The 2013 IMS-FPS Workshop

19 – 21 June 2013

National University of Singapore

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PROGRAMME

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Programme Overview

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08:50 – 09:00 Opening Address		
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09:45 – 10:30 Shige PENG	**09:45 – 10:30** Jin-Chuan DUAN	**09:45 – 10:30** Freddy DELBAEN
10:30 – 11:00 Break	**10:30 – 11:00** Break	**10:30 – 11:00** Break
11:00 – 11:30 (IS1A) Xinfu CHEN (IS2A) Rainer BUCKDAHN	**11:00 – 11:30** (IS1D) Bingyi JING (IS2D) Weiqiang YANG	**11:00 – 11:30** (IS1G) Tiong-Wee LIM (IS2G) Steven KOU
11:30 – 12:00 (IS1B) Jianfeng ZHANG (IS2B) Chao ZHOU	**11:30 – 12:00** (IS1E) Jussi KEPPO (IS2E) Hwai-Chung HO	**11:30 – 12:00** (IS1H) Johan LIM (IS2H) Loc Hung TRAN
12:00 – 12:30 (IS1C) Xianhua PENG (IS2C) Juan LI	**12:00 – 12:30** (IS1F) Meihui GUO (IS2F) Chin-Han CHIANG	**12:00 – 12:30** (IS1I) Siu-Pang YUNG (IS2I) Ning CAI
12:30 – 14:00 Lunch	**12:30 – 14:00** Lunch	**12:30 – 14:00** Lunch
14:00 – 14:25 (CS1A) Lingfei LI (CS2A) Johannes RUF	**14:00 – 14:25** (CS1E) Hideatsu TSUKAHARA (CS2E) Stéphane GOUTTE	**14:00 – 14:25** (CS1I) Christian KELLER (CS2I) John Alexander WRIGHT
14:25 – 14:50 (CS1B) Tsung-Lin CHENG (CS2B) Ling TANG	**14:25 – 14:50** (CS1F) Chen PAN (CS2F) Thomas LIM	**14:25 – 14:50** (CS1J) Behnam ZARPAK (CS2J) Jing XU
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15:15 – 15:40 (CS1D) Xiuchun BI (CS2D) Andy Guanghua LIAN	**15:15 – 15:40** (CS1H) AbdulRahman AL-HUSSEIN (CS2H) Pin NG	**15:15 – 15:40** (CS1L) Yingshan CHEN (CS2L) Fang Wei ZHANG
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Plenary Talks Invited Talks (Parallel Sessions IS1-IS2)
Contributed Talks (Parallel Sessions CS1-CS2)

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WEDNESDAY 19 June 2013	THURSDAY 20 June 2013	FRIDAY 21 June 2013
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16:55 – 17:40 Duan LI	**16:55 – 17:40** Haipeng XING	**16:55 – 17:10** Closing Address

Plenary Talks Invited Talks (Parallel Sessions IS1-IS2)
Contributed Talks (Parallel Sessions CS1-CS2)

Lecture theatre is equipped with desktop computer connected to LCD projector, projector screen, visualizer, overhead projector, white board, and separate connection for personal notebook/laptop. Microphone will be provided.

Seminar rooms are similarly equipped except that visualizer and overhead projector are only available upon prior request. Microphone is not provided.

Wednesday, 19 June 2013			
TIME	**ACTIVITY**	**VENUE**	**REF**
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09:00 – 09:45	**Philip PROTTER** Columbia University, USA *Financial Bubbles and the Possibility of Real Time Detection*	LT34	Pg 5
09:45 – 10:30	**Shige PENG** Shandong University, P.R. China *Risk under Knightian Uncertainty, BSDE and Path Dependent PDE*	LT34	Pg 5
10:30 – 11:00	Tea Break	LT34 foyer	
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11:00 – 11:30	**Xinfu CHEN** University of Pittsburgh, USA *Free Boundary Problems and Variational Inequality in Finance*	S17-04-05	Pg 8
	Rainer BUCKDAHN Departement de Mathematiques, Universite de Bretagne Occidentale, France *Nonlinear Stochastic Differential Games Involving a Major Player and a Large Number of Collectively Acting Minor Players*	S17-04-06	Pg 7
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11:30 – 12:00	**Jianfeng ZHANG** Department of Mathematics, University of Southern Australia *A Monotone Scheme for High Dimensional Fully Nonlinear PDEs*	S17-04-05	Pg 14
	Chao ZHOU National University of Singapore, Singapore *Quadratic BSDEs with Jumps: a Fixed-point Approach*	S17-04-06	Pg 15

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	Juan LI School of Mathematics and Statistics, Shandong University, Weihai, Shandong Province, People's Republic of China *Stochastic differential games for fully coupled FBSDEs with Jumps*	S17-04-06	Pg 11
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	Johannes RUF Oxford-Man Institute of Quantitative Finance, University of Oxford, Oxford *Why are Quadratic Normal Volatility Models Analytically Tractable?*	S17-04-06	Pg 25
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	Ling TANG National University of Singapore, Singapore *Calibration of Stochastic Volatility Models: A Tikhonov Regularization Approach*	S17-04-06	Pg 26

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Parallel Session CS1C & CS2C			
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	Zhaoli JIA Department of Statistics and Finance, School of Management, University of Science and Technology of China, People's Republic of China *Pricing variance swaps under stochastic volatility with an Ornstein-Uhlenbeck process*	S17-04-06	Pg 19
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15:15 – 15:40	**Xiuchun BI** Department of Statistics and Finance, University of Science and Technology of China, People's Republic of China *Precise Large Deviations of Aggregate Claims in a Risk Model with Regression-Type Size-Dependence*	S17-04-05	Pg 16
	Andy Guanghua LIAN School of Commerce, Division of Business, University of South Australia *Volatility Swaps and Volatility Options on Discretely Sampled Realized Variance*	S17-04-06	Pg 21
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Thursday, 20 January 2013			
TIME	**ACTIVITY**	**VENUE**	**REF**
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09:45 – 10:30	**Jin-Chuan DUAN** National University of Singapore, Singapore *Cascading Defaults and Systemic Risk of a Banking System*	LT34	Pg 1
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	Weiqiang YANG School of Mathematics, Shandong University, P.R. China *The Dual Process and the Monte-Carlo Method*	S17-04-06	Pg 14
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	Stéphane GOUTTE CNRS - Université Paris 7 and CREA Université du Luxembourg *Mean Variance Hedging under Defaults Risk*	S17-04-06	Pg 19
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	Thomas LIM Laboratoire d'Analyse et Probabilités, Université d'Evry and ENSIIE *Mean-variance Hedging on Uncertain Time Horizon in a Market with a Jump*	S17-04-06	Pg 22
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	Manachai RODCHUEN Department of Statistics, Faculty of Science Chiang Mai University, Chiang Mai, Thailand *The Generation of Simple Linear Regression Model*	S17-04-06	Pg 24

Thursday, 20 January 2013			
TIME	**ACTIVITY**	**VENUE**	**REF**
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	Pin NG Franke College of Business, Northern Arizona University *Stochastic Dominance via Quantile Regression with Applications to Investigate Arbitrage Opportunity and Market Efficiency*	S17-04-06	Pg 23
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16:10 – 16:55	**Peter FORSYTH** Cheriton School of Computer Science, University of Waterloo, Ontario, Canada *Optimal Trade Execution: Mean Variance or Mean Quadratic Variation?*	LT34	Pg 2
16:55 – 17:40	**Haipeng XING** State University of New York at Stony Brook, USA *Firms' credit rating dynamics in the presence of unobserved market structural changes*	LT34	Pg 6

Friday, 21 June 2013			
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09:45 – 10:30	**Freddy DELBAEN** ETH Zürich and University of Zürich, Switzerland *New convergence properties related to local theorems*	LT34	Pg 1
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11:00 – 11:30	**Tiong-Wee LIM** National University of Singapore, Singapore *An adaptive control approach to hedging options with transaction costs*	S17-04-05	Pg 12
	Steven KOU National University of Singapore, Singapore *Jumps in Equity Index Returns Before and During the Financial Crisis: A Bayesian Analysis*	S17-04-06	Pg 11
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	Loc Hung TRAN University of Finance and Marketing (UFM), Vietnam *A New Approach to Poisson Approximations*	S17-04-06	Pg 13

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	Ning CAI Department of Industrial Engineering and Logistics Management, Hong Kong University of Science and Technology, Hong Kong *A Drift Switching Reflected Jump-Diffusion Model for International Reserve Management*	S17-04-06	Pg 7
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Parallel Session CS1I & CS2I			
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	John Alexander WRIGHT Department of Statistics, The Chinese University of Hong Kong, Shatin, Hong Kong *Tests for the Equality of Multiple Sharpe Ratios*	S17-04-06	Pg 27
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	Jing XU National University of Singapore, Singapore Implicit *Incentives of Mutual Fund Flows and Liquidity Premia*	S17-04-06	Pg 27

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	Marc S. PAOLELLA Department of Banking and Finance, University of Zurich, Switzerland, & Swiss Finance Institute *Dynamic COMFORT: A Common Market Factor Non-Gaussian Returns Model with Dynamic Conditional Correlations*	S17-04-06	Pg 24
Parallel Session CS1L & CS2L			
15:15 – 15:40	**Yingshan CHEN** National University of Singapore, Singapore *Incomplete Information, Trend Following, and Liquidity Premium*	S17-04-05	Pg 17
	Fang Wei ZHANG School of Transportation, Southeast University, and Faculty of Science, Huzhou Teachers College *Study on Multiple Attribute Decision Making Problems Based on D-S Evidence Theory and Hypercube Segmentation*	S17-04-06	Pg 28
15:40 – 16:10	Tea Break	LT34 foyer	
16:10 – 16:55	**Alex Novikov** University of Technology, Sydney, Australia *On lower and upper bounds for Asian-type options: a unified approach*	LT34	Pg 4
16:55 – 17:10	*Closing Address*	LT34	

ABSTRACTS

Plenary Lectures

New convergence properties related to local theorems

Freddy DELBAEN, ETH Zürich, Switzerland

An extension of the weak convergence of probability measures is introduced. It measures in the language of characteristic functions the distance between probability measures and given limits (Gaussian or other measures). Applications are found in statistics (but less general than the known results), number theory, random matrices, large and moderate deviations.

Cascading Defaults and Systemic Risk of a Banking System

Jin-Chuan DUAN, National University of Singapore, Singapore

Systemic risk of a banking system arises from cascading defaults due to interbank linkages. Any large external shock can in principle triggers cascading defaults, but shocks to systematic risk factors, as opposed to banks' idiosyncratic elements, are more likely to drive cascading defaults and hence to cause higher systemic risk. This paper proposes a structural model for a banking system in which bank assets are subject to both systematic and idiosyncratic risks and bank liabilities contain interbank exposures which may or may not be subject to netting. This model allows us to define two useful measures: systemic exposure and systemic fragility. The former characterizes the expected losses due to interbank linkages under some prescribed macro stress scenario, whereas the latter measures the pervasiveness of bank defaults under the same condition. Our model is conducive to examining potential impacts on systemic risk under different banking network configurations. We devise a novel bridge sampling technique specifically for computing these two systemic risk measures, and obtain data and estimates for a network of 15 British banks. Our results are quarterly time series of estimates for systemic exposures and fragilities from before the 2008-09 financial crisis to the end of 2012. Through this empirical analysis, we shed light on the nature of systemic risk and open new ways for controlling such risk.

Optimal Trade Execution: Mean Variance or Mean Quadratic Variation?

Peter FORSYTH, Cheriton School of Computer Science, University of Waterloo, Ontario, Canada

Algorithmic trade execution has become a standard technique for institutional market players in recent years, particularly in the equity market where electronic trading is most prevalent. A trade execution algorithm typically seeks to execute a trade decision optimally upon receiving inputs from a human trader.

A common form of optimality criterion seeks to strike a balance between minimizing pricing impact and minimizing timing risk. For example, in the case of selling a large number of shares, a fast liquidation will cause the share price to drop, whereas a slow liquidation will expose the seller to timing risk due to the stochastic nature of the share price.

We compare optimal liquidation policies in continuous time in the presence of trading impact using numerical solutions of Hamilton Jacobi Bellman (HJB) partial differential equations (PDE). In particular, we compare the time-consistent mean-quadratic-variation strategy (Almgren and Chriss) with the time-inconsistent (pre-commitment) mean-variance strategy.
The Almgren and Chriss strategy should be viewed as the industry standard.

We show that the two different risk measures lead to very different strategies and liquidation profiles.

In terms of the mean variance efficient frontier, the original Almgren/Chriss strategy is significantly sub-optimal compared to the (pre-commitment) mean-variance strategy.

Optimal order placement in a limit order book

Xin GUO, UC Berkeley, USA

There is a growing body of research works on trading strategies for big orders over a period of time with various assumptions of price impact. These works mostly focus on a macroscopic timescale. On the millisecond timescale the price is no longer well defined and the state of the order book contains important information.

More importantly, one of the key issues at this timescale is the order placement problem, which is different from the optimal execution one. We discuss some simple models and strategies to place orders in a limit order book with the objective of minimizing the expected cost. We show that the optimal strategy may depend on key order book statistics and derive a diffusion limit approximation for such analysis.

We will discuss some key difference between the diffusion limit modeling for LOB and that for general queues with reneging.

Stochastic Control Problems with Singular Value Functions – Analytic Solutions and Application to Optimal Portfolio Liquidation

Ulrich HORST, Humboldt-Universität zu Berlin, Germany

We study stochastic optimal control problems with singular terminal values arising in models of optimal portfolio liquidation under market impact when traders can simultaneously trade in a lit and a dark market. For the benchmark Markovian control model we show that the value function can be characterized by a PDE with a singularity at the terminal time and establish existence and uniqueness of classical solutions results for the resulting HJB equation. If the market impact or cost function is not Markovian, then the value function can be described by a singular BSPDE rather than a PDE. We show that the BSPDE has a unique solution (in certain class).

The talk is based on joint work with Paulwin Graewe, Jinnia Qiu, and Eric Sere.

Formal Asymptotics for (i) the Penalty Method (ii) a Model for Carbon Allowance Prices

Sam HOWISON, University of Oxford, UK

I shall describe how formal asymptotic analysis can help in understanding the structure of two nonlinear problems with non-smooth payoffs: (i) numerical solutions for American put options and butterfly spreads using the penalty method, with a focus on the error analysis, and (ii) the behaviour near expiry of a model for carbon allowance prices, with a focus on the impact of the payoff discontinuity.

Prospect Theory and Trading Patterns

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

Reference dependence, loss aversion, and risk seeking for losses together comprise the preference-based component of prospect theory that sets its value function apart from the standard risk-aversion model. Using an elasticity analysis, we show that this distinctive preference component serves to underpin negative-feedback trading propensities, but cannot manifest itself in behavior directly or holistically at the individual-choice level. We then propose and demonstrate that the market interaction between prospect-theory investors and regular CRRA investors allows this preference component to dominate in equilibrium behavior and hence helps to reestablish the intuitive link between prospect-theory preferences and negative-feedback trading patterns. In the model, the interaction also reconciles the contrarian behavior of prospect-theory investors with asymmetric volatility and short-term return reversal. The results suggest that prospect-theory preferences can lead investors to behave endogenously as contrarian noise traders in the market interaction process.

On lower and upper bounds for Asian-type options: a unified approach

Alex NOVIKOV, University of Technology, Sydney, Australia

In a context of dealing with financial risk management problems it is desirable to have accurate bounds for option prices in situations when pricing formulae do not exist in the closed form. A unified approach for obtaining upper and lower bounds for Asian-type options is proposed in the paper. These bounds are applicable in the continuous and discrete-time frameworks and for the case of time-dependent interest rates as well. The numerical examples are provided which illustrate accuracy of the bounds.

Risk under Knightian Uncertainty, BSDE and Path Dependent PDE

Shige PENG, Shandong University, P.R. China

We introduce a new type of path-dependent partial differential equation (PPDE) to calculated risks under Knightian uncertainty. This PPDE is also regarded as a fully nonlinear Feynman-Kac formulation for the BSDE driven by G-Brownian motion. G-framework provides a powerful tool to distinguish three parts of Ito's processes in the corresponding risk value function.

Financial Bubbles and the Possibility of Real Time Detection

Philip PROTTER, Columbia University, USA

Due to their occasional spectacular consequences, mathematical models for financial bubbles have been developed over the last 10 years. We will survey many of these developments, explaining how the more interesting models lead to the close analysis of strict local martingales, and we will explain how models of bubbles are more reasonable in incomplete market settings than they are in complete market settings. We will close by exhibiting a method under which one can detect (but without certainty) whether or not a given stock price is undergoing bubble pricing.

Firms' Credit Rating Dynamics in the Presence of Unobserved Market Structural Changes

Haipeng XING, State University of New York at Stony Brook, USA

Many efforts have been made in the past decades to identify and measure new significant sources of credit risk. We find in this paper that credit market structural change, a new source of joint credit risk, cannot be captured by observable or unobservable firm-specific and macroeconomic risk factors. To demonstrate this, we proposes for firms' credit rating transition intensities a modulated semi-Markov model in which the model parameters may experience sharp shifts caused by credit market structural changes. We then develop a semiparametric estimation theory for the inference of time varying model parameters, baseline transition intensities, and probabilities of market structural changes. Based on the analysis of U.S. public firms between 1986 and 2008, we show strong evidence of the effect of market structural changes in the firm's rating transitions after the inclusion of observable firm-specific variables (distance to default and trailing return), macroeconomic covariates, and frailty effects.

ABSTRACTS

Invited Talks

Nonlinear Stochastic Differential Games Involving a Major Player and a Large Number of Collectively Acting Minor Players

Rainer BUCKDAHN, Departement de Mathematiques, Universite de Bretagne Occidentale, France

In the talk we consider a 2-person zero-sum non-linear stochastic differential game, in which the one player is a major one and the other player is formed by *N* collectively acting minor players, whose dynamics are driven by independent Brownian motions but who intervene with their control in a same manner. This leads to a pay-off/cost functional, defined through a backward SDE, which averages over the minor players.

For the game with the *N* minor players we consider a weak solution, which makes it possible to study the game by using controls. Under suitable assumptions the saddle-point controls of the game are determined. The main objective on which the talk focuses is the limit behavior of the stochastic differential game and of the saddle-point controls, as the number *N* of minor players tends to infinity. The limit stochastic differential game -a mean-field game- is discussed and its saddle-point controls are characterised as the limit of the saddle-point controls of the game with *N* minor players.

The talk is based on a common work by Shige Peng and Juan Li (Shandong University) together with the speaker.

A Drift Switching Reflected Jump-Diffusion Model for International Reserve Management

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

The Brownian drift control model better describes the dynamic behavior of international reserves than does the buffer stock model, and can manage reserves at a significantly lower cost. To enable the classic Brownian drift control model to capture both the jump behavior in reserve dynamics and the leptokurtic feature that the increment distribution has a higher peak and two asymmetric heavier tails than does the normal distribution, we propose a novel drift switching reflected double exponential jump-diffusion model for international reserve management. The model is simple and produces a closed-form expression for the total expected discounted cost of managing reserves, which in turn facilitates us to find optimal control variables that minimize the cost. Numerical examples relating to reserve management strategies under various circumstances are provided.

This is joint work with Xuewei Yang from Nanjing University.

Free Boundary Problems and Variational Inequality in Finance

Xinfu CHEN, University of Pittsburgh, USA

In this talk, I review the classical Stefan problem and its variational formulation. Then I present connections between free boundary problem and variational inequality. Some examples from mathematical finance are given.

Insider Trading and Option Returns Around Earnings Announcements

Chin-Han CHIANG, Lee Kong Chian School of Business, Singapore Management University, Singapore

This paper studies the relation between insider trading and option returns around earnings announcements. We show that put (call) options listed under stocks sold (purchased) by insiders earn a significant return premium. This return premium remains significant after controlling for systematic risk, volatility risk, and transaction cost. We provide the first piece of empirical evidence of rising volatility which generates the put option return premium, following insider sales. This rise in volatility is not fully anticipated by market investors, given a significant spread between the implied and realized volatility, and thus causes put options to be relatively undervalued. On the other hand, the call option premium is due to significant run-up in the underlying stock price. The option return premium is cross-sectionally correlated with lagged stock returns, stock volatility, firm size, R&D cost, and book-to-market ratio.

Statistical Models of Market Reactions to Influential Trades

Meihui GUO, Department of Applied Mathematics, National Sun Yat-sen University, Taiwan

In the literature, traders are often classified into informed and uninformed and the trades from informed traders have market impacts. We investigate these trades by first establishing a scheme to identify the influential trades from the ordinary trades under certain criteria. The differential properties between these two types of trades are examined via the four transaction states classified by the trade price, trade volume, quotes, and quoted depth. Marginal distribution of the four states and the transition probability between different states are shown to be distinct for informed trades and ordinary liquidity trades. Furthermore, four market reaction factors are introduced and logistic regression models of the influential trades are established based on these four factors. Empirical study on the high frequency transaction data from the NYSE TAQ database show supportive evidence for high correct classification rates of the logistic regression models.

Keywords: High frequency data, Influential trade, Quoted depth, Transition probability, Logistic regression model, Odds ratio.

Joint work with Yi-Ting Guo, Chi-Jeng Wang and Liang-Ching Lin

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A Price Risk Measure and Momentum Strategy

Hwai-Chung HO, Institute of Statistical Science, Academia Sinica, Taiwan

Examining the properties of stock returns has long been a central topic in finance. Most quantitative analyses conducted by academic researchers and practitioners focus only on the return distribution. However, the return distribution itself hardly helps to determine whether the price of a winner stock picked by using the momentum strategy reaches the level where the risk incurred from the falling of prices is imminent. Therefore, we construct an implied price risk index to quantify the downside risk of a stock and use it to manage the tail risk of the momentum strategy. The empirical results demonstrate that our modified strategy can not only achieve significant improvement on the overall performance, but also substantially reduce the drastic losses suffered from the 2008 global recession. We also establish the connection between the implied price risk index and the cross-sectional return differences based on the well-known three factors, the market beta, the firm size and the book-to-market ratio.

Authors: Hwai-Chung Ho and Hongwei Chuang, Institute of Statistical Science, Academia Sinica, Taiwan

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On the Estimation of Integrated Volatility with Jumps and Microstructure Noises

Bing-Yi JING, Department of Mathematics, Hong Kong University of Science & Technology , Hong Kong

We propose a nonparametric procedure to estimate the integrated volatility of Ito semi-martingale in the presence of jumps and microstructure noise. The estimator is based on a combination of the pre-averaging method and threshold technique, which serve to remove microstructure noise and jumps, respectively. The estimator is shown to work for both finite and infinite activity jumps. Furthermore, asymptotic properties of the proposed estimator, such as consistency and central limit theorem, are established. Simulations results are given to evaluate the performance of the proposed method in comparison with other alternative methods.

The Market Timing Ability of Individual Investors

Jussi KEPPO, National University of Singapore, Singapore

We document significant persistence in the ability of individual investors to time the stock market. Using data on all trades by individual Finnish investors over more than 14 years, we show that investors who successfully time the market in the first half of the sample are more likely to successfully time in the second half. We further show that investors who time the market around the run-up and crash in 1999 and 2000 are more likely to time the run-up and crash in 2007 and 2008. Our evidence suggests that it is possible to use the trading patterns of these smart investors to anticipate market movements, lending some credibility to the view that market bubbles are identifiable in real time.

Authors: Jussi Keppo, National University of Singapore; Tyler Shumway and Daniel Weagley, University of Michigan

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Jumps in Equity Index Returns Before and During the Financial Crisis: A Bayesian Analysis

Steven KOU, National University of Singapore, Singapore

We attempt to answer two questions in this paper: (i) How did jumps in equity returns change during the financial crisis 2007-2011; in particular, were there significant changes in jump rates or in jump sizes, or both? (ii) Were there finite number of large jumps (e.g. those in affine jump-diffusion models) or infinite number of small jumps (e.g. those in Levy type models) in equity returns before and during the crisis? To answer these questions, we first find that a simple affine jump-diffusion model fits both S&P 500 and Nasdaq 100 daily return data well; the model outperforms existing ones (in particular models with Levy jumps) during the crisis, and is at least as good before the crisis. Based on the model and the data sets, we conclude that: (i) Both positive and negative jump rates increased significantly during the financial crisis, while, somewhat surprisingly, there is little evidence that jump sizes have changed before and after the crisis. (ii) The empirical evidence favors finite number of large jumps in equity returns. This is a joint work with Cindy Yu and Haowen Zhong

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Stochastic differential games for fully coupled FBSDEs with Jumps

Juan LI, School of Mathematics and statistics, Shandong University, Weihai, Shandong Province

This paper is concerned with stochastic differential games (SDGs) defined through fully coupled forward-backward stochastic differential equations (FBSDEs) which are governed by Brownian motion and Poisson random measure. First we give some basic estimates for fully coupled FBSDEs with jumps under the monotonic condition. We also prove the well-posedness and regularity results for fully coupled FBSDEs with jumps on the small time interval under a Lipschitz condition (where the Lipschitz constants of σ, h with respect to z, k are small enough) and a linear growth condition. For SDGs, the upper and the lower value functions are defined by the controlled fully coupled FBSDEs with jumps. Using a new transformation, we prove that the upper and the lower value functions are deterministic. Then, after establishing the dynamic programming principle for the upper and the lower value functions of this SDGs, we prove that the upper and the lower value functions are the viscosity solutions to the associated upper and the lower Hamilton-Jacobi-Bellman-Isaacs (HJBI) equations, respectively. Furthermore, for a special case (when σ, h do not depend on y, z, k), under the Isaacs' condition, we get the existence of the value of the game.

It's based on a common work with Qingmeng Wei (School of Mathematics, Shandong University, Jinan 250100, P. R. China).

Condition Number Regularized Covariance Estimation with Application to Portfolio Optimization

Johan LIM, Department of Statistics, Seoul National University, Korea

Estimation of high-dimensional covariance matrices is known to be a difficult problem, has many applications, and is of current interest to the larger statistics community. In many applications including so-called the large p, small n setting, the estimate of the co-variance matrix is required to be not only invertible, but also well-conditioned. Although many regularization schemes attempt to do this, none of them address the ill-conditioning problem directly. In this paper, we propose a maximum likelihood approach, with the direct goal of obtaining a well-conditioned estimator. No sparsity assumptions on either the covariance matrix or its inverse are imposed, thus making our procedure more widely applicable. We demonstrate that the proposed regularization scheme is computationally efficient, yields a type of Steinian shrinkage estimator, and has a natural Bayesian interpretation. We investigate the theoretical properties of the regularized covariance estimator comprehensively, including its regularization path, and proceed to develop an approach that adaptively determines the level of regularization that is required. Finally, we demonstrate the performance of the regularized estimator in decision-theoretic comparisons and in the financial portfolio optimization setting. The proposed approach has desirable properties, and can serve as a competitive procedure, especially when the sample size is small and when a well-conditioned estimator is required.

This is a joint work with Joong-Ho Won, Seung-Jean Kim, and Bala Rajaratnam.

An adaptive control approach to hedging options with transaction costs

Tiong-Wee LIM, National University of Singapore, Singapore

In classical theories of option hedging, an interesting feature of the optimal hedging strategy in the presence of transaction costs is that the investor should rebalance the hedging portfolio only when the number of shares of stock falls too far out of line relative to the “target delta.” We make use of this feature to propose a new approach to hedging options with transaction costs using market data on stock and option prices. Our approach tunes the parameters of a model-reference adaptive hedging strategy to minimize the mean squared hedging error, and can be viewed as a hybrid of pure model-driven approaches and pure data-driven approaches in the literature. We present simulation and empirical studies of the S&P 500 futures options to illustrate the hedging performance of the model-reference adaptive strategy.

This is joint work with L. Chen and T. L. Lai.

Location, Location, Location: The Econometrics of Asset Pricing with Spatial Interaction

Xianhua PENG, Hong Kong University of Science & Technology, Hong Kong

It is common knowledge that spatial interaction is important in modeling real estate assets, as house prices are significantly affected by the neighborhood prices. Although spatial econometrics have been applied to empirical studies of housing markets, there is little theoretical work that studies the risk and return of real estate assets. In this paper, we attempt to fill this gap by proposing a spatial capital asset pricing model (S-CAPM) and a spatial arbitrage pricing theory (S-APT), which extend the classical asset pricing models by incorporating spatial interaction among asset returns. Furthermore, we study asymptotic properties of the estimators and test statistics needed for implementing the models. An empirical study of the futures contracts on the S&P/Case-Shiller Home Price Indices shows that the spatial interaction is statistically significant.

This is a joint work with Steven Kou and Haowen Zhong.

A New Approach to Poisson Approximations

Loc Hung TRAN, University of Finance and Marketing (UFM), Vietnam

The main purpose of this note is to present a new approach to Poisson Approximations. Some bounds in Poisson Approximations in term of classical Le Cam's inequalities for various wise-row triangular arrays of wide class of discrete independent random variables are established via Trotter-Renyi distance based on Trotter-Renyi operator method. Some analogous results related to random sums in Poisson Approximations are considered, too.

Keywords: Poisson approximation, Random summand, Le Cam's inequality, Trotter's operator, Renyi's operator, Poisson-binomial random variables, Geometric random variables, Negative binomial random variables

Mathematics Subject Classification 2010: 60F05, 60G50, 41A36.

Authors: Tran Loc Hung, University of Finance and Marketing; Le Truong Giang, Can Tho University, Vietnam

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The Dual Process and the Monte-Carlo Method

Weiqiang YANG, School of Mathematics, Shandong University, P.R. China

This talk will discusses some types of Monte-Carlo methods to solve PDE, which may involving Feynman-Kac formula, BSDE, martingale representation, Brownian bridge, Green function etc. Further, a new kind of Monte-Carlo method induced by the dual process will be introduced.

Time Consistent Optimal Controls for Mean-Variance Portfolio Selection Problems

Siu-Pang YUNG, Mathematics Department, The University of Hong Kong, Hong Kong

In a mean-variance portfolio selection problem, the portfolio wealth appears as a nonlinear term in the objective function. This makes the dynamic programming principle invalid and causes the traditional optimal selection strategy “time inconsistent”, in the sense that the optimal strategy started at the initial time may not be optimal again when we start at a later time. In this talk, we shall describe some of our current results in the search of time consistent optimal strategies for some mean-variance problems.

A Monotone Scheme for High Dimensional Fully Nonlinear PDEs

Jianfeng ZHANG, Department of Mathematics, University of Southern California

In this talk we propose a monotone numerical scheme for fully nonlinear parabolic PDEs, with typical examples including HJB equations and Bellman-Isaacs equations. As is well known, due to the curse of dimensionality, the standard PDE algorithms are feasible only for low dimensional problems (typically $d \le 3$). We shall use Monte Carlo approach. Our scheme works well for higher dimensional problems, when the generator of the PDE is dominated by the diagonal terms of the hessian matrix. Several numerical examples, up to dimension 12, are reported.

This is a joint work with Wenjie Guo (Fudan) and Jia Zhuo (USC).

Quadratic BSDEs with Jumps: a Fixed-point Approach

Chao ZHOU, National University of Singapore, Singapore

We prove the existence of bounded solutions of quadratic backward SDEs with jumps, using a direct fixed-point approach as in Tevzadze (2008). Under an additional standard assumption, we prove a uniqueness result, thanks to a comparison theorem. Then we study the properties of the corresponding g-expectations, we obtain in particular a non-linear Doob-Meyer decomposition for g-submartingales. We also give applications for dynamic risk measures and compute their inf-convolution, with some explicit examples of optimal risk transfer between two agents.

ABSTRACTS

Contributed Talks

Stochastic Maximum Principle for Hilbert Space Valued Forward-Backward Doubly SDES with Poisson Jumps

AbdulRahman AL-HUSSEIN, Qassim University, Saudi Arabia

In this talk we consider the optimal control problem of a control problem in infinite dimensions. This problem is governed by a fully coupled forward-backward doubly stochastic differential equation driven by a cylindrical Wiener process on a separable Hilbert spaces and a Poisson random measure. The control variable is allowed to enter in all coefficients appearing in this system.

The maximum principle for optimal control of this stochastic optimal control problem is derived.

Further discussions and proofs will be given as well in the talk.

Precise Large Deviations of Aggregate Claims in a Risk Model with Regression-Type Size-Dependence

Xiuchun BI, Department of Statistics and Finance, University of Science and Technology of China, People's Republic of China

In this work, we build a risk model under the framework of web Markov skeleton processes (WMSPs for short), which are a new class of stochastic processes and are found to be useful in modeling insurance risk. We introduce some regression-type dependence structures, including semi-Markov dependence and mirror semi-Markov dependence. For a case of heavy-tailed claims, we obtain precise large deviation formulas of the aggregate claims under some assumptions on the regression-type size-dependence.

Authors: Xiuchun Bi and Shuguang Zhang, Department of Statistics and Finance, University of Science and Technology of China, People's Republic of China;

Incomplete Information, Trend Following, and Liquidity Premium

Yingshan CHEN, National University of Singapore, Singapore

We study the optimal investment policy of an investor who trades in a market that switches stochastically between bull and bear regimes. The investor does not fully observe the state of the market and incurs transaction costs. We characterize the solution to this problem, focusing on two main implications. First, we show that in this framework the investor is mainly a trend follower, buying on the upswings and selling on the downswings. Second, compared to the full information case, we show that incomplete information about the state of the market can significantly amplify the magnitude of the effect of transaction costs on liquidity premia. Overall, trading costs combined with imperfect knowledge about the time-varying investment opportunities have a strong first-order role in asset pricing.

This is a joint work with Min Dai and Luis Goncalves-Pinto.

On the Ruin Time for Risk Reserve Processes with Heavy-Tailed Claims

Tsung-Lin CHENG, National Changhua University of Education, Taiwan

In this paper, we extend Lemma 1 of Chow and Zhang (1986) to the risk reserve models with heavy-tailed claims. In particular, we obtain an upper bound and a lower bound for the expectation of the time to ruin for the risk reserve process. Our results don't require any assumptions on the distributions of the claims. Moreover, both of continuous-time indexed and discrete-time indexed risk reserve processes are discussed separately. Finally, we conduct a simulation for a risk reserve process with Cauchy-distributed claims to illustrate our main results.

Authors: Tsung-Lin Cheng, National Changhua University of Education, Taiwan; Henghsiu Tsai, Academia Sinica, Taiwan

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Obstacle Problem of Path-dependent PDEs

Ibrahim EKREN, University of Southern California, USA

In this talk, we adapt the definition of viscosity solutions of path-dependent PDEs to the obstacle problem associated to a non-Markovian second order reflected backward stochastic differential equation with data uniformly continuous in (t, ω), and generator Lipschitz continuous in (y, z). We prove that our definition is consistent with the classical solutions, and satisfy a stability result. We show that the value functional defined via the second order reflected backward stochastic differential equation is the unique viscosity solution of the variational inequalities.

The Optimal Execution Strategy of Employee Stock Option

Yi FU, Mathematics and Science College, Shanghai Normal University, People's Republic of China

In this paper, we developed an optimal execution strategy for the employee stock option by means of the fluid model. We show that the value function is the viscosity solutions of the Hamilton-Jacobi-Bellman variational inequality equation and prove the comparison principle of the viscosity solutions. Finally, numerical illustrative examples and numerical solution of optimal selling strategies ate given by the finite difference method.

Authors: Baojun Bian, Department of Mathematics, Tongji University, Shanghai, People's Republic of China; Yi Fu and Jizhou Zhang, Mathematics and Science College, Shanghai Normal University, People's Republic of China.

Mean Variance Hedging under Defaults Risk

Stéphane GOUTTE, CNRS - Université Paris 7 and CREA Université du Luxembourg

We solve a Mean Variance Hedging problem in an incomplete market where multiple defaults can appear. For this, we use a default-density modeling approach. The global market information is formulated as progressive enlargement of a default-free Brownian filtration and the dependence of default times is modeled by a conditional density hypothesis. We prove the quadratic form of each value process between consecutive defaults times and solve recursively systems of quadratic backward stochastic differential equations. Moreover, we obtain an explicit formula of the optimal trading strategy. We illustrate our results with some specific cases.

Keywords: Mean variance hedging; default-density modeling; Quadratic backward stochastic differential equation (BSDE); Dynamic programming.

MSC Classification (2010): 60J75, 91B28, 93E20.

Authors: Sébastien CHOUKROUN, Université Paris 7 Diderot, France; Stéphane Goutte, Université du Luxembourg, Luxembourg; Armand Ngoupeyou, Université Paris 7 Diderot, France.

Pricing variance swaps under stochastic volatility with an Ornstein-Uhlenbeck process

Zhaoli JIA, Department of Statistics and Finance, School of Management, University of Science and Technology of China, People's Republic of China

In this paper, we present a highly efficient approach to price variance swaps under discrete sampling times. We have found a closed-form exact solution for the partial differential equation system based on the Ornstein-Uhlenbeck's stochastic volatility embedded in the framework proposed by Little and Pant. The key features of our new solution approach include the following: (1) with the newly found analytic solution, all the hedging ratios of a variance swap can also be analytically derived; (2) numerical values can be very efficiently computed from the newly found analytic formula.

Keywords: variance swaps; stochastic volatility; Ornstein-Uhlenbeck process; closed-form exact solution.

Path-Dependent Partial Integro-Differential Equations

Christian KELLER, University of Southern California, USA

We extend the notion of viscosity solutions for path-dependent PDEs, introduced in my joint work with Ekren, Touzi, and Zhang, to path-dependent partial integro-differential equations (PPIDEs). We establish well-posedness for a class of semilinear PPIDEs with uniformly continuous data. Existence follows relatively easily from a probabilistic representation by solutions of non-Markovian Backward SDEs with jumps. Our uniqueness proof relies on optimal stopping theory and the existence of classical solutions to Cauchy-Dirichlet problems involving (state-dependent) partial integro-differential equations that approximate the PPIDE under consideration. The results and their extensions are potentially useful for Finance problems in non-Markovian jump-diffusion models.

Building Time-dependent Commodity and Energy Derivative Models: An Additive Time Change Approach

Lingfei LI, Department of Systems Engineering and Engineering Management, The Chinese University of Hong Kong, People's Republic of China

We characterize Ornstein-Uhlenbeck processes time changed with additive subordinators as time-inhomogeneous Markov semimartigales, based on which a new class of commodity and energy derivative models with time-dependent and mean-reverting jumps is developed. Analytical solutions are obtained for European and Bermudan futures options via eigenfunction expansions, with American option prices computed efficiently by extrapolating Bermudan option prices. Calibration examples show that these new models are better alternatives than those developed in Li and Linetsky ("Time-changed Ornstein-Uhlenbeck processes and their applications in commodity derivative models", Mathematical Finance, 2012) by being much more parsimonious and faster for option pricing while calibrating very well to implied volatility surfaces. Our method can be applied to many other processes popular in finance to develop time-inhomogeneous Markov models with desirable features and tractability.

Keywords: commodity and energy derivatives, time change, additive subordinators, time-dependent and mean-reverting jumps, eigenfunction expansions.

Volatility Swaps and Volatility Options on Discretely Sampled Realized Variance

Andy Guanghua LIAN, School of Commerce, Division of Business, University of South Australia, Australia

Volatility derivatives such as variance swaps, variance options and volatility swaps are financial products written on discretely sampled realized variance. Actively traded in over-the-counter markets, these products are priced often by the continuously sampled approximation to simplify the computations. This paper presents an analytical approach to efficiently and accurately price discretely sampled volatility derivatives, and then analyzes the effect of continuous sampling approximation. Under the Heston stochastic volatility model, we first obtain an accurate approximation for the characteristic function of the discretely sampled realized variance. This characteristic function is then applied to derive semi-analytical (up to inverse Laplace transform) pricing formulae for variance options, volatility swaps and volatility options. We examine with numerical examples the accuracies of the approach in pricing these volatility derivatives. We also test the effect of discrete sampling in pricing volatility derivatives. For realistic contract specifications and model parameters, we find that continuously sampled variance swaps and options are commonly cheaper than their discretely sampled counterparts. Continuously sampled volatility swaps, surprisingly, are more expensive than their discretely sampled counterparts.

Keyword: Variance swaps, Variance options, Stochastic volatility, Characteristic function

J.E.L. Classification. D81, G13.

Authors: Andy Guanghua Lian, School of Commerce, Division of Business, University of South Australia; Carl Chiarella, Finance Discipline Group, Business School, University of Technology, Sydney, Australia; Petko S. Kalev, School of Commerce, Division of Business, University of South Australia

Mean-variance Hedging on Uncertain Time Horizon in a Market with a Jump

Thomas LIM, Laboratoire d'Analyse et Probabilités, Université d'Evry and ENSIIE

In this work, we study the problem of mean-variance hedging with a random horizon $T \wedge \tau$, where T is a deterministic constant and τ is a jump time of the underlying asset price process. We first formulate this problem as a stochastic control problem and relate it to a system of BSDEs with a jump. We then provide a verification theorem which gives the optimal strategy for the mean-variance hedging using the solution of the previous system of BSDEs. Finally, we prove that this system of BSDEs admits a solution via a decomposition approach coming from filtration enlargement theory.

Keywords: Mean-variance hedging, Backward SDE, random horizon, jump processes, progressive enlargement of filtration, decomposition in the reference filtration.

AMS subject classification: 91B30, 60G57, 60H10, 93E20.

Authors: Idris Kharroubi, CERAMADE, Université Paris Dauphine; Thomas Lim, Laboratoire d'Analyse et Probabilités, Université d'Evry and ENSIIE; Armand Ngoupeyou, Laboratoire de Probabilités et Modèles Aléatoires, Université Paris 7

Stochastic Dominance via Quantile Regression with Applications to Investigate Arbitrage Opportunity and Market Efficiency

Pin NG, Franke College of Business, Northern Arizona University

Tests for stochastic dominance constructed by translating the inference problem of stochastic dominance into parameter restrictions in quantile regressions are proposed. They are variants of the one-sided Kolmogorov-Smirnoff statistic with a limiting distribution of the standard Brownian Bridge. Simulation results show their superior size and power. They are applied to the NASDAQ 100 and S&P 500 indices to investigate dominance relationship before and after the major turning points. Results show no arbitrage opportunity between the bear and bull market, and markets are inefficient in that risk averters are better off by investing in the bull rather than the bear market.

Keywords: Quantile regression, Stochastic dominance, Brownian bridge, Internet bubble crisis, Sub-prime crisis.

JEL Classification: C01, C12, C31

Authors: Pin Ng, Franke College of Business, Northern Arizona University; Wing-Keung Wong, Department of Economics, Hong Kong Baptist University WLB, Shaw Campus, Hongkong; Zhijie Xiao, Department of Economics, Boston College, USA

Martingale Problems under Nonlinear Expectations

Chen PAN, Department of Mathematics, University of Science and Technology of China, People's Republic of China

In this work, we define the martingale problems under nonlinear expectations according to Stroock and Varadhan's classical ones. Then, in the light of Peng's (2005) idea about defining time consistent non-linear expectations, we derive the solution of the martingale problems based on viscosity solution theory for fully nonlinear parabolic PDEs. At last, as an application, we define the weak solutions to a class of *G*-SDEs, and give corresponding solutions.

Authors: Xin Guo, Department of Industrial Engineering and Operations Research, UC Berkeley, USA; Chen Pan Department of Mathematics, University of Science and Technology of China, People's Republic of China; Shige Peng, School of Mathematics, Shandong University, People's Republic of China

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Dynamic COMFORT: A Common Market Factor Non-Gaussian Returns Model with Dynamic Conditional Correlations

Marc S. PAOLELLA, Department of Banking and Finance, University of Zurich, Switzerland, & Swiss Finance Institute

A new multivariate time series model with various attractive properties is motivated and studied. By extending the CCC model in several ways, it allows for all the primary stylized facts of Financial asset returns, including volatility clustering, non-normality (excess kurtosis and asymmetry), and also dynamics in the dependency between assets over time. A fast EM-algorithm is developed for estimation. The predictive conditional distribution is a (possibly special case of a) multivariate generalized hyperbolic, so that sums of marginals (as required for portfolios) are tractable. Each element of the vector return at time t is endowed with a common univariate shock, interpretable as a common market factor, and this stochastic process has a predictable component. This leads to the new model being a hybrid of GARCH and stochastic volatility, but without the estimation problems associated with the latter, and being applicable in the multivariate setting for potentially large numbers of assets. Formulae associated with portfolio optimization, risk measures and option pricing based on the predictive density are developed. In-sample fit and out-of-sample conditional density forecasting exercises using daily returns on the 30 DJIA stocks confirm the superiority of the model to numerous competing ones. Extensions to the DCC and CCC Markov switching models are discussed, as well as extension to the stable Paretian and tempered stable distributional setting.

Authors: Marc S. Paolella and Pawel Polak, Department of Banking and Finance, University of Zurich, Switzerland & Swiss Finance Institute

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The Generation of Simple Linear Regression Model

Manachai RODCHUEN, Department of Statistics, Faculty of Science Chiang Mai University, Chiang Mai, Thailand

A simple linear regression model is the relationship between two variables. The value of one variable can estimate or predict based on the relationship with the other variable. For specified problem in linear regression model such as outlier, multicollinearity and missing data, the solution cannot be proof using statistical theory. In recently, the computer simulations are used as a tool to provide the answer of the problems in practical. This article presents a method to generate the population values under the simple linear regression model in order to satisfy the specified correlation coefficient.

Keywords: simulation; regression; coefficient; correlation

Authors: Manachai Rodchuen and Puttpong Bookkamana, Department of Statistics, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand

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Why are Quadratic Normal Volatility Models Analytically Tractable?

Johannes RUF, Oxford-Man Institute of Quantitative Finance, University of Oxford, Oxford

We discuss the class of Quadratic Normal Volatility (QNV) models, which have drawn much attention in the financial industry due to their analytic tractability and exibility. We characterize these models as the ones that can be obtained from stopped Brownian motion by a simple transformation and a change of measure that only depends on the terminal value of the stopped Brownian motion. This explains the existence of explicit analytic formulas for option prices within QNV models in the academic literature. Furthermore, via a different transformation, we connect a certain class of QNV models to the dynamics of geometric Brownian motion and discuss changes of numeraires if the numeraire is modelled as a QNV process.

Keywords: Local volatility, Pricing, Foreign Exchange, Riccati equation, Change of numeraire, Local martingale, Semi-static hedging, Hyperination

Joint work with Peter Carr and Travis Fisher.

Conditional Heteroskedasticity of Return Range Processes

Yan SUN, Department of Mathematics & Statistics, Utah State University, U.S.A

Assets prices often show a significant variation within a small period of time. To take into account such short-term variations, along with the volatility over time, we propose an interval-valued GARCH (I-GARCH) model for analyzing the return range data. We present the statistical properties in the framework of random sets. We obtain sufficient conditions under which the I-GARCH model is covariance stationary, and give an explicit formula for the auto-correlation function. In addition, we propose a conditional least squares estimate (CLSE) for estimating the model parameters. Simulation studies support our theorems. Furthermore, we apply our I-GARCH model to analyze the daily log return range data of several Dow Jones component stocks and derive interesting and promising results. Especially, our model successfully captures a subtle type of high volatility that is typically underestimated by the classical (point-valued) GARCH models. We elaborate on the impact of these findings to financial practice.

Authors: Yan Sun, Department of Mathematics & Statistics, Utah State University, U.S.A; Jennifer Loveland, Department of Mathematics & Statistics, Utah State University, U.S.A

Calibration of Stochastic Volatility Models: A Tikhonov Regularization Approach

Ling TANG, National University of Singapore, Singapore

We aim to calibrate stochastic volatility models from option prices. We develop a Tikhonov regularization approach to recover the risk neutral drift and volatility terms of stochastic volatility. Numerical results and empirical studies are presented. In contrast to existing literature, we do not assume that the model has special structure.

This is a joint work with Min Dai and Xingye Yue.

Estimating and Backtesting Distortion Risk Measures

Hideatsu TSUKAHARA, Faculty of Economics, Seijo University, Japan

We have shown in our previous work that for a wide class of distortion functions, it is possible to construct an estimator for distortion risk measures (DRMs) with reasonable accuracy based on weakly dependent data. In this presentation, we first show that the estimator always has a negative bias and illustrate a bootstrap-based method for bias correction. The method will be shown to possess consistency under a certain regularity condition.

For a Monte Carlo simulation study, we consider a stochastic volatility (SV) model with inverse gamma AR(1) volatility process. Simulation results for estimating value-at-risk, expected shortfall and proportional odds risk measure under various values of the parameters show that the normal approximation, our asymptotic variance estimation and bias correction methods are working to a reasonable extent.

As a next step in financial risk management, we need to evaluate the accuracy of the model and/or estimation procedure for risk measurement. To this end, a simple backtesting procedure will be proposed for DRMs which can be made theoretically rigorous with i.i.d. data. We can also implement the conditional approach by McNeil and Frey with GARCH-type observations.

Tests for the Equality of Multiple Sharpe Ratios

John Alexander WRIGHT, Department of Statistics, The Chinese University of Hong Kong, Shatin, Hong Kong

In this talk we discuss tests for the equality of multiple Sharpe ratios. First we extend the multivariate Sharpe ratio statistic of Leung and Wong (2008) for the case when excess returns are independently and identically distributed (IID). We then provide a test that holds under the much more general assumption that the excess returns are stationary and ergodic, making use of the generalised method of moments and heteroskedasticity and autocorrelation consistent estimation of covariance matrices. As such, this test relies on the asymptotic distribution of the estimators concerned. In contrast, the method for pairwise comparison of Sharpe ratios put forward in Ledoit and Wolf (2008) is a bootstrap approach and we extend it to work for many Sharpe ratios. Comparisons are made between the two approaches, using simulated IID returns, time-series returns and real-world data in the form of iShares returns. We conclude that the bootstrap approach of Ledoit and Wolf (2008) is, in general, more accurate but it can be impractically time-consuming.

Authors: Wei Rosa Huang, John Alexander Wright, and Sheung Chi Philip Yam, Department of Statistics, The Chinese University of Hong Kong, Shatin, Hong Kong

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Implicit Incentives of Mutual Fund Flows and Liquidity Premia

Jing XU, National University of Singapore, Singapore

We study the optimal investment policy of an open-end equity fund manager who needs to deal with periodic and tradable money flows into and out of her fund. The fund manager invests in a benchmark portfolio and in an alternative risky asset. We assume that trading on the alternative asset incurs transaction costs, while trading on the benchmark is costless. We assume a positive and convex sensitivity of fund flows to relative past performance, which gives the manager implicit incentives to gamble to finish ahead of the benchmark. We show that such implicit incentives significantly increase the frequency and volume of endogenous trading of the fund manager, while keeping her exogenous trading, which is imposed by the flows themselves, at negligible levels. As a result, if the fund manager is the marginal investor in the alternative asset, transaction costs can have a strong first-order effect on the liquidity premium of that asset.

This is a joint work with Min Dai and Luis F Gonclaves-Pinto

Financial Stochastic Differential Equations

Behnam ZARPAK, Shahed University, Tehran, Iran

ARIMA, GARCH and Neural Network are important discrete time models for financial time series data. But in this paper we have considered stochastic differential equation for discrete sample data. One advantage of this model is to work with a huge data. We have used maximum likelihood estimation with an explicit formula in Black-Scholes equation. Finally data analysis have shown with a specify financial data.

Keyword: Stochastic Differential Equation, Maximum Likelihood Estimation, Black-Scholes Differential Equation, Data Analysis.

Study on Multiple Attribute Decision Making Problems Based on D-S Evidence Theory and Hypercube Segmentation

Fang Wei ZHANG, School of Transportation, Southeast University, and Faculty of Science, Huzhou Teachers College

The theory of multiple attribute decision making (MADM) is an important branch of modern decision sciences. Uncertain MADM is the extending and development of classical theory in MADM. In this speech, the necessity, the feasibility and the application of combining D-S evidence theory with hypercube segmentation in multiple attribute decision making is studied. The main innovation of our research is that three methods are proposed based on the combination of evidence theory and hypercube segmentation. The first method is proposed for solving the multiple attribute decision making problems with normal random variables; the second method is for uncertain multiple attribute group decision making problems; the third method deals with two-people multiple attribute decision making problems. At last, a brief summary of this research is offered, the application and prospect of our main results is introduced.

Keywords: Multiple attribute decision making; D-S evidence theory; Hypercube segmentation; Numerical simulation.

INFORMATION

Committee | Logistics | General | Zonal Map

Committee

ORGANIZING COMMITTEE

Min DAI (National University of Singapore, Singapore)

Steven KOU (National University of Singapore, Singapore)

Tze Leung LAI (Stanford University, USA)

Logistics

LECTURE VENUES

Plenary lecture will take place in Lecture Theatre 34 (level 3, block S17). The duration for each plenary lecture is 45 minutes (including discussion time).

Parallel sessions of invited and contributed talks will take place in seminar room S17-04-05 and S17-04-06 (level 4, block S17). The duration for each invited talk and contributed talk is 30 minutes and 25 minutes, respectively (including discussion time).

The lecture theatres are equipped with desktop computer connected to LCD projector, projector screen, visualizer, overhead projector, white board, and separate connection for personal notebook/laptop.

MEALS

Tea breaks, served buffet-style at the foyer of the lecture theatre, are catered from a Halal-certified supplier. Usually some of the food items would be suitable for vegetarians.

Lunch and dinner are not included. Nevertheless, a wide variety of food at affordable prices (from S$2.00) is available in the non-air-conditioned canteen and air-conditioned cafe near the venue for talks. More canteens, fast food outlets and restaurants are found in other parts of the campus (refer to Zonal Map). Some are less than 10-minutes' walk away from the conference venue while some are accessible by internal shuttle bus. Some stalls may open as early as 7.30am and close as late as 8.00pm. Halal and Vegetarian options are available in all canteens on campus.

INTERNET ACCESS & USE OF COMPUTERS

A computing lab (S17-03-02) will be open for participants' access during the event period. It is located at level 3 of block S17 and consists of 42 desktop units that are internet-ready and installed with Windows 7, standard Microsoft Office applications, SSH, Adobe Reader, MATLAB. Limited WI-FI accounts would also be made available during event period for the convenience of those using personal notebook/laptop.

Operating hours: 8.30am – 6.00pm (Wednesday – Thursday)
8.30am – 5.30pm (Friday)

Participants will have to request for account name and password to use either the computer in the computing lab, or for WI-FI access on their own notebook/laptop. Approach the IT support staff for account name and password.

FAX SERVICE

Participants who wish to send faxes may do so at the general office of the Department of Mathematics (level 4, block S17). This service is chargeable at a flat rate of S$0.50 per page.

Operating hours: 8.30am – 6.00pm (Monday – Thursday)
8.30am – 5.30pm (Friday)

GETTING AROUND NUS

The internal shuttle buses A, B, C and D (free-of-charge) serve the Kent Ridge campus.

Bus A1 and A2 cover substantial parts of the campus. A1 stops outside Kent Ridge MRT station, near NUH Staff Canteen and opposite S17 while A2 stops outside S17, opposite NUH Staff Canteen and opposite Kent Ridge MRT station.

Bus B is a loop service that serves Kent Vale and the other part of the campus. It does not stop at or anywhere near S17.

Bus C is a loop service that serves Kent Vale. It stops in front of and opposite S17.

Bus D is a loop service that serves the University Town. D1 stops in front of S17 while D2 stops opposite S17.

The public bus SBS95 stops at the same stops as A1 and A2 between S17 and Kent Ridge MRT station. It also stops near and opposite Buona Vista MRT station (which is off-campus).

LIBRARIES

There are seven multi-disciplinary and special libraries in NUS. The Central Library, for instance, is a multi-disciplinary library with a collection that covers architecture, building and real estate, engineering & technology, arts, humanities and social sciences. The Science Library is a special library that holds collections covering primarily the biological sciences, chemistry, computer science, mathematics, statistics & applied probability, materials science and physics. The Science/Medical Library is located on levels 3 to 6, block S6. All libraries are controlled by smart-card access but a special arrangement has been made to allow workshop participants to enter the libraries with their name tags during the workshop period (also need to complete a form on-site and provide Passport Number for record tracking). Participants may browse/read the materials in the library without loan privileges.

Operating hours of the libraries during workshop period:

Science/Medical/Central Libraries:	8.30am – 7.00pm (Monday – Friday) 8.30am – 5.00pm (Saturday)
Hon Sui Sen Memorial Library:	8.30am – 6.00pm (Monday – Friday) 8.30am – 5.00pm (Saturday)
Music Library:	8.30am – 6.00pm (Monday – Friday)

General

PUBLIC TRANSPORTATION

The public transport network in Singapore consists of bus, MRT (Mass Rapid Transit), LRT (Light Rail Transit) and taxi. Buses and MRTs are the most affordable modes of public transport with standard fares ranging from S$1.00 to S$2.20 (depending on distance). Bus fares are charged on board by tapping a stored-value card or paying the exact fare in Singapore currency to the driver.

MRT fare is paid by tapping a Stored Value Card or a Standard Ticket at the gantry. The Standard Ticket can be used up to six times within 30 days from the date of purchase. The purchase price includes a deposit of 10 cents and this is automatically refunded on the travel fare of the third trip. A user also enjoys a 10-cent discount on the sixth trip. The Standard Ticket can be purchased at the General Ticketing Machine (GTM) at all MRT and LRT stations. LRTs are only available in selected residential neighbourhoods and operate similarly as MRTs.

Typically, the first bus and train starts running at 5.30am and the last service is 11.30pm daily. Special night bus services with specific routes that charge a flat rate of S$3.00/S$3.50 are available from 11.30pm to 4.30am on Fridays, Saturdays and eves of Public Holidays.

Taxis can be flagged down 24 hours a day on most roads or at taxi-stands outside most major shopping centres and hotels. There is no need to bargain for prices as the taxis are all metered. The basic fare consists of a flag-down fare and a metered fare. The flag-down fare for the first kilometer is between S$3.00 and S$5.00, depending on the type of taxi (regular or premium). The metered fare after the first kilometer is based on the distance and waiting times during the journey. Additional charges may also be incurred depending on the time of travel and origin of the journey. A detailed rates guide is posted on the rear door of each taxi for reference.

More information on public transport can be found at:
(www.publictransport.sg/content/publictransport/en/homepage/CommutersGuide.html).

GETTING TO THE AIRPORT

The easiest way to get to the airport is by taxi. For reference, the journey from NUS with smooth traffic would take about 30 minutes and cost about S$25.00 without surcharge. Surcharges may be incurred depending on time of travel and if the taxi was pre-booked via phone.

To get to the airport by MRT (Mass Rapid Transit), connect to the East-West line (green line) going in the direction of Pasir Ris/Changi Airport. The Changi Airport MRT station is located under Terminals 2 and 3 which are connected to Terminal 1 by sky train. A one-way MRT fare from Kent Ridge station is about S$2.30 (using the Standard Ticket) and takes approximately 57 minutes. More Information on MRT Network Map and fare can be found at:
http://www.smrt.com.sg/Trains/NetworkMap.aspx

FOOD & SHOPPING

Food centres and food courts serving local, Asian and sometimes international cuisine at affordable prices are commonly found in neighbourhoods and shopping malls. There would usually be at least one each of Halal and vegetarian stalls in most establishments. Operating hours of the stalls vary but most of them open by 10am and close by 9pm.

Restaurants and cafes are usually found in shopping malls and bigger neighbourhoods. Operating hours depend on the types of meals served but most would be open between 11.00am and 9.00pm.

Most shopping malls in Singapore operate from 11.00am to 10.00pm every day.

BANK SERVICES & FOREIGN EXCHANGE

Participants may use major credit cards to withdraw cash using the Auto Teller Machines, which can be found in various locations on campus. Alternatively, the local banks offer regular banking services including processing foreign exchange and traveler's cheques. The nearest branches are:

DBS (Holland Village Branch)
Address: 257 Holland Avenue, Singapore 278984
Operating hours: 8.30am – 4.30pm (Monday – Friday)
8.30am - 1.00pm (Saturday)

DBS/POSB (NUS Remix Branch)
Address: 31 Lower Kent Ridge Road, #01-02 Yusof Ishak House, Singapore 119078
Operating hours: 8.30 AM - 4.30 PM (Monday to Friday)
8.30 AM - 1.00 PM (Saturday)
Only Personal Banking Services are available. Demand Draft and Remittance services are not available. All cash transactions must be made at Automated Teller Machines.

POSB (Buona Vista Branch)
Address: Blk 43 Holland Drive #01-59, Singapore 270043
Operating hours: 8.30am – 4.30pm (Monday – Friday)
8.30am - 1.00pm (Saturday)

UOB (Holland Village Branch)
Address: 211 Holland Avenue, #01-12 Holland Road Shopping Centre, Singapore 278967
Operating hours: 9.30am – 4.00pm (Monday – Friday)
9.00am - 12.30pm (Saturday)

PHONES & STAMPS

Public pay phones (cash and card) are available next to the male toilet at the foyer of Lecture Theatre 27 (opposite block S17). Pay phone cards and postage stamps can be purchased at the co-op below Lecture Theatre 27. Other goods and services available at the co-op include books, stationery, sundries and photocopying.

Operating hours (co-op): 9.00am – 6.00pm (Monday – Friday)

The Kent Ridge Post Office at Yusof Ishak House (three bus-stops from LT 27) provides a more comprehensive postal service.

Operating hours: 8.30am – 5.00pm (Monday – Friday)
8.30am – 1.00pm (Saturday)

USEFUL PHONE NUMBERS

Taxi (for current and advanced booking):

Company	Telephone	Colour of vehicle
CityCab	65521111	Yellow
Comfort Taxi	65521111	Blue
Premier Taxis	63636888	Silver
Prime Taxis	67780808	Copper (regular service); Blue (limousine service)
Smart Cab	64857777	Green (regular service); White (supreme service)
SMRT Taxis	65558888	White
Trans Cab	65553333	Red
Yellow Top Taxis	62935545	Yellow top with black body

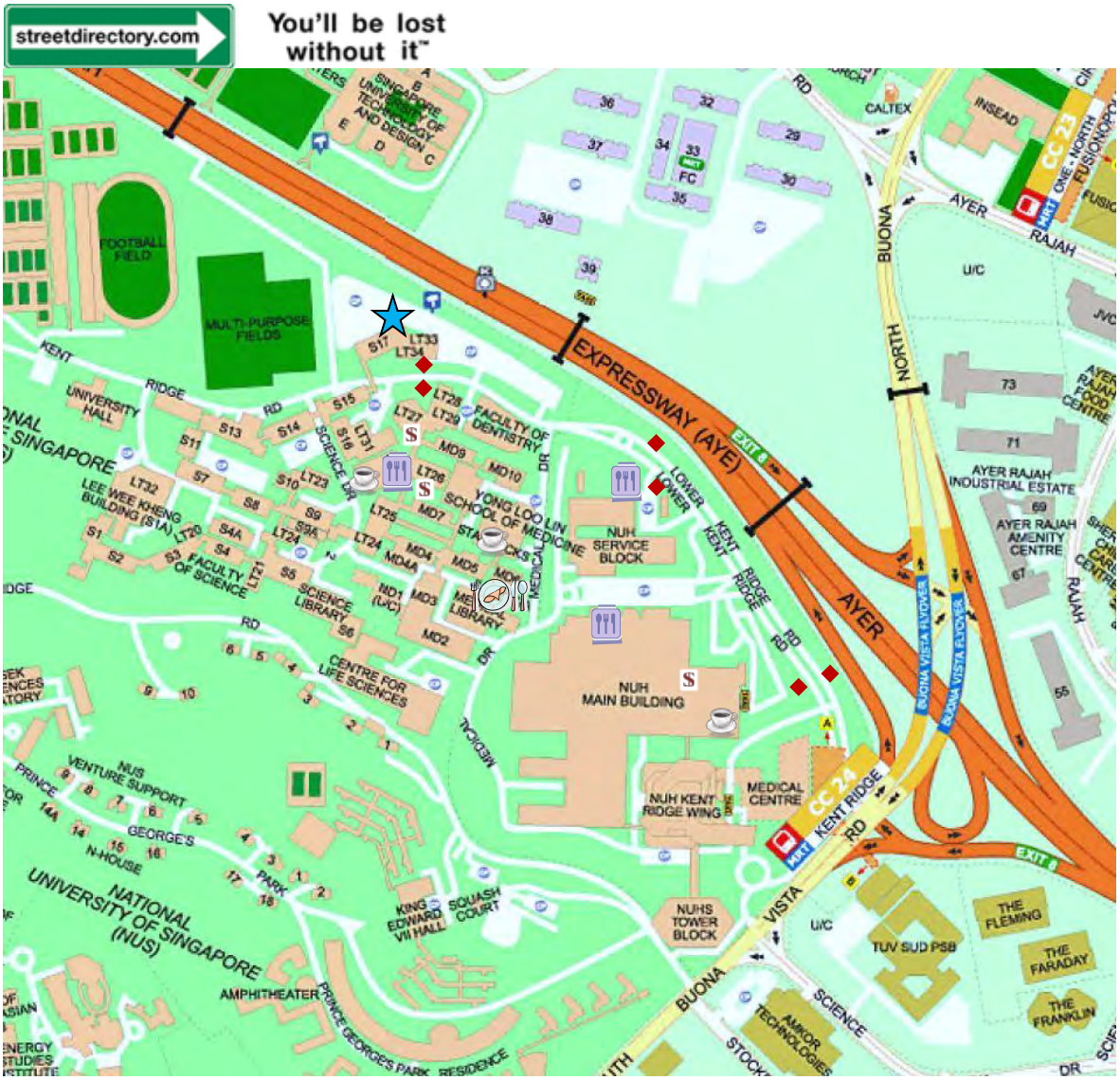
Local Emergency Services for Credit Cards:

American Express	62991997
Diner's Club Singapore	64160800 (during office hours); 64160800 (after office hours)
MasterCard	800-1100-113
Visa	800 4481 250

Others:

Tourist Information	1800-7362000
24-hour Flight Enquiry (Changi Airport)	1800-5424422
Buona Vista Neighbourhood Police Post	1800-7779999
Police Emergency	999
Non-emergency Ambulance	1777
Fire Engine/Ambulance	995

Zonal Map



Map powered by Streetdirectory.com

Workshop venue (S17)

Bus-stop

Canteen/Food Court

Restaurant

Coffee joints (Starbucks at School of Medicine; Spinelli at Science canteen; The Coffee Bean at NUH)

Auto Teller Machine