JAFEE-ISM International Symposium:

In Celebration of 30th Anniversary of the Foundation of JAFEE

(Revised Version, as of August 3)

Dates
August 18 (Fri) and 19 (Sat), 2023

Venue
Surugadai Campus, Chuo University 3-11-5 Kandasurugadai, Chiyoda-ku, Tokyo 101-8324, Japan
https://www.chuo-u.ac.jp/english/visit/surugadai/

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Invited Speakers

Plenary session:

Beatrice Accaio (ETH Zurich), Richard Davis (Columbia University), Freddy Delbaen (ETH Zurich, emeritus), Marie Kratz (ESSEC Business School), Shigeo Kusuoka (University of Tokyo, emeritus), Doojin Ryu (Sungkyunkwan University)

Parallel session:

Henry Chiu (Imperial College London), Pierre Del Moral (INRIA), Jin-Chuan Duan (National University of Singapore), Emmanuel Gobet (Ecole Polytechnique), Mei-Hui Guo (National Sun Yat-sen University), Tomoyuki Ichiba (University of California, Santa Barbara), Ajay Jasra (KAUST), Hyeongjun Kim (Yeungnam University), Takuya Kiriu (Osaka University), Hyeng Keun Koo (Ajou University), Daisuke Kurisu (University of Tokyo), Andrew Lim (National University of Singapore), Alex McNeil (University of York), Stefan Mittnik (Ludwig-Maximilians-University Munich, emeritus), Seongju Moon (Gyeongsang National University), Teppei Ogihara (University of Tokyo), Marc Paollela (University of Zurich), Hyungbin Park (Seoul National University), Jun Sekine (Osaka University), Julian Sester (National University of Singapore), Soo Young Song (Chung-Ang University), Marko Weber (National University of Singapore), Kazuhiro Yasuda (Hosei University), Ju-Yi Yen (University of Cincinnati)

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August 18 (Friday)

9:00-10:00	Registration	
	Room 401	
10:00-10:10	Presidential address	
10:10-10:50	Keynote talk 1 (Chair: Hideatsu Tsukahara) Richard Davis (Columbia University) *Time series estimation of the dynamic effects of disaster-type shocks*	
10:50-11:00	Break	
11:00-11:40	Keynote talk 2 (Chair: Hideatsu Tsukahara) Shigeo Kusuoka (University of Tokyo, emeritus) *Machine learning and regularization function*	
11:40-13:10	Lunch break	
	Room 802	**Room 803**
	Session 1 (Chair: Yuji Yamada)	Session 2 (Chair: Toshinao Yoshiba)
13:10-13:40	Marko Weber (National University of Singapore) *Holding stocks, trading bonds*	Emmanuel Gobet (Ecole Polytechnique) *Structured dictionary learning of rating migration matrices for credit risk modeling*
13:40-14:10	Julian Sester (National University of Singapore) *Robust deep hedging*	Jin-Chuan Duan (National University of Singapore) *Machine learning interpretable models via sequential Monte Carlo optimization*
14:10-14:40	Henry Chiu (Imperial College London) *Mathematical finance without probability*	Alex McNeil (University of York) *Vine-copula models for financial and macroeconomic time series*

14:40-15:15	Coffee break at *Good View Dining* on the 19th floor of Surugadai Campus building	
	Session 3 (Chair: Kazuhiro Yasuda)	Session 4 (Chair: Takaki Hayashi)
15:15-15:45	Hyungbin Park (Seoul National University) *A sensitivity analysis of the long-term expected utility of optimal portfolios*	Hyeng Keun Koo (Ajou University) *An anticipatory social preference with sustainability constraint*
15:45-16:15	Jun Sekine (Osaka University) *Many-player stochastic games under Epstein-Zin preferences and relative performance criteria*	Stefan Mittnik (Ludwig Maximilians University Munich, emeritus) *A risk-based investment strategy for funded pension plans with intergenerational payout smoothing*
16:15-16:45	Tomoyuki Ichiba (University of California Santa Barbara) *Stochastic differential games on random directed networks*	Marc Paollela (University of Zurich) *Momentum without crashes*
16:45-17:00	Break	
	Room 401	
17:00-17:40	Keynote talk 3 (Chair: Yuri Imamura) Doojin Ryu (Sungkyunkwan University) *Financial market microstructure and beyond*	
18:00-	Reception at *Good View Dining* on the 19th floor of Surugadai Campus building	

August 19 (Saturday)

9:00-10:00	Registration	
	Room 401	
10:00-10:40	Keynote talk 4 (Chair: Jiro Akahori) Marie Kratz (ESSEC Business School) *Automatic threshold selection for extreme value regression models of tail risks*	
10:40-10:50	Break	
10:50-11:30	Keynote talk 5 (Chair: Jiro Akahori) Beatrice Accaio (ETH Zurich) *Quantifying arbitrage*	
11:30-13:10	Lunch break	
	Room 802	**Room 803**
	Session 5 (Chair: Yuta Koike)	KAFE Session 1 (Chair: Teruo Nakatsuma)
13:10-13:40	Mei-Hui Guo (National Sun Yat-sen University) *Dynamic portfolio strategy utilizing network-based approaches*	Soo Young Song (Chung-Ang University) *Forecasting student loan credit recovery with machine learning approaches*
13:40-14:10	Ju-Yi Yen (University of Cincinnati) *Mathematical analysis of automated market makers*	Takuya Kiriu (Osaka University) *The impact of macroeconomic announcements on risk, preference, and risk premium*
14:10-14:40	Teppei Ogihara (University of Tokyo) *Asymptotically efficient parameter estimation for jump-diffusion processes*	Seongju Moon (Gyeongsang National University) *The dynamic relation between economic policy uncertainty and stock market volatility in two countries: United States and S. Korea*

14:40-15:15	Coffee break at *Good View Dining* on the 19th floor of Surugadai Campus building	
	ISM Session (Chair: Kengo Kamatani))	KAFE Session 2 (Chair: Doojin Ryu)
15:15-15:45	Pierre Del Moral (INRIA) *A backward Ito-Ventzell formula with an application to stochastic interpolation*	Kazuhiro Yasuda (Hosei University) *An optimal consumption and investment problem with an exponential utility under a stochastic factor model*
15:45-16:15	Ajay Jasra (KAUST) *Unbiased estimation using underdamped Langevin dynamics*	Daisuke Kurisu (University of Tokyo) *Adaptive deep learning for nonlinear time series models*
16:15-16:45	Andrew Lim (National University of Singapore) *Optimal trade execution and learning when price impact is uncertain*	Hyeongjun Kim (Yeungnam University) *Forecasting student loan credit recovery with machine learning approaches*
16:45-17:00	Break	
	Room 401	
17:00-17:40	Keynote talk 6 (Chair: Jun Sekine) Freddy Delbaen (ETH Zurich, emeritus) *Insurance premiums when default is taken into account*	
17:40-17:50	Closing address	

JAFEE-ISM International Symposium: Abstract

August 18, 2023 (Fri)

10:10-10:50 Keynote talk 1, Room 401

Time series estimation of the dynamic effects of disaster-type shocks

Richard Davis (Columbia University)

This paper provides three results for SVARs under the assumption that the primitive shocks are mutually independent. First, a framework is proposed to accommodate a disaster-type variable with infinite variance into a SVAR. We show that the least squares estimates of the SVAR are consistent but have non-standard asymptotics. Second, the disaster shock is identified as the component with the largest kurtosis. An estimator that is robust to infinite variance is used to recover the mutually independent components. Third, an independence test on the residuals pre-whitened by the Choleski decomposition is proposed to test the restrictions imposed on a SVAR. The test can be applied whether the data have fat or thin tails, and to over as well as exactly identified models. Three applications are considered. In the first, the independence test is used to shed light on the conflicting evidence regarding the role of uncertainty in economic fluctuations. In the second, disaster shocks are shown to have short term economic impact arising mostly from feedback dynamics. The third uses the framework to study the dynamic effects of economic shocks post-covid. (This is joint work with Serena Ng.)

11:00-11:40 Keynote talk 2, Room 401

Machine learning and regularization function

Shigeo Kusuoka (University of Tokyo, emeritus)

The regularization is used to avoid overfitting in machine learning or in statistics. However, as far as the author knows, it is not discussed what kind of regularization function is suitable. The author discusses this question from the view point of uniform law of large number.

13:10-14:40 Session 1, Room 802

Holding stocks, trading bonds

Marko Weber (National University of Singapore)

In an economy with random growth, several long-lived agents with heterogeneous risk aversions, time-preferences, and personal income streams make consumption and investment decisions, trading stocks and a consol bond, and borrowing from and lending to each other. We find in closed form equilibrium stock prices, interest rates, consumption, and trading policies. Agents do not trade stocks, although their returns are time-varying and predictable. Agents dynamically trade the consol bond in response to growth shocks, as to hedge their effect on interest rates, dividends, and personal incomes. Static fund separation holds if agents have also access to a linear bond and two additional hedges for dividend and growth shocks. Such additional assets can be dynamically replicated with the stock and the consol bond. No representative agent exists.

Robust deep hedging

Julian Sester (National University of Singapore)

We study pricing and hedging under parameter uncertainty for a class of Markov processes which we call generalized affine processes and which includes the Black-Scholes model as well as the constant elasticity of variance (CEV) model as special cases. Based on a general dynamic programming principle, we are able to link the associated nonlinear expectation to a variational form of the Kolmogorov equation which opens the door for fast numerical pricing in the robust framework. The main novelty of the paper is that we propose a deep hedging approach which efficiently solves the hedging problem under parameter uncertainty. We numerically evaluate this method on simulated and real data and show that the robust deep hedging outperforms existing hedging approaches in highly volatile periods. *(This is joint work with Eva Lütkebohmert and Thorsten Schmidt)*

Mathematical finance without probability

Henry Chiu (Imperial College London)

We present a pathwise approach to continuous-time finance based on causal functional calculus. Our framework does not rely on any probabilistic concept. We introduce a definition of continuous-time self-financing portfolios, which does not rely on any integration concept and show that the value of a self-financing portfolio belongs to a class of nonanticipative functionals, which are pathwise analogs of martingales. We show that if the set of market scenarios is generic in the sense of being stable under certain operations, such self-financing strategies do not give rise to arbitrage. We then consider the problem of hedging a path-dependent payoff across a generic set of scenarios. Applying the transition principle of Rufus Isaacs in differential games, we obtain a pathwise dynamic programming principle for

the superhedging cost. We show that the superhedging cost is characterized as the solution of a path-dependent equation. For the Asian option, we obtain an explicit solution. (Joint-work with Rama Cont)

13:10-14:40 Session 2, Room 803

Structured dictionary learning of rating migration matrices for credit risk modeling

Emmanuel Gobet (Ecole Polytechnique)

Rating Migration Matrix is a crux to assess credit risks. Modeling and predicting these matrices are then an issue of great importance for risk managers in any financial institution. As a challenger to usual parametric modeling approaches, we propose a new structured dictionary learning model with auto-regressive regularization that is able to meet key expectations and constraints: small amount of data, fast evolution in time of these matrices, economic interpretability of the calibrated model. To show the model applicability, we present a numerical test with real data and a comparison study with the widely used parametric Gaussian Copula model: it turns out that our new approach based on dictionary learning significantly outperforms the Gaussian Copula model.

Machine learning interpretable models via sequential Monte Carlo optimization

Jin-Chuan Duan (National University of Singapore)

Utilizing big data becomes realistic with machine learning. However, black-box machine learning typically fails to meet managerial needs and/or compliance requirements. Without any doubt, these important considerations can be better served by intepretable models, but such models are often ill-equiped to handle high-dimensional features. This talk is about expanding the realm of interpretable models with machine learning by sequential Monte Carlo (SMC) optimization. First, I will illustrate the general idea behind SMC optimization and show its working using a simple example. Next, I will demonstrate how to greatly improve the performance of a hedonic housing price model through finding an optimal stable subset of interpretable features from over 150,000 potential variables arising from interaction terms.

Background reading: "Sequential Monte Carlo optimization and statistical inference" Duan, J.-C., Li, S., & Xu, Y. (2022). Wiley Integrative Reviews: Computational Statistics, e1598.
https://doi.org/10.1002/wics.1598.

Vine-copula models for financial and macroeconomic time series

Alex McNeil (University of York)

We present some new approaches to modelling and forecasting macroeconomic and financial time series using stationary d-vine (s-vine) copula processes. We show how non-Gaussian extensions of ARMA processes can be constructed to model data that have non-Gaussian marginal distributions and/or non-Gaussian and non-linear serial dependence structures. We also show how these models can be combined with uniform-measure-preserving transformations known as v-transforms to construct processes for volatile financial return series which can outperform classical econometric models in certain cases. Methods will be illustrated with a variety of applications to data.

15:15-16:45 Session 3, Room 802

A sensitivity analysis of the long-term expected utility of optimal portfolios

Hyungbin Park (Seoul National University)

This paper discusses the sensitivity of the long-term expected utility of optimal portfolios for an investor with constant relative risk aversion. Under an incomplete market given by a factor model, we consider the utility maximization problem with long-time horizon. The main purpose is to find the long-term sensitivity, that is, the extent how much the optimal expected utility is affected in the long run for small changes of the underlying factor model. The eigenpair does not only characterize the long-term behavior of the optimal expected utility but also provides an explicit representation of the expected utility on a finite time horizon. We conclude that this eigenpair therefore determines the long-term sensitivity.

Many-player stochastic games under Epstein-Zin preferences and relative performance criteria

Jun Sekine (Osaka University)

In a multidimensional Black-Scholes model, Lacker and Soret (2020) studied the N-player stochastic game, where each competitive agent (eg., fund manager) maximizes the expected CRRA utilities of consumption streams and the terminal wealth with respect to the benchmarks, the averages among all agents. For the problem, the explicit expression of its Nash equilibrium was obtained, and, moreover, the mean-filed limit was computed, letting $N \to \infty$. In this talk, we pursue their exact analysis with the following generalizations: (i) Employing the Epstein-Zin recursive utility. (ii) Considering the agents' portfolio constraints. (iii) Employing a regime-switching model. The talk is based on a joint work with Assil Fadle of Ecole Polytechnique, Paris.

Stochastic differential games on random directed networks

Tomoyuki Ichiba (University of California, Santa Barbara)

We consider stochastic differential games on random directed networks with mean-field interactions, where the network of countably many players is formulated randomly in the beginning and each player in the network attempts to minimize the expected cost with a finite time horizon. Here, the cost function is determined by the network. Under the setup of the linear quadratic stochastic game with directed chain graph, we solve explicitly for an open-loop Nash equilibrium for the system and we find that the dynamics under the equilibrium is an infinite-dimensional Gaussian process associated with a Catalan Markov chain. We extend it to the random directed tree structure and discuss convergence results from the finite player game to infinitely many player game via Fourier transforms. This is joint work with Yichen Feng and Jean-Pierre Fouque.

15:15-16:45 Session 4, Room 803

An anticipatory social preference with sustainability constraint

Hyeng Keun Koo (Ajou University)

We propose a social preference with sustainability constraint. We take a Rawlsian perspective and impose a minimum welfare constraint for all future generations. Our preference is represented by a social utility function which has the future minimum welfare level as a component. Thus our preference is a anticipatory preference. We provide an optimal consumption and investment policies with such a preference.

A risk-based investment strategy for funded pension plans with intergenerational payout smoothing

Stefan Mittnik (Ludwig Maximilians University Munich, emeritus)

Interest in risk-adjusted investment strategies has grown in recent years as a result of major market crashes since the turn of the century, such as the dot-com bubble burst at the beginning of the century, the financial crisis of 2008, and the Corona Crash of 2020. Yet the systematic application of such strategies in practice is the exception rather than the rule. Here we present a risk-adjusted investment strategy in the context of a pension scheme with intergenerational risk sharing. In this scheme, the intergenerational transfer of market risk is realized through the establishment of a collective reserve fund, the inflows and outflows of which are managed through market risk. We show that the use of a risk-adjusted investment strategy can improve the performance of the pension system and while reducing the risk of a negative reserve in times of market crisis. In addition, we assess the implications of imposing different levels of minimum-diversification requirements across the assets held.

Momentum without crashes

Marc Paollela (University of Zurich)

We construct a momentum factor that identifies cross-sectional winners and losers based on a weighting scheme that incorporates all the price data, over the entire lookback period, as opposed to only the first and last price points of the window. The weighting scheme is derived from the fractional-difference filter—a statistical transformation that preserves memory in the data, and has an economic interpretation of coherently combining reversal and momentum patterns in the returns. Our extensive out-of-sample analysis shows that the new fractional momentum strategy not only achieves significantly higher (risk adjusted) returns, but also mitigates the notoriously large drawdowns of the classical momentum and short-term reversal strategies. The performance results are robust with respect to transaction costs and other real world frictions; excess returns are not explained by other asset pricing factors; and they are pervasive across different asset universes and foreign markets.

17:00-17:40 Keynote talk 3, Room 401

Financial market microstructure and beyond

Doojin Ryu (Sungkyunkwan University)

I explain the brief history of financial market microstructure. I introduce structural microstructure models and their extensions and applications. I also illustrate the recent studies of empirical market microstructure using high-frequency and high-quality datasets.

August 19, 2023 (Sat)

10:00-10:40 Keynote talk 4, Room 401

Automatic threshold selection for extreme value regression models of tail risks

Marie Kratz (ESSEC Business School)

We introduce a method to estimate simultaneously the tail and the threshold parameters of an extreme value regression model. This standard model finds its use in finance to assess the effect of market variables on extreme loss distributions of investment vehicles such as hedge funds. However, a major limitation is the need to select ex ante a threshold below which data are discarded, leading to estimation inefficiencies. To solve these issues, we extend the tail regression model to non-tail observations with an auxiliary splicing density, enabling the threshold to be selected automatically. We then apply an artificial censoring mechanism of the likelihood contributions in the bulk of the data to decrease specification issues at the estimation stage. We illustrate the superiority of our approach for inference over classical peaks-over-threshold methods in a simulation study. Empirically, we investigate the determinants of hedge fund tail risks over time, using pooled returns of 1,484 hedge funds. We find a significant link between tail risks and factors such as equity momentum, financial stability index, and credit spreads. Moreover, sorting funds along exposure to our tail risk measure discriminates between high and low alpha funds, supporting the existence of a fear premium. This is a joint work with Julien Hambuckers and Antoine Usseglio-Carleve.

10:50-11:30 Keynote talk 5, Room 401

Quantifying arbitrage

Beatrice Accaio (ETH Zurich)

In this talk I will present a way to quantify arbitrage, that allows to deal with model uncertainty without imposing the no-arbitrage condition. In markets that admit "small arbitrage", we can still make sense of the problems of pricing and hedging. The pricing measures here will be such that asset price processes are close to being martingales, and the hedging strategies will need to cover some additional cost. I will show a quantitative version of the Fundamental Theorem of Asset Pricing and of the Super-replication theorem. I will then introduce a strong adapted Wasserstein distance between market models, that is suited for robustness of the amount of arbitrage and existence of respective pricing measures. Based on joint work with Julio Backhoff and Gudmund Pammer

13:10-14:40 Session 5, Room 802

Dynamic portfolio strategy utilizing network-based approaches

Mei-Hui Guo (National Sun Yat-sen University)

This study explores the application of financial network models forconstructing dynamic investment portfolios. We employ correlation coefficients and the Gaussian kernel function to calculate similarity matrices between stocks. The network model is constructed using the Minimum Spanning Tree and the Planar Maximally Filtered Graph, with centrality measured using eigenvectors. Various stock selection and asset allocation methods, including high/low centrality selection, rho-dependent selection, and weighting based on risk ratios, are considered. A dynamically updated approach is utilized to adjust the investment strategy for each period. Empirical analysis using S&P100 stocks from 2014 to 2021 reveals that the dynamic portfolio strategy based on the Gaussian kernel function network achieves superior cumulative returns.

Mathematical analysis of automated market makers

Ju-Yi Yen (University of Cincinnati)

Automated market makers (AMMs) are examples of Decentralized Finance systems. Nowadays, AMMs are dominated by the Constant Function Market Makers (CFMMs). CFMMs pool liquidity from its takers and providers, and set the relative prices of the two assets within the pool by a mathematical formula. The relative price is determined by the reserves of the two assets in the pool. Notice that the assets in the liquidity pool are risky assets, their performances are impacted by the market risk. In this talk, we describe the stochastic process used for modeling the relation between the pool price and the corresponding market price for assets traded via CFMMs, and present limit theorems of this stochastic process. Our results are deduced from properties of the Brownian motion and its local time process.

Asymptotically efficient parameter estimation for jump-diffusion processes

Teppei Ogihara (University of Tokyo)

We consider efficient parameter estimation for a parametric jump-diffusion process model via local asymptotic normality (LAN). LAN gives us a lower bound of asymptotic variance, and hence it enables us to discuss asymptotic efficiency of parameter estimators for parametric models. To show LAN for diffusion processes in Gobet (AIHP PS 2002), the inequalities (so-called the Aronson estimates) that the transition density functions are bounded from below and above by Gaussian density functions up to a constant were crucial in the proof. However, it is difficult to obtain Aronson-type estimates for jump-diffusion processes. Instead, we use a scheme with the L^2 regularity condition developed in Jeganathan (Sankhya Ser. A 1982) that does not require Aronson-type estimates. The original scheme cannot be applied for jump-diffusion processes because of their fat-tailed behaviors. Therefore, we extend the

scheme so that it can be applied to jump-diffusion processes. Under LAN, we can discuss optimality of estimators for the jump-diffusion model. We show that the quasi-maximum-likelihood and Bayes-type estimators proposed in previous works attain the lower bound of asymptotic variances and consequently these estimators are asymptotically efficient in this model.

13:10-14:40 KAFE Session 1, Room 803

House price cycle, credit driven demand and Jeonse as a special purpose investment vehicle

Sooyoung Song (Chung-Ang University)

Devastating effect of real estate collapse has never been more reverberated throughout the advanced economies not only on the domestic economy as well as the global economy than in the wake of Global Financial Crisis since 2008. In contrast, the South Korean economy had retained relatively stable residential market and suffered from the moderate domestic economy downturn. Nevertheless, ironically indeed, steeply surging residential house price in the wake of pandemic crisis has been accused, though groundless, as a primary culprit of government policy failure to control household debt in light of wealth inequality as well as even income inequality, despite the better economic performance than most other advanced economies. These recent episodes of housing market may indicate more persistent impact of real estate on an economy than perceived. In such a parlance, this paper highlights the inherent feature of financing within the housing transaction focusing on the channels through which the overvaluation of house price persists. As the asset value of house, that is house price, is the source of leveraging, the fundamental value of housing service helps formulate the expectation of housing price on which the overvaluation of housing market price is evaluated. The higher the expected value of housing, the lower the overvaluation of housing market price, which in turn reduces the overvaluation concern and drives steep rise of housing price. Regardless of whether housing is consumed via either owned house or rented one, the financing source is primarily from the financial intermediary. Then such financing is strictly regulated several measures such as LTV or DTI. Nonetheless, South Korean housing owners find an additional source, ‘ Jeonse ’ (傳貰), circumventing the existing regulation on the housing loan, which is not unique but peculiar feature of residential tenancy. Jeonse rather works as an instrument of financing, i.e. middle-term (longer than one year) repurchase agreement, circumventing the micro prudential policy, which could amplify the housing price fluctuation. Thus it works like a Special Purpose Investment Vehicle with the margin account in which the leverage is given as a Jeonse price. The prevalence of Jeonse in the South Korea may indicate the inclusive finance is still an elusive one. So the current paper sheds a new light on intertwined effect between the real estate policy and financial policy.

The impact of macroeconomic announcements on risk, preference, and risk premium

Takuya Kiriu (Osaka University)

This study examines the impact of macroeconomic announcements on the risk premium and its sources under time-varying preference. We propose a novel method to decompose risk premium changes into the risk and preference components, which are estimated from option prices immediately before and after the announcement using the Recovery Theorem. The results of the empirical analysis for the United States stock market indicate that (1) the negative (positive) macroeconomic announcement surprise increases (decreases) the risk premium; (2) the risk component mainly drives the increase (decrease) in the risk premium; and (3) the preference component has limited influence on the risk premium.

The dynamic relation between economic policy uncertainty and stock market volatility in two countries : United states and S. Korea

Seongju Moon (Gyeongsang National University)

The financial industry has become one of the most data-driven industries and the recent technological developments in big data, financial services, consumer-data management, social network services, and filtering data quality has made better interpretation of analyzed data possible in the finance industry. Financial data consist of a huge volume of quotes, market data, historical trade data, and time-sequenced transaction data used to model market and customer behavior. Many papers found that the stock market Volatility and Economic Policy Uncertainty (EPU) are closely correlated. This paper looked at whether the EPU index generated by big data has information capability in the volatility of the stock market and at whether there are existed the long-run equilibrium and short-run relation between the U.S. and S. Korea stock market. This paper findings reveal that the EPU index in both the U.S. and S. Korea affects the volatility of the stock market significantly, which in turn, indicates that the EPU index can provide useful and meaningful information to investors in the stock and derivatives markets in both countries.

15:15-16:45 ISM Session, Room 802

A backward Ito-Ventzell formula with an application to stochastic interpolation

Pierre Del Moral (INRIA)

We discuss a novel backward Ito-Ventzell formula and an extension of the Aleeksev-Gröbner interpolating formula to stochastic flows. We also present some natural spectral conditions that yield direct and simple proofs of time uniform estimates of the difference between the two stochastic flows when their drift and diffusion functions are not the same, yielding what seems to be the first results of this type for this class of anticipative models. We illustrate the impact of these results in the context of diffusion perturbation theory, interacting diffusions and discrete time approximations.

Unbiased Estimation using Underdamped Langevin Dynamics

Ajay Jasra (King Abdullah University of Science and Technology)

In this work we consider the unbiased estimation of expectations w.r.t. probability measures that have non-negative Lebesgue density, and which are known point-wise up-to a normalizing constant. We focus upon developing an unbiased method via the underdamped Langevin dynamics, which has proven to be popular of late due to applications in statistics and machine learning. Specifically in continuous-time, the dynamics can be constructed to admit the probability of interest as a stationary measure. We develop a novel scheme based upon doubly randomized estimation, which requires access only to time-discretized versions of the dynamics and are the ones that are used in practical algorithms. We prove, under standard assumptions, that our estimator is of finite variance and either has finite expected cost, or has finite cost with a high probability. To illustrate our theoretical findings we provide numerical experiments that verify our theory, which include challenging examples from Bayesian statistics and statistical physics.

Optimal trade execution and learning when price impact is uncertain

Andrew Lim (National University of Singapore)

This paper considers the problem of optimal trade execution with a linear price impact function when both the drift (intercept) and permanent price impact (slope) parameters are uncertain. Since the trading rate affects the returns data that is used to learn the uncertain parameters, this problem is intrinsically a tradeoff between exploration and exploitation, and it is of particular interest to understand how the trader goes about "exploring" under the optimal policy. To sidestep the well-known challenges of solving the dynamic programming equation, which is infinite dimensional in general and has no explicit solution even when the prior on both parameters is Gaussian, we consider the asymptotic regime where the learning rate vanishes and use a Taylor Series expansion extract the exploration component of the optimal policy. This exploration term can be easily characterized and computed, and provides surprising but ultimately

intuitive insights about the nature of exploration, its dependence on the time horizon, and the way it balances between controling inventory and learning the drift and market impact parameters. (Joint work with Galvin Ng).

15:15-16:45 KAFE Session 2, Room 803

An optimal consumption and investment problem with an exponential utility under a stochastic factor model

Kazuhiro Yasuda (Hosei University)

We consider an optimal consumption and investment problem on a finite time horizon to optimize the discounted expected exponential utility of consumption and terminal wealth. As our stock price processes, we adopt a stochastic factor model that the mean returns of risky assets linearly depend on underlying economic factors formulated as the solutions of linear stochastic differential equations. We derive the corresponding Hamilton-Jacobi-Bellman equation and obtain an explicit solution. Using the solution, we construct the optimal strategy and obtain the optimal value function explicitly. This is a joint work with Hiroaki Hata (Hitotsubashi University).

Adaptive deep learning for nonlinear time series models

Daisuke Kurisu (University of Tokyo)

In this talk, we develop a general theory for adaptive nonparametric estimation of mean functions of nonstationary and nonlinear time series using deep neural networks (DNNs). We first consider two types of DNN estimators, non-penalized and sparse-penalized DNN estimators, and establish their generalization error bounds for general nonstationary time series. We then derive minimax lower bounds for estimating mean functions belonging to a wide class of nonlinear autoregressive (AR) models that include nonlinear generalized additive AR, single index, and threshold AR models. Building upon the results, we show that the sparse-penalized DNN estimator is adaptive and attains the minimax optimal rates up to a poly-logarithmic factor for many nonlinear AR models. Through numerical simulations, we demonstrate the usefulness of the DNN methods for estimating nonlinear AR models with intrinsic low-dimensional structures and discontinuous or rough mean functions, which is consistent with our theory.

Forecasting student loan credit recovery with machine learning approaches

Hyeongjun Kim (Yeungnam University)

This paper investigates the forecasting capability of different machine learning approaches for student loan credit recovery using micro-level data. We compare the performance of logistic regression, random forest, support vector machine, and deep neural network algorithms in predicting student loan credit recovery. By utilizing a dataset comprising detailed information on student loan credit recovery, the study aims to enhance the accuracy of predictions, enabling proactive strategies to manage student loan credit recovery. Each machine learning algorithm is implemented and evaluated using appropriate performance metrics, including accuracy, precision, recall, and F1 score. In conclusion, this study underscores the significance of accurate forecasting in student loan credit recovery and showcases the applicability of machine learning algorithms in addressing this challenge. The findings have practical implications for stakeholders involved in managing student loans, facilitating better decision-making and risk mitigation.

17:00-17:40 Keynote talk 6, Room 401

Insurance premiums when default is taken into account

Freddy Delbaen (ETH Zurich, emeritus)

Economic Agents buying insurance take into account that the insurance company can default. In that case they are not fully covered. The required capital for this insurance is used as a parameter. This capital is the sum of the input provided by the shareholders of the insurance company and the premiums paid for by the insured. The problem is to find an equilibrium between these two contributions. A premium allocation technique is used. This is joint work with Delia Coculescu, Institute of Mathematics, University of Zurich and Philippe Artzner, Karl-Theodore Eisele, Université Louis Pasteur, Strasbourg.