ABSTRACTS

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March 18, Monday
Chair of the day: Takaki Hayashi (Keio Univ.)

09:50-09:55	Opening Remark

1st. Session / Chair: Yoichi Nishiyama (The Institute of Statistical Mathematics)

10:00-10:50	Shigeo Kusuoka (The University of Tokyo) "A remark on credit risk models and copula"
10:50-11:30	Hongzhong Zhang (Columbia University) "Quickest detection in a system with correlated noise"

11:30-13:00	Lunch break

2nd. Session / Chair: Yuji Yamada (Tsukuba University)

13:00-13:50	Eckhard Platen (University of Technology, Sydney) "Benchmarked Risk Minimization"
13:50-14:30	Hideatsu Tsukahara (Seijo University) "Risk Management with Distortion Risk Measures"
14:30-15:10	Andrew Lim (National University of Singapore & University of California at Berkeley) "Optimal dynamic portfolio choice with multiple decentralized agents"

15:10-15:30	Coffee Break

3rd. Session / Chair: Hongzhong Zhang (Columbia University)

15:30-16:20	Takeaki Kariya (Meiji University) "Measuring Credit Risk of French, Italian, Spanish and Greek GBs Relative to German GB and Deriving Term Structures of Default Probabilities"
16:20-17:00	Toshinao Yoshiba (Bank of Japan) "Analytical solutions for expected loss and standard deviation of loss with an additional loan"
17:00-17:40	Yuji Morimoto (Capitas Consulting Corporation) "Current topics regarding risk management practice in finance and insurance"

18:00-20:00	Reception

March 19, Tuesday
Chair of the day: Satoshi Yamashita (ISM)

1st. Session / Chair: Jiro Akahori (Ritsumeikan University)

10:00-10:50	Philip Protter (Columbia University) "Can one detect a financial bubble in real time?"
10:50-11:30	Masaaki Fukasawa (Osaka University) "Efficient Discretization of Stochastic Integrals"

11:30-13:00	Lunch break

2nd. Session / Chair: Masaaki Fukasawa (Osaka University)

13:00-13:50	Short communication Takanori Adachi (ICS, Hitotsubashi University) "A note on categorical risk measure theory" Nienlin Liu (Ritsumeikan University) "The Fourier estimation method based on discrete Fourier transform"
13:50-14:30	Cecilia Mancini (University of Florence) "Measuring the relevance of the microstructure noise in financial data"
14:30-15:10	Yoshinori Kawasaki (The Institute of Statistical Mathematics) "Yield curve estimation using both bid and ask prices of coupon bonds"

15:10-15:30	Coffee Break

3rd. Session / Chair: Hideatsu Tsukahara (Seijo University)

15:30-16:20	Richard A. Davis (Columbia University) "Noncausal Vector AR Processes with Application to Financial Time Series"
16:20-17:00	Yoichi Nishiyama (The Institute of Statistical Mathematics) "On Entropy-Martingale Methods in Statistics"
17:00-17:40	Peter Spreij (University of Amsterdam) "Affine diffusions with non-canonical state space"

17:40-17:45	Closing Remark

Shigeo Kusuoka

The University of Tokyo

A remark on credit risk models and copula

Abstract

Copula models with finite parameters are widely used to describe the joint distribution of default times. But it is not clear whether these copula models are dynamically consistent. The authors show that the set of copula models that are dynamically consistent and satisfy some technical regularity conditions, is a set of the first category in the Baire sense in a certain space of copula functions with finite parameters.

(Joint work with Takenobu Nakashima)

Hongzhong Zhang

Columbia University

Quickest detection in a system with correlated noise

Abstract

The problem of quickest detection arises in many applications in quality control and financial surveillance. In this work, we study the quickest detection of signals in a system of 2 sensors coupled by a negatively correlated noise, which receive continuous sequential observations from the environment. It is assumed that the signals are time invariant and with equal strength, but that their onset times may differ from sensor to sensor. The objective is the optimal detection of the first time at which any sensor in the system receives a signal. The problem is formulated as a stochastic optimization problem in which an extended Lorden's criterion is used as a measure of detection delay, with a constraint on the mean time to the first false alarm. The case in which the sensors employ their own cumulative sum (CUSUM)strategies is considered, and it is proved that the minimum of 2 CUSUMs is asymptotically optimal as the mean time to the first false alarm increases without bound. Implications of this asymptotic optimality result to the efficiency of the decentralized versus the centralized system of observations are further discussed.

Eckhard Platen

University of Technology Sydney

Benchmarked risk minimization

Abstract

This paper discusses the problem of hedging not perfectly replicable contingent claims using the numeraire portfolio. The proposed concept of benchmarked risk minimization generalizes classical risk minimization, pioneered by Foellmer, Sondermann and Schweizer. The latter relies on a quadratic criterion, requests square integrability of contingent claims, assumes certain martingale properties and relies on the existence of an equivalent risk neutral probability measure. Benchmarked risk minimization avoids these restrictive assumptions and provides symmetry with respect to all primary securities. It employs the real world probability measure and the numeraire portfolio to identify the minimal possible price for a contingent claim. Furthermore, the resulting benchmarked (i.e. numeraire-denominated) profit and loss is only driven by uncertainty that is orthogonal to traded uncertainty, and forms a local martingale that starts at zero. Consequently, benchmarked profits and losses, when pooled and sufficiently different, become asymptotically negligible through diversification. This property is highly desirable from a risk management point of view. It makes benchmarked risk minimization the least expensive method for pricing and hedging a diversified pool of not fully replicable benchmarked contingent claims. Finally, a benchmarked risk minimizing hedging strategy takes into account evolving information about the nonhedgeable part of a contingent claim, which classical risk minimization ignores.

(Joint work with Ke Du)

Hideatsu Tsukahara

Seijo University

Risk management with distortion risk measures

Abstract

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 procedures 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. As a capital allocation principle, the Euler allocation based on DRMs are easy to compute and widely applicable. We give some numerical results for the comparison of the Euler allocation with several DRMs under some scenarios on the loss distribution. The portfolio optimization problem with DRMs following Acerbi is now being investigated; how to implement numerically is one of the remaining issues on DRMs.

Andrew Lim

National University of Singapore & University of California at Berkeley

Optimal dynamic portfolio choice with multiple decentralized agents

Abstract

While the primary concern of many financial institutions is the aggregate performance of its trades, centralized optimization over all asset holdings across multiple correlated markets is infeasible in practice due to the complexity of the system and each of the constituent markets, and a decentralized approach where trades in each market are optimized by a different portfolio manager conditional on a proprietary model of his investment universe, is more commonly adopted. The difficulty with this approach is that the resulting collection of "locally optimized" allocations can be extremely inefficient from the perspective of the firm. In this paper, we formulate a multi-agent dynamic portfolio choice problem and study the problem of optimizing system efficiency. We show that a coordination mechanism consisting of an internal system of swap contracts can induce decentralized allocations that as a collection are optimal for the firm. We provide a characterization of the optimal contract and an iterative algorithm for computing it. This algorithm can be implemented without compromising proprietary agent level information or intervention by an all-knowing centralized agent, and only uses data that is commonly reported as part of a firm's risk management system.

Takeaki Kariya

Meiji University

Measuring credit risk of French, Italian, Spanish, and Greek GBs relative to German GBs, and deriving the term structures of default probabilities (TSGBs)

Abstract

Applying the Kariya 's (2012) model to Euro government bonds, we make a relative credit risk analysis on the credit risk of French, Italian, Spanish, and Greek GBs relative to German GBs. First we measure credit risk spreads of these GBs in price level over four years. Then their TSDPs are derived relative to DGB prices with recovery rate being assumed as 0. Thirdly an almost perfect linear relationship between interest differentials and default probabilities is observed with discussion on the Maastricht convergence condition.

(Joint work with Yoshiro Yamamura, Koji Inui, Yoko Tanokura, ZhuWang)

Toshinao Yoshiba

Bank of Japan

Analytical solutions for expected loss and standard deviation of loss with an additional loan

Abstract

We evaluate expected loss and standard deviation of loss for a bank loan, taking into account the bank 's strategic control of the expected return on the loan. Assuming that the bank supplies an additional loan to minimize the expected loss of the total loan, we provide analytical formulations for expected loss and standard deviation of loss with bivariate normal distribution functions.

There are two cases in which an additional loan decreases the expected loss: i) the asset/liability ratio of the firm is low but its expected growth rate is high; ii) the asset/liability ratio of the firm is high and the lending interest rate is high. With a given expected growth rate and given interest rates, the two cases are identified by two thresholds for the current asset/liability ratio. The bank maintains the current loan amount when the asset/liability ratio is between the two thresholds.

Given the bank 's strategy, the bank decreases the initial expected loss of the loan. On the other hand, the bank has a greater risk for the standard deviation of loss. (Joint work with Satoshi Yamashita.)

Keywords: Probability of default (PD); Loss given default (LGD); Exposure at default (EaD); Expected loss (EL); Unexpected loss (UL); Structural model

Yuji Morimoto

Capitas Consulting Corporation

Current topics regarding risk management practice in finance and insurance

Abstract

In this session, I will overview the current topics and issues in the risk management practices in finance and insurance. First, I will introduce the current status of the risk management practice by showing the selected results of the survey conducted by TRMA (Tokyo Risk Managers Association) last year. Then, I will explain the risk management issues in the insurance industry so called ERM (Enterprise Risk Management), which the regulatory body is introducing as a tool for the supervision of financial institutions. In the second topic, various kinds of quantitative issues are included, although many of them have not been deeply researched yet and many practitioners do not know the pitfalls or caveats for implementing the techniques into risk management. The objective of this talk is to share these issues with academics of various fields and hopefully to get solutions for some issues in near future.

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Philip Protter

Columbia University

Can one detect a financial bubble in real time?

Abstract

Recent advances in the mathematical modeling of financial bubbles have led to the observation that bubble detection often boils down to determining if, under the risk neutral measure, a process is a strict local martingale or a true martingale. Bubbles are fairly easily recognizable after the fact, once they have run their course, but it is often difficult to detect their presence in real time. There are few tools available to distinguish a martingale from a strict local martingale, and it seems that determining which is the case from data is a delicate procedure. Indeed, one can argue that in principle it is impossible. Nevertheless in this talk we will explain how, in a special case, there is hope that one can determine when a bubble is present, and when it is not, in real time.

(Joint work with Robert Jarrow and Younes Kchia)

Masaaki Fukasawa

Osaka University

Efficient discretization of stochastic integrals

Abstract

Sharp asymptotic lower bounds of the expected quadratic variation of discretization error in stochastic integration are given when the integrator admits a predictable quadratic variation and the integrand is a continuous semimartingale with nondegenerate local martingale part. Asymptotically efficient schemes which attain the lower bounds are constructed explicitly.

The result is directly applicable to practical hedging problem in mathematical finance; for hedging a payoff which is replicated by a continuous-time trading strategy, it gives an asymptotically optimal way to choose discrete rebalancing dates and portfolios with respect to transaction costs. The asymptotically efficient strategies in fact reflect the structure of transaction costs. In particular a specific biased rebalancing scheme is shown to be superior to unbiased schemes if transaction costs follow a convex model.

Short Communication

Takanori Adachi (ICS, Hitotsubashi University)

A note on categorical risk measure theory

Abstract

We introduce a category that represents varying risk as well as uncertainty, and give a generalized conditional expectation as a contravariant functor on the category. Then, we re formulate dynamic monetary value measures as a contravariant functor on the category. We show some axioms of dynamic monetary value measures in the classical setting are deduced as theorems in the new formulation, which may be one of the evidences that the axioms are natural.

Nienlin Liu (Ritsumeikan University)

The Fourier estimation method based on discrete Fourier transform

Abstract

In the talk, we will introduce another version of Fourier estimation method, which is based on discrete Fourier transform. Thanks to the group structure, the estimator is always positive (definite) and the consistency is easier to prove.

(Joint work with Jiro Akahori, Yukie Yasuda and Maria Elvira Mancino)

Cecilia Mancini

University of Florence

Measuring the relevance of the microstructure noise in financial data

Abstract

We show that the Truncated Realized Variance (TRV) of a semimartingale converges to zero when observations are contaminated by noise. Under the additive iid noise assumption, a central limit theorem is also proved. In consequence it is possible to construct a feasible test allowing us to measure, for a given path of a given data generating process at a given observation frequency, the relevance of the noise in the data when we want to estimate the efficient process integrated variance IV. We thus can optimally select the observation frequency at which we can "safely" use TRV. The local size of our test is investigated and its performance is verified on simulated data. We are especially interested in the application of the test to financial data, and a comparison conducted on the one hand with the Bandi and Russel (2008) and Ait-Sahalia, Mykland and Zhang (2005) mean square error criterions and on the other hand with the Realized Variance (RV) signature plot, shows that, in order to estimate IV, in many cases we can rely on TRV for lower observation frequencies than previously indicated when using RV. The advantages of our method are at least two: on the one hand the underlying model for the efficient data generating process is less restrictive in that jumps are allowed (in the form of an Ito semimartingale, SM). On the other hand our criterion is pathwise, rather than based on an average estimation error, allowing for a more precise estimation of IV because the choice of the optimal frequency is based on the observed path. Further analysis on both simulated and empirical financial data is conducted in [Lorenzini 2012] and is also still in progress.

Keywords: semimartingales with jumps, noisy data, integrated variance, threshold estimation, test to select optimal sampling frequency, financial asset prices

Yoshinori Kawasaki

The Institute of Statistical Mathematics

Yield curve estimation using both bid and ask prices of coupon bonds

Abstract

We consider the problem of estimating yield curves utilizing both bid and ask prices of coupon bonds. Many of the existing research in this literature are based on the closing price. With our eyes set on a real-time base inference during trading hours, we work on both bid and ask data for every traded bond. For a coupon bond we sometimes observe either bid or ask price only, while at other occasions we may find both prices at a time. A collection of such bond data naturally leads to nonparametric-regression-type yield curve estimation. After observing that the smoothing spline ANOVA framework properly fits this multiple curve estimation problem, we show that it is possible to estimate yield curves that are simultaneously coherent with bid and ask prices.

(Joint work with Yasunori Horikoshi.)

Richard A. Davis

Columbia University

Noncausal Vector AR processes with application to financial time series

Abstract

Inference procedures for noncausal autoregressive (AR) models have been well studied and applied in a variety of applications from environmental to financial. For such processes, the observations at time t may depend on both past and future shocks in the system. In this paper, we consider extension of the univariate noncausal AR models to the vector AR (VAR) case. The extension presents several interesting challenges since even a first-order VAR can possess both causal and noncausal components. Assuming a non-Gaussian distribution for the noise, we show how to compute an approximation to the likelihood function. Under suitable conditions, it is shown that the maximum likelihood estimator (MLE) of the vector of AR parameters is asymptotically normal. The estimation procedure is illustrated with a simulation study for a VAR(1) process and with two real data examples.

(Joint work with Li Song)

Yoichi Nishiyama

The Institute of Statistical Mathematics

On entropy-martingale methods in statistics

Abstract

The title of my talk is the same as that of my forthcoming book to be published by Chapman & Hall. My talk will be based on my own results that would be contained in my book, including some topics of a stochastic maximal inequality as an extension of Doob's inequality, some infinite-dimensional Lenglart's and Burkholder's inequalities, some central limit theorems for separable random fields of locally square-integrable martingales including a new Donsker theorem for function-indexed empirical processes of i.i.d. samples under a bit stronger condition than Sudakov's sufficient condition for the existence of bounded continuous versions of general Gaussian random fields and the (probably) final version of the Jain-Marcus theorems for the sum of i.i.d. Lipschitz random fields, and a semiparametric Z-estimation procedure, which would often yield some adaptive estimators, with applications to Cox's regression model and an ergodic diffusion process model with high frequency data.

Peter Spreij

University of Amsterdam

Affine diffusions with non-canonical state space

Abstract

Multidimensional affine diffusions have been studied in detail for the case of a canonical state space. We present results for general (convex) state spaces and provide a complete characterization of all possible affine diffusions with polyhedral and quadratic state space. We give necessary and sufficient conditions on the behavior of drift and diffusion on the boundary of the state space in order to obtain invariance and to establish strong existence and uniqueness. If time permits, we will discuss existence of exponential moments and the validity of the affine transform formula for processes with a general closed convex state space. Our results apply to a wide class of affine processes, including those with a matrix-valued state space, which have recently gained interest in the literature.

(Joint work with Enno Veerman)