International Conference on Financial Risks and Uncertainties

August 27, 2016 (Sat) 9:30 – 17:30
August 28, 2016 (Sun) 10:00 – 17:15

Hotel Oacity Kyowa in Miyakojima, Okinawa, Japan

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Organized by
Research Project at KIER Joint Usage and Research Center,
"Analysis of capital market with model uncertainty",
Institute of Economic Research, Kyoto University.

Co-organized by
Japanese MEXT Grants-in-Aid for Scientific Research (A) # 25245046.
Credit Pricing Corporation (CPC).

Official website: `https://sites.google.com/site/miyakojimaconf/`

August 27 (Sat)

9:30–9:45 Opening address

Session 1

9:45–10:30 Chen Nan The Chinese University of Hong Kong
"An Optimization View of Financial Systemic Risk Modeling:

10:30–11:15 Kazuhiro Yasuda Hosei University
"On Classical and Restricted Impulse Stochastic Control for the Exchange Rate"

11:15–12:00 Hitoshi Hayakawa Hokkaido University
"Monetary Asset Bubble"

Session 2

13:30–14:15 Kazutoshi Yamazaki Kansai University
"Parisian reflection and applications in insurance and credit risk"

14:15–15:00 Lingfei Li The Chinese University of Hong Kong
"Error Analysis of Finite Difference and Markov Chain Approximations for Option Pricing"

Session 3

15:15–16:00 Sebastian Jaimungal University of Toronto
"Mean-Field Games and Systemic Risk with Ambiguity Aversion"

16:00–16:45 Christopher Ting Singapore Management University
"Fully Model-Free Approach to the Term Structures of Financial Uncertainties"

16:45–17:30 Tomonori Nakatsu Ritsumeikan University
"An integration by parts type formula for stopping times and its application"

August 28 (Sun)

10:00–17:00 Reports and discussions on recent developments
on the analysis of capital markets with model uncertainty

17:00–17:15 Closing address

August 27, 9:45–10:30

An Optimization View of Financial Systemic Risk Modeling: The Network Effect and the Market Liquidity Effect

Chen Nan

The Chinese University of Hong Kong

Financial institutions are interconnected directly by holding debt claims against each other (the network channel), and they are also bound by the market liquidity in selling assets to meet debt liabilities when facing distress (the liquidity channel). The goal of our study is to investigate how these two channels of risk interact to propagate individual defaults to a system-wide catastrophe. We formulate the model as an optimization problem with equilibrium constraints and derive a partition algorithm to solve for the market-clearing equilibrium. The solutions so obtained enables us to identify two factors, the network multiplier and the liquidity amplifier, to characterize the contributions of these two channels to financial systemic risk, whereby we can acquire better understanding of the effectiveness of several policy interventions. The analysis behind the algorithm yields estimates for the contagion probability on the basis of the market value of the institutions' net worths, underscoring the importance of equity capital as a cushion against systemic shocks in the presence of the liquidity channel. The optimization formulation also provides more structural insights to allow us to extend the study of systemic risk to a system with debts of different seniorities, and meanwhile presents a close connection to the literature of stochastic networks. Finally, we illustrate the impacts of the network and the liquidity channels – in particular, the significance of the latter – in the formation of systemic risk with data on the European banking system.

August 27, 10:30–11:15

On Classical and Restricted Impulse Stochastic Control for the Exchange Rate

Kazuhiro Yasuda

Hosei University

Our problem is motivated by an exchange rate control problem with a finite horizon, where the control is composed of a direct impulsive intervention and an indirect, continuously acting intervention given by the control of the domestic interest rate. By suitably restricting the class of impulse controls, we give a fully analytical solution of the value function, boundaries of intervention and amounts of intervention. We also illustrate features of our solution through numerical experiments. Joint work with G. Bertola and W. J. Runggaldier.

August 27, 11:15–12:00

Monetary Asset Bubble

Hitoshi Hayakawa

Hokkaido University

This paper introduces a novel dynamic general equilibrium model with fiat money, where the setting of decentralized markets provides a micro-foundation of money as the media of exchange. Using the model, asset bubble is shown to be a consequence of two sequential monetary dynamics. The first dynamics is brought by a payment technology shock, where payments are made in a more efficient order. The second dynamics is brought by a financial technology shock, which allows net payments in asset markets. In the view of purchasing power distribution, asset bubble exacerbates inequality in the sense that it effectively serves as regressive transfers."

August 27, 13:30–14:15

Parisian reflection and applications in insurance and credit risk

Kazutoshi Yamazaki

Kansai University

We consider a company that receives capital injections so as to avoid ruin. Differently from the classical bail-out settings where the underlying process is restricted to stay at or above zero, we study the case bail-out can only be made at independent Poisson times. Namely, we study a version of the reflected process that is pushed up to zero only on Poisson observation times at which the process is below zero. We also study the case with additional classical reflection above so as to model a company that pays dividends according to a barrier strategy. Focusing on the spectrally one-sided Levy case, we compute, using the scale function, various fluctuation identities including capital injections and dividends.

August 27, 14:15–15:00

Error Analysis of Finite Difference and Markov Chain Approximations for Option Pricing

Lingfei Li

The Chinese University of Hong Kong

Mijatovic and Pistorius (Math. Finance, 2013) proposed an efficient Markov chain approximation method for pricing European and barrier options in general one-dimensional Markovian models, however sharp convergence rates of this method for realistic financial payoffs which are non-smooth are rarely available. In this paper, we solve this problem for general one-dimensional diffusion models, which play a fundamental role in financial applications. For such models, the Markov chain approximation method is equivalent to the method of lines using central difference. Our analysis is based on the spectral representation of the exact solution and the approximate solution. By establishing the convergence rate for the eigenvalues and the eigenfunctions, we obtain sharp convergence rates for the transition density and the price of options with non-smooth payoffs. In particular, we have shown that for call/put-type payoffs, convergence is second order, while for digital-type payoffs, convergence is only first order in general. Furthermore, we provide theoretical justification for two well-known smoothing techniques that can restore second order convergence for digital-type payoffs and explain oscillations observed in the convergence for options with non-smooth payoffs. As an extension, we also establish sharp convergence rates for European options in a rich class of Markovian jump models constructed from diffusions via subordination. The theoretical estimates are confirmed by numerical examples.

August 27, 15:15–16:00

Mean-Field Games and Systemic Risk with Ambiguity Aversion

Sebastian Jaimungal

University of Toronto

Banks decisions to borrow from and lend to the central bank affect the overall stability of the financial markets. In this paper, following Carmona, Foque and Sun (2015), we study a game theoretic framework for how banks modify their optimal decisions when they incorporate the aggregate behaviour of all banks. Here, we add in the effect that model ambiguity has on the Nash equilibrium for the finite game as well as its mean-field variation. In both cases, we demonstrate that, in equilibrium, as ambiguity aversion increases banks tend to follow the aggregate behaviour more closely. Hence, the probability that any one bank defaults is reduced when banks base their decisions acknowledging that their models have uncertainty.

August 27, 16:00–16:45

Fully Model-Free Approach to the Term Structures of Financial Uncertainties

Christopher Ting

Singapore Management University

Wall Street's fear gauge, VIX, has become the standard volatility index to measure the level of fear (risk aversion). In this paper, we present a fully model-free method to construct the volatility indexes and their term structures. The method is fully model-free in that no option pricing model is involved in all stages of the computation. Being fully model-free, a big advantage is that practitioners do not have to worry about the elusive model risk. The method is also numerically exact and provides a basis for computing the variance risk premiums more accurately. Using the fully model-free method, we construct the term structures of volatilities as indicators of financial uncertainties in the banking and commodity sectors.

August 27, 16:45–17:30

An integration by parts type formula for stopping times and its application

Tomonori Nakatsu

Ritsumeikan University

In this talk, we shall prove an integration by parts (IBP) type formula for stopping times. In order to obtain the formula, we will first construct a process which works as if it is an "alarm clock" telling us whether the stopping times are already achieved or not. Then, we shall use the Girsanov theorem. Applications of the formula to the numerical computation of the risk called the delta for options depending on the stopping times will be also considered.