

2018 Kagawa International Symposium

“Recent Developments in Statistics and Econometrics”

Date: March 1-3, 2018

Venue: Youxin Memorial Hall,
Faculty of Economics, Kagawa University

Organizers:

Feng Yao

(Faculty of Economics, Kagawa University)

Masanobu Taniguchi

(Research Institute for Science & Engineering,
Waseda University)

Supported by

- (1) Kiban (A-15H02061) M. Taniguchi, Research Institute for Science & Engineering, Waseda University
- (2) Tokutei-Kadai (B) M. Taniguchi, Research Institute for Science & Engineering, Waseda University
- (3) Faculty of Economics, Kagawa University



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Saiwai-cho Campus, Kagawa University.

(Access map: <http://www.ec.kagawa-u.ac.jp/access/>)

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- (3) Faculty of Economics, Kagawa University

Program (* Speaker for co-authors)

March 1 (Thursday)

13:50 - 14:00: Opening

Sinobu Sato (Faculty of Economics, Kagawa Univ.)

Masanobu Taniguchi (Waseda Univ.)

Feng Yao (Kagawa Univ.)

Session (I): 14:00 - 15:20 Chaired by Feng Yao

14:00 - 14:40: Forecasting in the Data-Rich Environment

Ruey S. Tsay (Univ. of Chicago)

14:40 - 15:20: Limit Theory for the Long Run Variance of Finite Markov Chains

Peter R. Hansen (Univ. of North Carolina)

15:20 - 16:00: Forecasting Multiple Time Series with One-Sided Dynamic Principal Components

Daniel Peña (Univ. Carlos III de Madrid)

16:00 - 16:20: Coffee break

Session (II): 16:20 - 17:40 Chaired by Masanobu Taniguchi

16:20 - 17:00 On Optimal Dimension Reduction for High-Dimensional and Functional Time Series

Marc Hallin (Univ. libre de Bruxelles)

17:00 - 17:40: On the Asymptotic Non-null Behavior of High-dimensional Spherical Location Tests

Davy Paindaveine (Univ. libre de Bruxelles)

18:00 - 19:30: Buffet Party

March 2 (Friday)

Session (III): 9:30 - 10:50 Chaired by Yuzo Hosoya

9:30 - 10:10 The Measures of Time-series Interdependence: Theoretical Extension and Numerical Improvement

Yuzo Hosoya* (Emeritus Professor, Tohoku Univ.) and Taro Takimoto (Kyushu Univ.)

10:10 - 10:50: Estimation Problems in Spatial Panel Data Analysis Monte Carlo Experiments

Gigh Fitrianto* and Koichi Maekawa (Hiroshima Univ. of Economics)

10:50 - 11:10: Coffee break

Session (IV): 11:10 - 12:30: Chaired by Davy Paindaveine

11:10 - 11:50 Bayesian Modelling and Forecasting of Value-at-Risk via Threshold Realized Volatility

Cathy W.S. Chen* (Feng Chia Univ.) and Toshiaki Watanabe (Hitotsubashi Univ.)

11:50 - 12:30: An Impulsive Dynamics Model for a Fish Stock

Tomoyuki Nakagawa (Hiroshima Univ.), Sam Subbey (Cornell Univ., Institute of Marine Research, Bergen) and Hiroko Kato Solvang* (Institute of Marine Research, Bergen)

12:30 - 13:30: Lunch

Session (V): 13:30 - 15:30 Chaired by Cathy W.S. Chen

13:30 - 14:10: Statistical Analysis on the Special Complex Manifolds in Connection with Time Series Analysis

Yasuko Chikuse (Emeritus Professor, Kagawa Univ.)

14:10 - 14:50: Change Point Detection Based on Method of Moment Estimators

Ilia Negri* (Univ. Bergamo) and Yoichi Nishiyama (Waseda Univ.)

14:50 - 15:30: Robust GEL Test in Infinite Variance Processes and its Application to Change Point Tests

Fumiya Akashi* (Waseda Univ.), Holger Dette and Yan Liu

15:30 - 15:50: Coffee break

Session (VI): 15:50 - 17:50: Chaired by Ranade Ravindra R.

15:50 - 16:30: Systemic Risk Assessment by Hawkes Processes

Yu Izumisawa, Takaaki Koike and Hiroshi Shiraishi* (Keio Univ.)

16:30 - 17:10: A Model of Rational Bubbles with Additive Outliers

Naoya Katayama (Kansai Univ.)

17:10 - 17:50: Interactions between Financial Leverage and Product Quality in the Tourism & Leisure Industry: Testing the Moderating Role of Business Conditions

Setareh Katircioglu (Univ. of Kyrenia) and Salih Katircioglu* (Eastern Mediterranean Univ.)

18:30 - 20:30: Dinner Party

March 3 (Saturday)

Session (VII): 9:30 -11:00: Chaired by Koichi Maekawa

9:30 - 10:00: Bias Reduction for Nonparametric and Semiparametric Regression Models

Ming-Yen Cheng (Hong Kong Baptist Univ. and National Taiwan Univ.)

10:00 - 10:30: Gaussian Approximation of Maxima of Wiener Functionals and Its Application to High-frequency Data

Yuta Koike (Tokyo Univ.)

10:30 - 11:00: Study on Early Warning of Internet Financial Loan Risk under Big Data

Yirong Ying*, Heyun Wang and Yunhe Yue (Shanghai Univ.)

11:00 - 11:20 Coffee break

Session (VIII): 11:20 -12:20: Chaired by Kenichi Amaya

11:20 - 11:50: Economic Policy Uncertainty and Financial Market Volatility: Evidence from Japan

Takayuki Morimoto (Kwansei Gakuin Univ.)

11:50 - 12:20: Causal Relationships between FDI Flow and Technological Innovation of China and Japan

Xiuwu Zhang* (Huaqiao Univ.) and Feng Yao (Kagawa Univ.)

Abstracts

Forecasting in the Data-Rich Environment

Ruey S. Tsay (Univ. of Chicago)

Abstract: We consider and compare different forecasting methods when the data are rich. The methods considered included deep-learning, random forest, and other statistical methods developed for big data. We pay attention to model uncertainty and parameter uncertainty, and discuss various approaches to model averaging and combined forecasts, including Egalitarian Lasso for shrinkage. Real examples are used to demonstrate the analysis and forecasting performance in finite samples.

Limit Theory for the Long Run Variance of Finite Markov Chains

Peter R. Hansen (Univ. of North Carolina)

Abstract: We consider the long-run variance, of a multivariate time series, X_t , where X_t is given from a homogeneous finite Markov chain. We show that the maximum likelihood estimator is consistent for and has a Gaussian limit distribution. The estimator can be motivated by a filtering approach that sheds additional light on the asymptotic variance and its components. We derive a consistent estimator of the asymptotic variance that facilitates inference and we compare the finite sample properties of three methods for inference, including a bootstrap implementation.

Forecasting Multiple Time Series with One-Sided Dynamic Principal Components

Daniel Peña* (Univ. Carlos III de Madrid), **Ezequiel Smucler** and **Victor J. Yohai**

Abstract: We define one-sided dynamic principal components (ODPC) for time series as linear combinations of the present and past values of the series that minimize the reconstruction mean squared error. Previous definitions of dynamic principal components depend on past and future values of the series. For this reason, they are not appropriate for forecasting purposes. On the contrary, it is shown that the ODPC introduced in this paper can be successfully used for forecasting high-dimensional multiple time series. An alternating least squares algorithm to compute the proposed ODPC is presented. We prove that for stationary and ergodic time series the estimated values converge to their population analogues. We also prove that asymptotically, when both the number of series and the sample size go to infinity, if the data follows a dynamic factor model, the reconstruction obtained with ODPC converges, in mean squared error, to the common part of the factor model.

Monte Carlo results shows that forecasts obtained by the ODPC compare favourably with other forecasting methods based on dynamic factor models.

On Optimal Dimension Reduction for High-Dimensional and Functional Time Series

Marc Hallin (Univ. libre de Bruxelles)

Abstract: Dimension reduction techniques are at the core of the statistical analysis of high-dimensional and functional observations. Whether the data are vector- or function-valued, principal component techniques, in this context, play a central role. The success of principal components in the dimension reduction problem is explained by the fact that, for any $K \leq p$, the K first coefficients in the expansion of a p -dimensional random vector \mathbf{X} in terms of its principal components is providing the best linear K -dimensional summary of \mathbf{X} in the mean square sense. The same property holds true for a random function and its functional principal component expansion. This optimality feature, however, no longer holds true in a time series context: principal components and functional principal components, when the observations are serially dependent, are losing their optimal dimension reduction property to the so-called *dynamic principal components* introduced by Brillinger in 1981 in the vector case and, in the functional case, their functional extension proposed by Hörmann, Kidziński and Hallin in 2015 (Journal of the Royal Statistical Society Series B 77, 319-348).

Based on joint work with Siegfried Hörmann and Marco Lippi.

On the asymptotic non-null behavior of high-dimensional spherical location tests

Davy Paindaveine (Univ. libre de Bruxelles)

Abstract: In the Fisher-von Mises-Langevin model, we consider the high-dimensional version of the spherical location testing problem, that is, we want to test the null hypothesis that the modal location θ coincides with a given value θ_0 on the p -dimensional unit sphere, with p large. It is well-known that, in standard situations where the dimension p and the underlying concentration κ are fixed, the Watson test is asymptotically optimal. In [2], we investigated whether or not this extends to the case where the concentration $\kappa = \kappa_n$ goes to zero as n goes to infinity. In the present work, we consider, as in [1], the high-dimensional setup where the dimension p_n goes to infinity with n . We allow the concentration κ_n to behave in a completely free way with n , which offers a complete spectrum of problems ranging from arbitrarily challenging to arbitrarily easy

problems. We identify five different regimes, depending on the convergence/divergence properties of κ_n , that yield different limiting asymptotic experiments. Asymptotically optimal tests are obtained in each regime.

- [1] Chr. Cutting, D. Paindaveine, and Th. Verdebout, Testing uniformity on high-dimensional spheres against monotone rotationally symmetric alternatives, *Annals of Statistics*, to appear.
- [2] D. Paindaveine and Th. Verdebout, Inference on the mode of weak directional signals: a Le Cam perspective on hypothesis testing near singularities, *Annals of Statistics*, to appear.

The Measures of Time-series Interdependence:

Theoretical Extension and Numerical Improvement

Yuzo Hosoya* (Tohoku Univ.) and **Taro Takimoto** Kyushu Univ.)

Abstract: The measures of one-way effect, reciprocity, and association are defined as overall as well as frequency-wise quantities in the frequency domain. In this talk, we suggest extension of those measures to nonstationary reproducible processes, Dahlhaus' locally stationary processes and to Helson-Lowdenslager's doubly parametrized stationary processes $\{w(t,s)\}$. An application to U.S. macroeconomic data is exhibited where we discuss improvement of numerical procedure for the Whittle parameter estimation of those measures based on the stationary vector ARMA model.

Estimation Problems in Spatial Panel Data Analysis Monte Carlo Experiments

Gigh Fitrianto* and **Koichi Maekawa** (Hiroshima Univ. of Economics)

Abstract: We consider estimation problems of spatial Durbin model specification (1) with spatial and time-period fixed effect and (2) random spatial effect and time-period fixed effect as in Elhorst (2014).

$$y_t = \delta W y_t + [x, wx] \beta + \mu_i + \tau_t + \varepsilon_t ,$$

where μ_i : fixed spatial fixed (or random) effect, τ_t : time-period fixed effect, W and w are spatial weight matrices. We compare the two estimation methods such as the full maximum likelihood estimator (FMLE) and the two step-estimation method using the concentrated maximum likelihood estimator (CLME) proposed by Elhorst. The comparison is made by Monte Carlo experiment under the data generating process (GDP) such that the dependent variables are taken from the cigarette data in Baltagi and Li 's (2004) and the dependent variable is generated by the spatial Durbin mode in the

two cases of (1) and (2) above. As a result our experiment shows that FMLE is superior to CMLE. We also discuss some difficulties in estimation of spatial panel data modes.

Elhorst, J. Paul (2014), *Spatial Econometrics from Cross-Section Data to Spatial Panels*, Springer.

Baltagi BH and Li D (2004), Prediction in the panel data model with spatial autocorrelation. In:

Anselin L., Florax RJGM, Rey SJ (eds) *Advances in spatial econometrics*, Springer.

Bayesian Modelling and Forecasting of Value-at-Risk via Threshold Realized Volatility

Cathy W. S. Chen* (Feng Chia Univ.) and **Toshiaki Watanabe** (Hitotsubashi Univ.)

Abstract: This study proposes a threshold realized GARCH that jointly models daily returns and realized volatility, thereby taking into account the bias and asymmetry of realized volatility and incorporating it with skew Student-t innovations as the observation equation. We view this model as a sharp transition model and treat the realized volatility as a proxy for volatility under this nonlinear structure. Through the Bayesian Markov chain Monte Carlo method, our model can jointly estimate the parameters in the return equation, the volatility equation, and the measurement equation. As an illustration, we conduct a simulation study and apply the proposed method to the U.S. stock market. Based on quantile forecasting and volatility estimation, we find that the threshold heteroskedastic framework with realized volatility successfully replicates the asymmetric dynamic structure. We also investigate the predictive ability of volatility by comparing the proposed model with traditional GARCH as well as some popular asymmetric GARCH and realized GARCH models. This threshold realized GARCH model with skew Student-t innovations outperforms the competing risk models in out-of-sample volatility and VaR forecasting.

An Impulsive Dynamics Model for a Fish Stock

Tomoyuki Nakagawa (Hiroshima Univ.), **Sam Subbey** (Cornell Univ., Institute of Marine

Research, Bergen) and **Hiroko Kato Solvang*** (Institute of Marine Research, Bergen)

Abstract: This paper presents a modeling framework that captures the impulse biomass dynamics (bust – boom) of a fish stock. The framework is based on coupling a Hawke-process model that uses exogenous information to identify impulsive event times, to a discrete-time delay biomass dynamics model. The proposed method applies to the net volume flux of Atlantic water into the Barents Sea and the Barents Sea capelin. The results in this paper are innovative in two ways: 1. The results present a validated proof of an alternative hypothesis for the observed bust-boom dynamics of the

particular fish stock considered; 2. The modeling framework allows for modeling and predicting population dynamics with impulsive characteristics that may be caused by exogenous (environmental) processes.

**Statistical Analysis on the Special Complex Manifolds
in Connection with Time Series Analysis**

Yasuko Chikuse (Kagawa Univ.)

Abstract: Statistical analyses on special manifolds, in particular, the complex Stiefel manifolds and the complex Grassmann manifolds, are concerned in this paper. We give the definitions of these manifolds and the fundamental population probability distributions on these manifolds. We have the discussions on various mathematical properties of the polynomials with complex matrix arguments and certain relations with the analyses on the corresponding real manifolds, which are useful for the statistical analyses on the complex manifolds.

Backtesting VaR and expectiles with realized scores

Ilia Negri* (Univ. Bergamo) and **Yoichi Nishiyama** (Waseda Univ.)

Abstract: A chance point detection procedure is proposed based on the method of moment estimators. The test statistics is based on a suitable Z process. The asymptotic behavior of this process is established under the null hypothesis. The consistency of the test is also proved. Some examples of application of this methods to some parametric family of random variables are proposed.

Robust GEL test in infinite variance processes and its application to change point tests

Fumiya Akashi * (Waseda Univ.) and **Holger Dette** and **Yan Liu**

Abstract: This talk constructs the testing procedure of linear hypothesis on the coefficients of ARMA processes, which may have infinite variance. When the model is generated by a heavy-tailed innovation process, it is well known that the rate of convergence and the limit distribution of fundamental statistics contain unknown tail-index of the error distribution, and it is unfeasible to derive the critical value of the test in practice. To overcome the difficulties, the self-weighted generalized empirical likelihood (GEL) method is constructed in this talk, and the proposed GEL statistic is shown to converge to the standard chi-square distribution regardless of whether the model

has infinite variance or not. That is, the proposed test statistic is shown to be robust against the heavy-tails of the model. Therefore, various important tests involving model diagnostics can be carried out without any prior estimation for the unknown quantity of the models such as the tail-index of the innovations. In particular, this talk also apply the self-weighted GEL method to the change point detection problem of infinite variance processes. Some simulation studies illustrate the finite sample performance of the proposed test.

Systemic Risk Assessment by Hawkes Processes

Yu Izumisawa, Takaaki Koike and Hiroshi Shiraishi* (Keio Univ.)

Abstract: This study discusses various methods for systemic risk assessment when branching structure for adverse effects is modelled by multivariate Hawkes processes. Systemic risk is referred as a risk that risks with individual institution spread to other institutions, markets, and even entire financial systems, and systemic risk assessment has been paid attention after the global financial crisis occurred in 2008. We consider systemic risk assessment by associating causality of Hawkes processes with vulnerability of systemic risk. Then, branching structure of events observed from Hawkes processes can be grasped visually by using Hawkes graphs. In addition, we introduce another risk indicator for systemic risk, that is, Expected Shortfall (ES) based risk measure for systemic risk assessment. Moreover, a systemic risk assessment for 6 financial markets is discussed by using each stock index. This analysis shows that both of Hawkes graph and ES are important for systemic risk assessment.

A Model of Rational Bubbles with Additive Outliers

Naoya Katayama (Kansai Univ.)

Abstract: In this paper, we propose a new bubble model that represents the duration of no bubble, and bubble emergence and collapse phases under rational bubble condition and restart of the bubble condition. The proposed model is based on the Evans' periodically collapsing model, and approximately represents as an autoregressive model with additive outliers (AOs). Empirical evidence from stock price indices shows that the S&P 500, Nikkei 225, and TAIEX demonstrate strong evidence of the existence of AOs.

Interactions between Financial Leverage and Product Quality in the Tourism & Leisure Industry: Testing the Moderating Role of Business Conditions

Setareh Katircioglu (Univ. of Kyrenia) and **Salih Katircioglu*** (Eastern Mediterranean Univ.)

Abstract: The present study develops a new model and proposes new research impetus by searching the effects of financial leverage and its related control variables on the level of product quality offered by business firms. Another contribution of this research study to the literature is that the moderating role of business conditions in the effects of financial leverage on product quality is tested. A panel data of 80 tourism and leisure firms in the UK have been constructed on quarterly basis as they were available from Thomson Reuters' DataStream. Results of empirical analyses provide a strong evidence of negative effects of financial leverage on product quality. Financial leverage impact negatively on firm-level investments as well. This study finds that business conditions and macroeconomic performance in the UK have positively significant effects on firm-level product quality; this shows that any positive climate in business environment at macro level would contribute to promotion of the quality levels of products offered by business firms. Another major finding of this new research study is that business conditions at macro level have significant moderating role in the relationship between financial leverage and product quality.

Bias Reduction for Nonparametric and Semiparametric Regression Models

Ming-Yen Cheng (Hong Kong Baptist Univ. and National Taiwan Univ.)

Abstract: Nonparametric and semiparametric regression models are useful statistical regression models to discover nonlinear relationships between the response variable and predictor variables. However, optimal efficient estimators for the nonparametric components in the models are biased which hinders the development of methods for further statistical inference. In this paper, based on the local linear fitting, we propose a simple bias reduction approach for the estimation of the nonparametric regression model. Our approach does not need to use higher-order local polynomial regression to estimate the bias, and hence avoids the double bandwidth selection and design sparsity problems suffered by higher-order local polynomial fitting. It also does not inflate the variance. Hence it can be easily applied to complex statistical inference problems. We extend our approach to varying coefficient models, to estimate the variance function, and to construct simultaneous confidence band for the nonparametric regression function. Simulations are carried out for comparisons with existing methods, and a data example is used to investigate the performance of the proposed method.

**Gaussian Approximation of Maxima of Wiener Functionals
and its Application to High-Frequency Data**

Yuta Koike (Tokyo Univ.)

Abstract: In this talk we present a new upper bound for the Kolmogorov distance between the maximum of a high-dimensional vector of smooth Wiener functionals and the maximum of a Gaussian random vector. The main feature of our bound is that in many applications it allows the dimension of the vector to be much larger than the sample size of data. One commonly encounters such a situation in high-dimensional statistics. As a special case, we show that the maximum of multiple Wiener-Ito integrals with common orders is well-approximated by its Gaussian analog in terms of the Kolmogorov distance if their covariance matrices are close to each other and the maximum of the fourth cumulants of the multiple Wiener-Ito integrals is close to zero after multiplied by a polynomial of the logarithm of the dimension. This may be viewed as a new kind of fourth moment phenomenon, which has attracted considerable attention in the recent studies of probability. This type of Gaussian approximation result has many potential applications to statistics. To illustrate this point, we present some statistical applications in high-frequency financial econometrics.

Study on Early Warning of Internet Financial Loan Risk under Big Data

Yirong Ying*, **Heyun Wang** and **Yunhe Yue** (Shanghai Univ.)

Abstract: This paper is under the background of big data, combined with the development of network financial lending industry and domestic and foreign typical platform case analysis, to calculate the risk factors. Through the establishment of risk early warning model, we carry out qualitative and quantitative analysis, and practical application in China's existing lending industry and platform, try to find gaps and improve constantly.

Economic Policy Uncertainty and Financial Market Volatility: Evidence from Japan

Takayuki Morimoto (Kwansei Gakuin Univ.)

Abstract: In this study, we show a relationship between economic policy uncertainty and financial market volatility in Japanese financial market. Uncertainty is measured by the index of economic policy uncertainty (EPU) based on newspaper coverage, frequency newly developed by Baker et al. Volatility is calculated as a sum of squared intraday returns, which is known as the realized volatility

(RV). The EPU and RV are combined with the mixed data sampling (MIDAS) approach in order to investigate how economic policy uncertainty shocks are associated with the Japanese financial market volatility. The result will contribute to financial market research and economic policy studies.

Keywords: Economic policy uncertainty index; Realized volatility; GARCH-MIDAS model; DCC-MIDAS model; Japanese financial market.

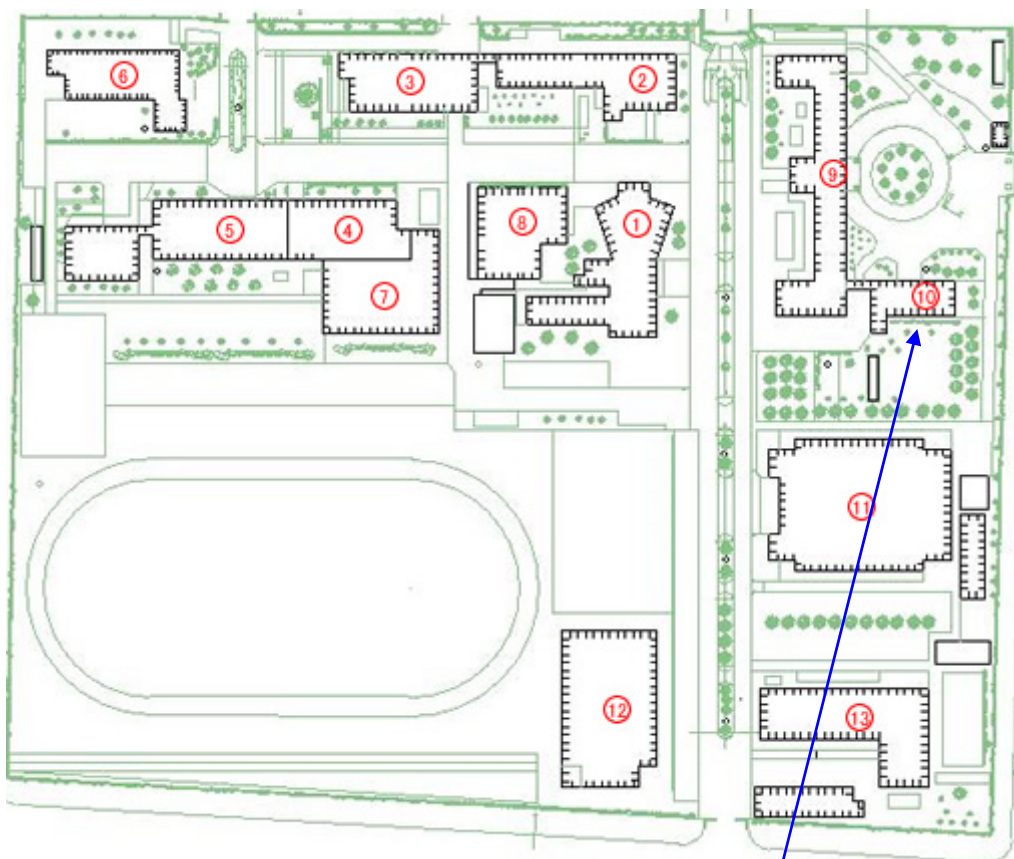
Causal Relationships between FDI Flow and Technological Innovation of China and Japan

Xiuwu Zhang* (Huaqiao Univ.) and **Feng Yao** (Kagawa Univ.)

Abstract: The improvement of a country's technological innovation level is bound to be influenced by the technological flows of inward FDI and outward FDI (foreign direct investment). We look at the characteristics of the foreign capital utilization effect between developed and developing countries. In the view of C-H theory of international capital flow model and the Wald test of one-way effect causal measures for cointegrated multiple time series, we investigate the similarities and differences of the dynamic effects that the foreign capital inflows and outflows brought respectively to Japanese and Chinese technological innovation. The empirical results show that the one-way effect of inward FDI to innovation of China is weak. The volatility however of China is stronger than that of Japan. The one-way effect causal intensity of the outward FDI to technology innovation output is small both in China and Japan. Further, the long-term and short-term effects are not identical.

Venue: Youxin Memorial Hall, Faculty of Economics,
Saiwai-cho Campus, Kagawa University.

(Access map: <http://www.ec.kagawa-u.ac.jp/access/>)

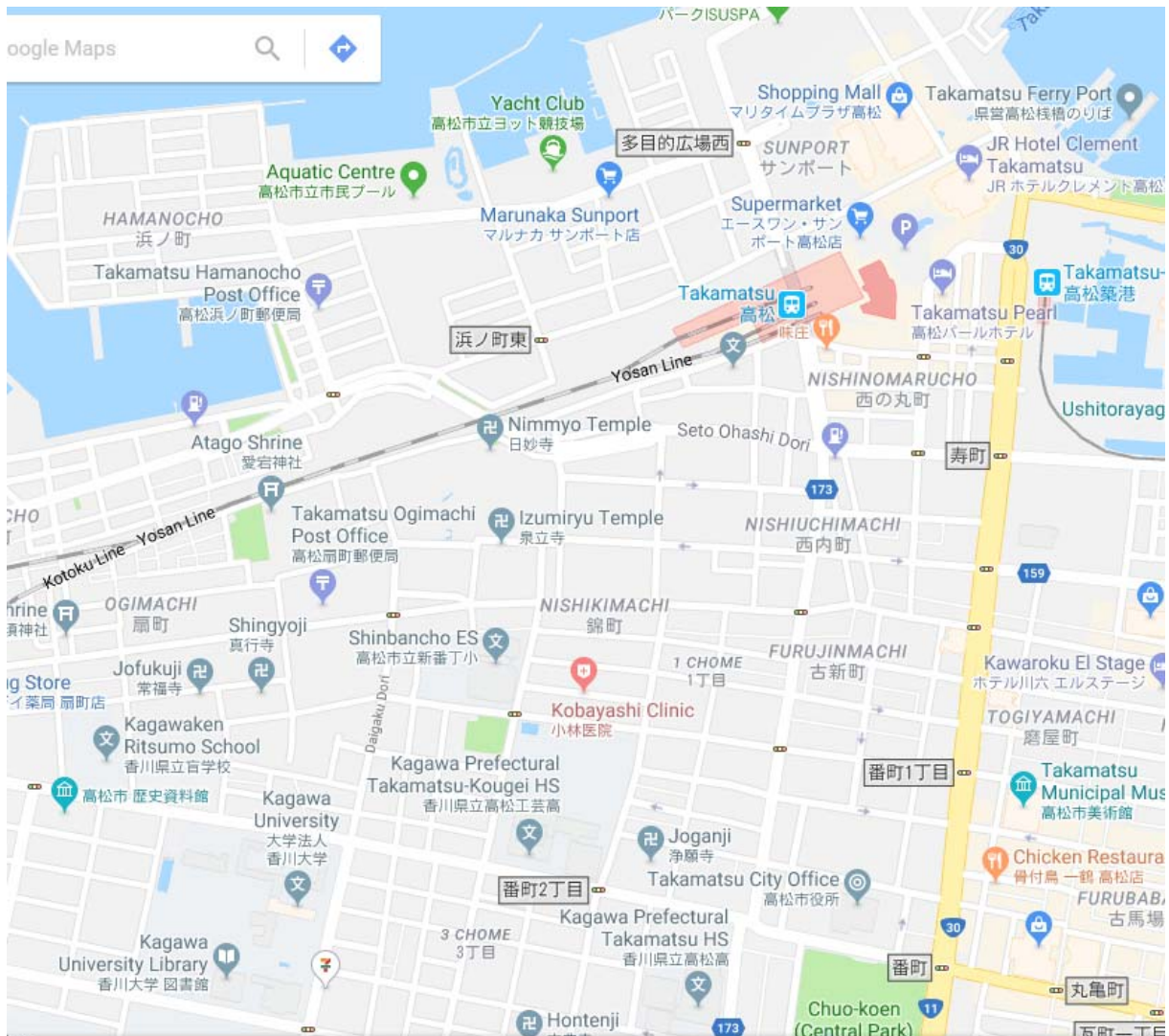


1	幸町南1号館	9	幸町南7号館
2	幸町南2号館	10	又信記念館 Youxin Memorial Hall
3	幸町南3号館	11	講堂
4	幸町南4号館	12	第二体育館
5	幸町南6号館	13	課外活動共用施設
6	交友会館		
7	幸町南5号館		
8	保健管理センター		

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From Takamatsu station, take the Kotoden Bus heading to Shimin Byoin Loop, drop at Economic Faculty (香川大学経済学部), walk 2 minutes. It is better to use a Taxi (may cost about 900 yen).

From Takamatsu Airport, take Airport Limousine Bus, drop at Kencho Dori (県庁通り), walk 10 to 15 minutes.



Buffet Party at Sorami (ソラミ 空海)



Dinner party at 喜代美山荘 花樹海 (〒760-0004 香川県高松市西宝町 3 丁)



