
TMU Workshop on Finance 2017

August 29 – 30, 2017

Marunouchi Satellite Campus, TMU
Marunouchi Eiraku Bldg., the 18th Floor
1-4-1, Marunouchi, Chiyoda, Tokyo

Program and Abstracts

Plenary Speakers

Sebastian Jaimungal	U. of Toronto
Michael Tehranchi	U. of Cambridge
Hoi Ying Wong	Chinese U. of Hong Kong
Kit Pong Wong	U. of Hong Kong

Committee

Yukio Muromachi (Chair), Yuta Koike, Tadao Oryu, Takashi Shibata

Organized by

Research Center for Quantitative Finance, TMU

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Research Project at KIER Joint Usage and Research Center,

“Analysis of systemic risk with model uncertainty”

JSPS KAKENHI (25245046, 26242028, 16H03123, 17H02547)



August 29, 2017 (Tuesday)

13:00-13:10 Opening address

13:10-14:00 **Sebastian Jaimungal** (University of Toronto)

“Stochastic Control in Commodity & Energy Markets : Model
Uncertainty, Algorithmic Trading, and Future Directions”

14:00-14:30 **Yuta Koike** (Tokyo Metropolitan University)

“Testing the Absence of Lead-Lag Effects in High-Frequency Data”

14:30-14:50 Break

14:50-15:40 **Kit Pong Wong** (University of Hong Kong)

“Investment Efficiency and Product Market Competition”

15:40-16:10 **Rusudan Kevkhishvili** (Kyoto University)

“An Application of Time Reversal to Credit Risk Management”

16:10-16:30 Break

16:30-17:20 **Simon Clinet** (University of Tokyo)

“Testing if the Market Microstructure Noise is a Function of the Limit
Order Book”

17:20-17:50 **Yasuhiro Shimizu** (Nomura Securities, Tokyo Metropolitan University)

“Does Rebalance Premium Really Exist?”

August 30, 2017 (Wednesday)

13:00-13:50 **Michael Tehranchi** (University of Cambridge)

“Spectral Term Structure Models”

13:50-14:20 **Hyun Jin Jang** (Ulsan National Institute of Science and Technology)

“Contingent Convertible Bonds with a Default Risk Premium”

14:20-14:40 Break

14:40-15:30 **Hoi Ying Wong** (Chinese University of Hong Kong)

“Regression-Based Monte Carlo Simulation for High-Dimensional Portfolio Problems”

15:30-16:00 **Wenjun Chen** (Hokkaido University)

“Merger and Acquisition Strategy under Imperfect Information:
A Mixed Payment Model”

16:00-16:10 Closing address

Stochastic Control in Commodity & Energy Markets : Model Uncertainty, Algorithmic Trading, and Future Directions

Sebastian Jaimungal (University of Toronto)

I will provide an overview of cutting edge stochastic control problems related to commodity and energy markets. One of the common threads will be incorporating model uncertainty into valuation and trading of financial instruments. I will show how model uncertainty can be cast as a robust optimal control problem and demonstrate how derivative valuation is modified when agents account for it. As a second application, I will discuss how agents optimize their trading actions in an interconnected electricity market. When agents account for the price impact of their trades, I will show that they induce cointegration in prices. Moreover, when agents trade using market orders they incur costs due to the existence of a bid-ask spread and by orders walking through layers of the limit order book. Hence, as a third application, I will show how agents can act instead as liquidity providers and optimize the placement of their limit orders to benefit from the bid-ask spread. Finally, I will describe some open problems related to partial information, and multiple agents using mean-field games.

Testing the absence of lead-lag effects in high-frequency data

Yuta Koike ^{*†‡}

In this talk we consider the problem of testing whether there exists a (possibly) time-lagged correlation between two Brownian motions based on their high-frequency observation data where the observation times are possibly non-synchronous. The test statistic considered here is the maximum of the absolute value of the empirical cross-covariance function computed by the method of Hayashi and Yoshida (2005, Bernoulli), which is originally used in Hoffmann, Rosenbaum and Yoshida (2013, Bernoulli) as a contrast function to estimate the time-lag parameter of the lead-lag relationship considered here. The approximation of the null distribution of the test statistic is analytically difficult, so we develop a bootstrap procedure to solve this issue. The validity of the proposed bootstrap procedure is ensured by a version of the Gaussian approximation theory developed recently by Chernozhukov, Chetverikov and Kato, especially Chernozhukov, Chetverikov and Kato (2015, Probab. Theory Relat. Fields).

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Investment Efficiency and Product Market Competition

Neal M. Stoughton*

Kit Pong Wong[†]

Long Yi[‡]

Does more competition lead to more information production and greater investment efficiency? This question is largely unexplored in the finance literature. This paper provides both a model and a series of extensive empirical tests. The model features a two-stage Bayesian game in differentiated products market competition. We find that competition causes firms to acquire less information and investments become more inefficient relative to a first best case with the same market structure. Empirically the panel regression analysis provides strong support for the theory and shows that investment is more efficient in concentrated industries.

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AN APPLICATION OF TIME REVERSAL TO CREDIT RISK MANAGEMENT

MASAHIKO EGAMI

Graduate School of Economics, Kyoto University

RUSUDAN KEVKHISHVILI

Graduate School of Economics, Kyoto University

ABSTRACT. This article develops a new risk management framework for companies on the basis of the leverage process (a ratio of company asset value over its debt). We approach this task by time reversal, last passage time, and the h -transform of linear diffusions. For general diffusions with killing, we obtain the probability density of the last passage time to a certain alarming level and analyze the distribution of the time left until killing after the last passage time to that level. We then apply these results to the leverage process of the company. Finally, we suggest how a company should determine the aforementioned alarming level. Specifically, we construct a relevant optimization problem and derive an optimal alarming level as its solution.

Testing if the market microstructure noise is a function of the limit order book *

Simon Clinet^{†‡} and Yoann Potiron[§]

August 15, 2017

Abstract

In this paper, we build tests for the presence of error in a model where the market microstructure noise is a known parametric function of the limit order book. The tests compare two novel and distinct quasi-maximum likelihood estimators of volatility, where the related model includes an additive error in the market microstructure noise or not. The limit theory is investigated in a general nonparametric framework. If there is no error in the model, we provide a consistent estimator of the efficient price based on maximum likelihood estimation of the parameter. Furthermore, we show that realized volatility remains efficient when performed on the estimated price rather than on the efficient price.

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Does rebalance premium really exist?

Yasuhiro Shimizu (Nomura Securities, Tokyo Metropolitan University)

Due to increasing interest in rule-based investing, the argument about the impact of rebalancing on investment performance (rebalance premium) has attracted growing attention in the investment industry. In this research, we quantitatively assess the rebalance premium in a hypothetical market where there are no changes in investment opportunities and show the improvement of performance purely from rebalancing is small and economically insignificant in a realistic circumstance. We also show that the realized rebalance premiums observed in real markets are significantly larger than that estimated in geometric Brownian motion models, which implies the realized rebalance premiums are mostly from changes in investment opportunities such as return reversals.

Spectral term structure models

Michael Tehranchi (University of Cambridge)

This talk will discuss a certain stochastic evolution equation in the space of probability measures, including existence and uniqueness results. A solution of this equation gives rise, in a natural way, to an interest rate term structure model, in the same spirit as the Heath-Jarrow-Morton framework. An application to stochastic volatility models is also considered.

Contingent convertible bonds with a default risk premium

Hyun Jin Jang*, Young Hoon Na[†], Harry Zheng[‡]

August 10, 2017

Abstract

Contingent convertible bonds (CoCos) are hybrid instruments characterized by the features of both debt and equity. CoCos are automatically converted into equities or written down when the capital-ratio of the issuing bank falls below a contractual threshold. This study presents a new methodology for pricing CoCos with a capital-ratio trigger and for quantifying the issuing banks potential default risk in the post-conversion period for pricing CoCos. First, we propose a model for a CET1 ratio composed of the core equity value and total risk-weighted asset value by employing a geometric Brownian motion and a single random variable. Second, we formulate the post-conversion risk premium in these CoCos by measuring the probability of the CET1 ratio of the issuing bank breaching a regulatory default threshold after conversion. In the numerical test, we validate the accuracy and efficiency of the proposed model by comparing it with a crude Monte Carlo method, and conduct an empirical test to show the post-conversion premium in the market price of equity-conversion CoCos.

Keywords : Contingent capital, CoCo bond, capital-ratio trigger, CET1 ratio, bond-equity conversion time, default time

JEL : G13, C67

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Regression-based Monte Carlo Simulation for High-Dimensional Portfolio Problems

Hoi Ying WONG (The Chinese University of Hong Kong)

The least-squares Monte-Carlo (LSMC) simulation is originally constructed for American option pricing but its application has been extended to the computation of regulatory capitals and portfolio selection. Classical theoretical results showing the convergence of the LSMC simulation assume that the regression coefficients are estimated without error. We show that the estimation errors in the regression coefficients make the convergence failure and the problem is more pronounced for a high-dimensional portfolio. We propose to solve the problem using high-dimensional regression with model selection such as LASSO. By taking into account of estimation errors in the regression coefficients, we prove for the convergence of the proposed approach for multi-asset American option pricing, value-at-risk computation for high-dimensional nonlinear portfolios and dynamic mean-variance portfolio selection with constraints. (This presentation is based several joint works with J. Chen, Z. Li, and T. Sit.)

Merger and acquisition strategy under imperfect information: A mixed payment model

Wenjun Chen

Graduate School of Economics and Business Administration, Hokkaido University

Abstract: This paper develops a dynamic model of a joint takeover to determine the timing, acquisition premiums, and terms. The model incorporates imperfect information and the strategy by solving a Markov perfect Nash equilibrium. The results predict that the bidder will make a high cash payment to the target to gain high post-merger management control. The abnormal return to the participating firm can be positive or negative due to asymmetric information. In addition, the model relates the acquisition premium payment and the merger threshold to the growth rate, volatility, and correlation coefficient of the bidder and target.

Keywords: Sharing-rule, Real option, Takeover, Acquisition premium, Synergy, Bargain power