Our method is based on geometric arguments which reduce the bivariate problem to various univariate problems. The surplus level of the first insurer when the second one is ruined first will also be discussed in connection with a few open questions. This is joint work with Andrei Badescu from University of Toronto and Landy Rabehasaina from Universite de Franche Comte.

Ka Chun Cheung (Statistics and Actuarial Science, HKU)

Conditional Comonotonicity and Its Applications

The notion of conditional comonotonicity was first employed implicitly in Kaas et al. (2000) and was formally introduced in Jouini and Napp (2004) as a generalization of the classical concept of comonotonicity. In this talk, construction and characterization of conditionally comonotonic random vectors will be discussed. The usefulness of this concept is then illustrated through some actuarial applications such as improved convex upper bounds construction and optimal allocation of policy limits.

Hanzhi Ding (Citi)

On the Oil and Gas Industry in China

Y.K. Kwok (Mathematics, HKUST)

Efficient Option Pricing Using the Fast Fourier Transforms

The Fourier transform approach is an important tool in options pricing, and together with the Fast Fourier transform (FFT) algorithms, real time options pricing can be delivered. The underlying asset price processes can allow for more general realistic structure of asset returns, say, excess kurtosis and stochastic volatility. It is known that once the characteristic function of the risk neutral density is known analytically, the analytic expression for the Fourier transform of the option value can be derived. By treating option price analogous to a probability density function, option prices across the whole spectrum of strikes can be obtained via fast Fourier transform. Fourier transform is an effective tool to compute convolution products. We show how this property of the Fourier transform of a convolution product can be used to value various types of option pricing models. In particular, we show how one can price Bermudan style options under Levy processes using FFT techniques in an efficient manner by reformulating the risk neutral valuation formulation as a convolution. By extending the finite state Markov chain approach in option pricing, we illustrate an innovative FFT-based network tree approach for option pricing under Levy process. Similar to the forward shooting grid technique in the usual lattice tree algorithms, the approach can be adapted to valuation of options with exotic path dependence. We also show how to apply the Fourier space time stepping techniques that solve the partial differential-integral equation for option pricing under Levy processes. This versatile approach can handle various forms of path dependence of the asset price process and features / constraints in the option models. Sampling errors and truncation errors in numerical implementation of FFT are discussed. This is a joint work with Kwai Sun LEUNG and Hoi Ying WONG.

Tze Leung Lai (Statistics, Stanford U & HKU)

Modeling Default Probabilities in Credit Risk Management

We first give an overview of the valuation theory of mortgage-backed securities, the subprime crisis of 2007, and the internal-ratings based approach to measuring credit risk of retail loans in the Basel II Accord. We then propose a new approach that uses generalized linear mixed models for dynamic panel data to model the default probabilities of corporate loans and the default and prepayment of retail loans. This approach is applied to an empirical study of 10,000 subprime 2-28 ARM loans that originated in the period 2004-06, showing how warning signals to the subprime crisis are reflected by predicting the default probabilities of these loans.

Robert Phelps (Asia Pacific Risk, Risk CoE Development ASPCCR, HSBC)

Detecting Asset Bubbles

Current conditions of government policy and market behaviour give rise to a risk of asset bubbles forming. Although it has proven difficult to clearly define a bubble, detecting when a bubble is in formation is a key need in rising markets where this may constitute the main risk to financial lenders. We overview bubble concepts and indicate some promising directions for bubble detection indicator development.

Elias Shiu (U of Iowa)

The Changing Insurance Business and Quantitative Finance

Nowadays, many products sold by life insurance companies are basically mutual funds, wrapped around with some insurance features or guarantees. These guarantees are financial options that should be priced, hedged, and reserved by means of modern option-pricing theory. This talk will explain some of these options, and discuss their impacts during the recent financial crisis.

Dragon Tang (Business and Economics, HKU)

The Price Impact of CDS Trading

We investigate empirically whether credit default swaps (CDS) spreads are influenced by shifts in demand/supply dynamics in the market. We find that while changes in CDS spreads are insensitive to accumulated trading volume, net buying interest (NBI), a measure we construct to measure latent trade imbalance between consecutive trades, significantly affects CDS price changes. This price impact appears to be statistically significant even in the absence of concomitant stock price changes, but its economic magnitude is on par with the average bid-ask spread. While changes in fundamental information contribute to the price impact of net buying interest, liquidity of CDS contracts is another factor. We show that the effect of NBI is three times stronger in the least liquid CDS contracts than in the most liquid CDS contracts. Furthermore, exogenous supply shocks attenuate the initial price impact and accelerate the subsequent price reversal.

Zhen Wei (Merrill Lynch)

Quantitative Asset Allocation based Products for Institutional and Retail Investors

Lixin Wu (Mathematics, HKUST)

Inflation Derivatives: From Market Model to Foreign Currency Analogy

In this paper, we establish a market model for the term structures forward inflation rates based on the risk-neutral dynamics of nominal and real zero-coupon bonds. Under the market model, we can price inflation caplets as well as inflation swaptions with a formula similar to the Black's formula, thus justify the current market practice. We demonstrate how to further extend the market model to cope with volatility smiles. Moreover, we establish a consistency condition on the volatility of real zero-coupon bonds using arbitrage arguments, and with that re-derive the model of Jarrow and Yildirim (2003) with forward real rates based on "foreign currency analogy", and thus interconnect the two modeling paradigms.

Matthew Yiu (HK Monetary Authority)

Liquidity Crunch in Late 2008: High-Frequency Differentials between Forward-Implied Funding Costs and Money Market Rates

The US Federal Reserve and the European Central Bank have adopted a number of measures, including aggressive policy rate cuts, to ease the liquidity crunch in the financial markets following the collapse of Lehman Brothers. Using high frequency spot and forward foreign exchange and interest rate quotes that are potentially executable for the period surrounding the 2008 global financial turmoil, this study examines the variations of intraday funding liquidity across the global financial markets that span different time zones. Moreover, the paper also tests how and to what extent policy actions undertaken by central banks affect the dynamics of market liquidity conditions. Similar to Hui et al. (2009), the paper uses the differential between the US dollar interest rate implied by the covered interest rate parity condition and the corresponding US dollar interest rate as a proxy for the liquidity (or the lack of it) in the US dollar money market. The study focuses on the EUR/USD exchange rate and compares the most stressful crisis period with other relatively less stressful periods. The intraday funding liquidity condition during the most tumultuous period shows that the pressures in the demand for US dollars through foreign exchange and forward markets spilled over to the Asian markets. The paper also examines how policy announcements by the central banks affect the dynamics of market liquidity. The study employs autoregressive models to capture the potential effects of monetary policy announcements on both the mean and volatility of the liquidity proxy. The empirical results show that the coordinated cuts of policy rates failed to stimulate lending in the short-term US money market, whereas the uncapped currency swap lines offered by the Federal Reserve to other central banks succeeded in easing the liquidity condition in the market. The policy is more effective and persistent for the very short end of the money market.

Siu Pang Yung (Mathematics, HKU)

Stop-Loss Functions and Insurance Layer Functions in Optimal Insurance Problems

In the work of Arrow around 1963, a stop-loss insurance policy was proved to be optimal under a concave utility objective. On the other hand, market researches revealed that the optimal policy might be a stop-loss policy with a coverage ceiling, namely an insurance layer policy. By changing the concave utility objective to a prospect theory type of objective of Kahneman and Tversky, we have proved that the insurance layer policy is really optimal. Furthermore, we have found that these simple policies, in the form of stop-loss or insurance layer, are optimal to other optimal insurance problems with various risk measure objectives despite their nonlinearities.

Jin Zhang (Business and Economics, HKU)

Equilibrium Asset and Option Pricing Under Jump Diffusion

This paper develops an equilibrium asset and option pricing model in a production economy under jump diffusion. The model provides analytical formulas for an equity premium and a more general pricing kernel that links the physical and risk-neutral densities. The model explains the two empirical phenomena of the negative variance risk premium and implied volatility smirk if market crashes are expected. Model estimation with the S&P 500 index from 1985 to 2005 shows that jump size is indeed negative and the risk aversion coefficient has a reasonable value when taking the jump into account. This is a joint work with Huimin Zhao and Eric C. Chang.