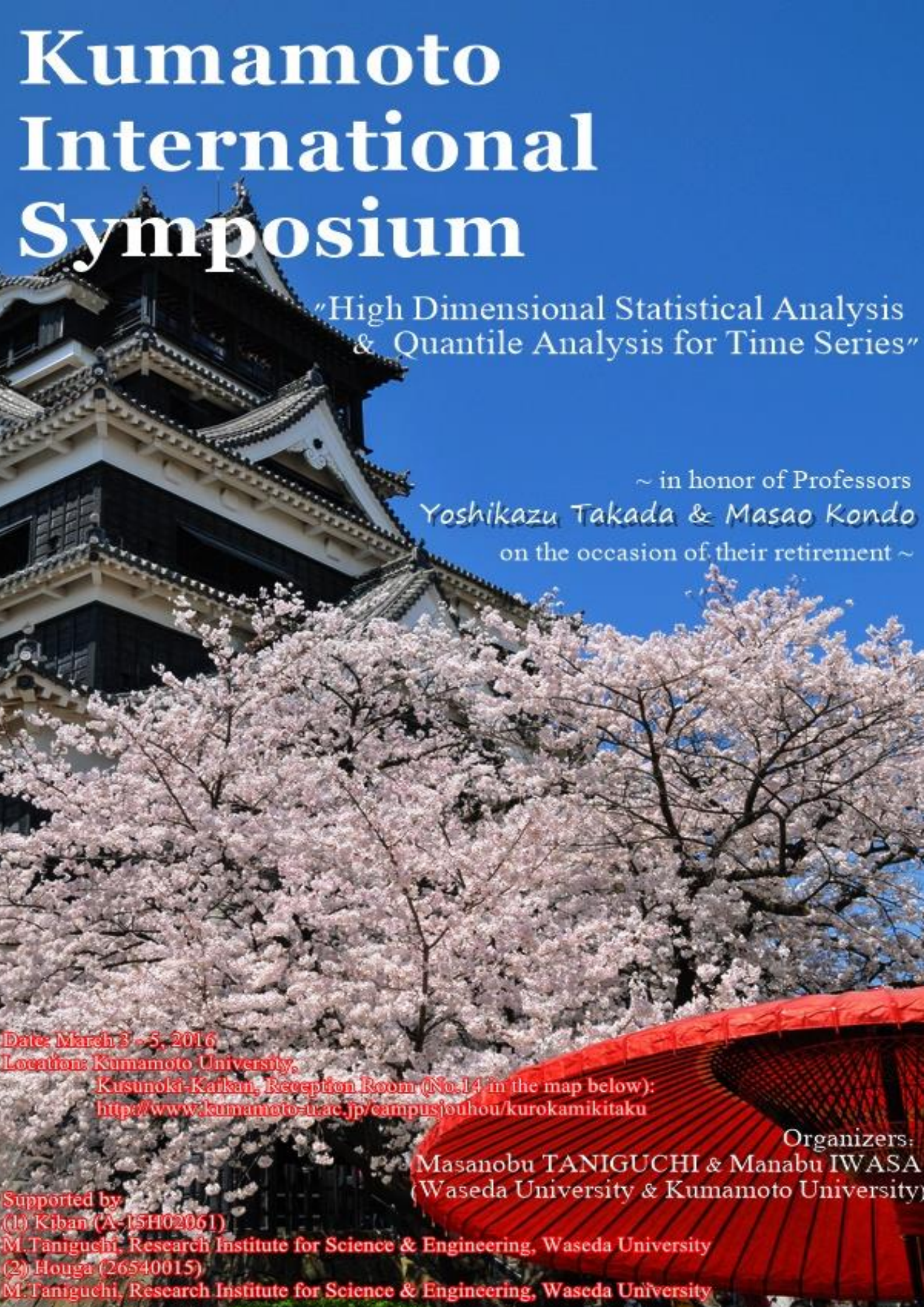
Kumamoto International Symposium

"High Dimensional Statistical Analysis & Quantile Analysis for Time Series"

~ in honor of Professors
Yoshikazu Takada & Masao Kondo
on the occasion of their retirement ~



Date: March 3 – 5, 2016
Location: Kumamoto University,
Kusunoki-Kaikan, Reception Room (No.14 in the map below):
http://www.kumamoto-u.ac.jp/campusjouhou/kurokamikitaku

Organizers:
Masanobu TANIGUCHI & Manabu IWASA
(Waseda University & Kumamoto University)

Supported by:
(1) Kiban (A) (15H02061)
M. Taniguchi, Research Institute for Science & Engineering, Waseda University
(2) Houga (26540015)
M. Taniguchi, Research Institute for Science & Engineering, Waseda University

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Program

(* Speaker)

March 3

Session (I): 13:25 - 15:30: chaired by G.D. Lin

13:25 - 13:30: Masanobu Taniguchi (Waseda Univ.)
Opening

13:30 - 14:00: Fumiya Akashi (Waseda Univ.)
Self-weighted empirical likelihood approach for infinite variance processes

14:00 - 14:30: Xiaoling Dou* (Waseda Univ.), Satoshi Kuriki, Gwo Dong Lin, Donald Richards
EM algorithm for estimation of B-spline copula

14:30 - 15:00: Junichi Hirukawa* (Niigata Univ.), Minehiro Takahashi and Ryota Tanaka
On the extension of Lo's modified R/S statistics against to locally stationary short-range dependence

15:00 - 15:30: Hiroko Kato Solvang (Institute of Marine Research Sundstgt.) and Masanobu Taniguchi
Estimation for spectral density of categorical time series data

Break: 15:30 - 15:45

Session (II): 15:45 - 17:45: chaired by J. Hirukawa

15:45 - 16:15: Ching Kang Ing (Institute of Statistical Science, Academia Sinica)
On high-dimensional cross-validation

16:15 - 16:45: Richard Davis (Columbia Univ.)

Big n, Big p: Eigenvalues for Covariance Matrices of Heavy-Tailed Multivariate Time Series

16:45 - 17:15: William T.M. Dunsmuir (The Univ. of New South Wales)
Topics in Binomial Time Series Regression Analysis

17:15 - 17:45: Liudas Giraitis* (Queen Mary Univ. of London), G. Kapetanios and Y. Dendramis
Estimation of time varying stochastic covariance matrices for large datasets

March 4

Session (III): 9:00 - 11:00: chaired by Solvang Kato

9:00 - 9:30: Toshinari Kamakura (Chuo Univ.)
Properties of LM tests for survival distributions

9:30 - 10:00: Yan Liu (Waseda Univ.)
Robust parameter estimation for irregularly observed stationary process

10:00 - 10:30: Hiroshi Shiraishi (Keio Univ.)
Statistical Estimation for Optimal Dividend Barrier with Insurance Portfolio

10:30 - 11:00: Shu Hui Yu (National Univ. of Kaohsiung)
A VaR estimator under correlated defaults

Session (IV): 11:00 - 12:30: chaired by H. Shiraishi

11:00 - 11:30: Marc Hallin (Université libre de Bruxelles)
R-estimation in semiparametric dynamic location-scale models

11:30 - 12:00: Gwo Dong Lin* (Institute of Statistical Science, Academia Sinica), Chin-Diew Lai and K. Govindaraju
Correlation Structure of the Marshall--Olkin Bivariate Exponential Distribution

12:00 - 12:30: Murad Taqqu (Boston Univ.)
A unified approach to self-normalized block sampling

Lunch 12:30 - 13:30:

Session (V): 13:30 - 14:30: chaired by Y. Liu

13:30 - 14:00: Yoshihiro Yajima (Univ. of Tokyo)
On a discrete Fourier transform of irregularly spaced spatial data and its applications

14:00 - 14:30: Nobuhiro Taneichi (Kagoshima Univ.)
Improvement of deviance for binary models

Break: 14:30 - 14:45

Session (VI): 14:45 - 15:45: chaired by X. Dou

14:45 - 15:15: Makoto Aoshima (Univ. of Tsukuba)
High-dimensional classification in non-sparse settings

15:15 - 15:45: Satoru Koda, Ryuei Nishii* (Kyushu Univ.),
K. Mochida, Y. Onda, T. Sakurai and T. Yoshida (Riken Institute)
Sparse modeling of gene networks based on time series of gene expressions

Break: 15:45 - 16:00

Session (VII): 16:00 - 17:00: chaired by F. Akashi

16:00 - 16:30: Rinya Takahashi (Kobe Univ.)
On von Mises' condition for the domain of attraction of the generalized Pareto distribution

16:30 - 17:00: Takemi Yanagimoto (Institute of Statistical Mathematics)
Three Innovative Techniques for Reducing the Variance of an Estimator: What is

the Fourth?

18:30 - Celebration Dinner

March 5

Session (VIII): 9:30 - 10:30: chaired by Shu Hui Yu

9:30 - 10:00: Hiroto Hyakutake* (National Defense Academy) and Kohei Sawatsuhashi
Profile analysis for random effect model with missing data

10:00 - 10:30: Shinto Eguchi (Institute of Statistical Mathematics)
A reconsideration of mathematical statistics

Break 10:30 -10:45:

Session (IV): 10:45 - 11:45: chaired by H. Hyakutake

10:45 - 11:15: Shuya Kanagawa* (Tokyo City Univ.) and Saneyuki Ishida
Identification of jump times of large jumps for the Nikkei 225 stock index from daily share prices via a stochastic volatility model

11:15 - 11:45: Yoshihiko Maesono* and Taku Moriyama (Kyushu Univ.)
Direct kernel type estimator of a conditional density and its application to regression

Abstracts

Akashi, F.

Self-weighted empirical likelihood approach for infinite variance processes

Abstract: This talk applies the empirical likelihood method to the testing problem for a linear hypothesis of infinite variance ARMA models. A self-weighted least absolute deviation-based empirical likelihood ratio (SWLAD-EL) test statistic is constructed, and remarkably, the proposed test statistic is shown to converge to a standard chi-square distribution although we deal with the infinite variance models. We also compare the finite sample performance of the proposed test with that of classical LAD-based test by simulation experiments. It is also reported that the proposed test is applicable to the real data analysis such as variable selection or testing serial correlations.

Dou, X.

EM algorithm for estimation of B-spline copula

Abstract: Baker's distribution is a method proposed to construct multivariate distributions using order statistics with given marginal distributions. This can be considered as the Bernstein copulas. We investigate the properties of Baker's distribution and the Bernstein polynomials, and propose the B-spline copula including the Bernstein copula as a special case. For the estimation of parameters, the EM algorithm designed for the Bernstein copula is applicable with minor changes. A data set is analyzed as an illustrative numerical example. (Joint work with S. Kuriki, G.D. Lin and D. Richards)

Hirukawa, J.

On the extension of Lo's modified R/S statistics against to locally stationary short-range dependence

Abstract: Lo (1991) developed test for long-run memory that is robust to short-range dependence. It was extension of the “range over standard deviation”

or R/S statistic, for which the relevant asymptotic sampling theory was derived via functional central limit theory. In this case, we consider extension of Lo's modified R/S statistics which is aimed to be robust against locally stationary short-range dependence. (Joint work with M. Takahashi and R. Tanaka)

Kato, S.H.

Estimation for spectral density of categorical time series data

Abstract: Stoffer et al. [1993] developed the Spectrum Envelop approach to explore periodical characteristics for categorical time series. It was applied to the study of DNA sequences to find inconsistencies in established gene segments. The Spectrum Envelope is maximized by the optimal scaling for each category to help emphasize any periodic feature in the categorical process. This is recognized as an analogue of mean-variance portfolio. We will discuss about the relationship between them by applying the mean-diversification portfolio approach by Meucci [2009]. (Joint work with M. Taniguchi)

Ing, C-K.

On high-dimensional cross-validation

Abstract: Cross-validation (CV) is one of the most popular methods for model selection. By splitting n data points into a training sample of size n_c and a validation sample of size n_v in which $n_v/n \to 1$ and $n_c \to \infty$, Shao (1993) showed that subset selection based on CV is consistent in a regression model of p candidate variables with $p \ll n$. However, in the case of $p \gg n$, the number of candidate variables, is much greater than n, not only does CV's consistency remain undeveloped, but subset selection is also practically infeasible. In this paper, we fill this gap by using CV as a backward elimination tool for eliminating variables that are included by high-dimensional variable screening methods possessing sure screening property. By choosing an n_v such that n_v/n converges to 1 at a rate faster than the one suggested by Shao (1993), we establish the desired consistency result. We also illustrate the finite-sample performance of the proposed procedure using Monte Carlo simulation.

Davis, R.

Big n, Big p: Eigenvalues for Cov Matrices of Heavy-Tailed Multivariate Time Series

Abstract: In this paper we give an asymptotic theory for the eigenvalues of the sample covariance matrix of a multivariate time series when the number of components p goes to infinity with the sample size. The time series constitutes a linear process across time and between components. The input noise of the linear process has regularly varying tails with index between 0 and 4; in particular, the time series has infinite fourth moment. We derive the limiting behavior for the largest eigenvalues of the sample covariance matrix and show point process convergence of the normalized eigenvalues as n and p go to infinity. The limiting process has an explicit form involving points of a Poisson process and eigenvalues of a non-negative definite matrix. Based on this convergence we derive limit theory for a host of other continuous functionals of the eigenvalues, including the joint convergence of the largest eigenvalues, the joint convergence of the largest eigenvalue and the trace of the sample covariance matrix, and the ratio of the largest eigenvalue to their sum. In addition, we apply the limit theory in the setting of a paper by Lam and Yao (2012, AoS) who suggested a tool for determining a number of relevant eigenvalues in the context of high-dimensional financial time series analysis. (Joint work with Thomas Mikosch, Johann Heiny and Xiaolei Xie)

Dunsmuir, W.

Topics in Binomial Time Series Regression Analysis

Abstract: This review talk presents several connected results about the modelling of binomial valued time series regression. Conditional on a state equation, W_t, consisting of a linear regression term, $x_t^T\beta$ and a correlated time series U_t the observed time series, Y_t consists of independent observations on a binomial distribution $B(m_t, \pi_t)$ in which the number of trials m_t for the tth observation can vary in time and $\text{logit}\,\pi_t = W_t$.

Two specifications for the correlated series U_t will be considered. Observation driven U_t are generated using past values of the observed responses according

to a generalized linear autoregressive moving average recursion. Parameter driven U_t use an unobserved (latent) Gaussian autoregressive moving average process to induce serial dependence in the observed series.

The talk will review score type tests for detecting both types of serial dependence. For the observation driven models these can be derived based on the simple logistic regression fit but there are questions of non-standard hypothesis testing that can arise for certain specifications of the serial dependence leading to parameters that are not estimable under the null hypothesis of no serial dependence. In these cases we propose the use of the supremum type test. For the parameter driven model, the score test is given in two stages: first, test for existence of a latent process leading to a non-standard score test; and, second, test for serial dependence in the process. The first test relies only on the logistic regression fit. The second test relies on using marginal likelihood based on the generalized linear mixed model fitting procedure. Here some interesting issues about variance estimates on the boundary and non-standard testing procedures also arise particularly in the binary case (where $m_t=1$ for all t)

The talk will also explain how the models with serial dependence can be fit to data. Applications of the method to several binary and binomial series will be given to illustrate the methods.

Giraitis, L.

Estimation of time varying stochastic covariance matrices for large datasets

Abstract: In this paper we extend the strand of the literature of estimation of covariance matrix for large dimensional datasets to dependent heterogenious variables. We combine kernel estimation with fixed coefficient estimation methods for large dimensional covariance matrices. Theoretical results allow both stochastic and deterministic structural change and hold under weaker conditions than usually assumed. Monte Carlo analysis illustrates the utility of estimation methods. The paper include brief but illustrative empirical application in the context of forecasting macroeconomic data. (Joint work with G. Kapetanios, Y. Dendramis)

Kamakura, T.

Properties of LM tests for survival distributions

Abstract: Weibull distributions are wildly used in engineering and medical fields. Many researchers are interested in devising methods of testing and estimating parameters for applications to reliability and survival data. In this article we will investigate small sample behaviors of testing and estimating Weibull models based on the likelihood including censored data. The Lagrange multiplier (LM) test is simple and may have good performance according to our experience recently. We will derive several LM tests for Weibull parameters; shape parameter, scale parameter and mean parameter with handling censored data. For comparing performance with other statistics we will conduct simulations studies on nominal and actual significance levels for the LM test, the likelihood ratio test and the Wald test. In case of shape parameter with one the derived LM test is very simple without any likelihood calculations, which include iterations. We find that the LM test tend to assures α-size test in that the true significance levels are smaller than the predefined size of α for any sample size and the true α approaches the nominal α from undersides in accordance with sample size n larger.

Liu, Y.

Robust parameter estimation for irregularly observed stationary process

Abstract: We define a new class of disparities for robust parameter estimation of irregularly observed stationary process. The proposed disparities of spectral densities are derived from the point of view of prediction problem. The proposed disparities are not contained in the class of either location disparities or scale disparities. We investigate asymptotic properties of the minimum contrast estimators based on the new disparities for irregularly observed stationary processes with both finite and infinite variance innovations. The method provides a new way to estimate parameters robust against irregularly observed stationary process with infinite variance innovations. The relative efficiencies under regularly observed cases and the ratio of mean squared error under irregularly observed cases for comparison of different disparities are shown in our simulation studies.

Shiraishi, H.

Statistical Estimation for Optimal Dividend Barrier with Insurance Portfolio

Abstract: We consider a problem where an insurance portfolio is used to provide dividend income for the insurance company's shareholders. This is an important problem in application of risk theory. Whenever the surplus attains the level barrier, the premium income is paid to the shareholders as dividends until the next claim occurs. In this presentation, we consider the classical compound Poisson model as the aggregate claims process, under which the dividends are paid to the shareholders according to a barrier strategy. Optimal dividend barrier is defined as the level of the barrier that maximizes the expectation of the discounted dividends until ruin, which was initially proposed by De Finetti (1957) in the discrete time model and thereafter discussed by Bühlmann (1970) in the classical risk model with the foundation laid. Although this problem was actively studied around 2000, it is less discussed with the estimation of the unknown barrier. In this presentation, we propose the estimation problem of the optimal dividend barrier, which is critical in application.

Yu, S-H.

A VaR estimator under correlated defaults

Abstract: Correlation between assets is an important issue after the financial crisis and it is also crucial for studying portfolio's performance. Therefore, we consider a portfolio with two assets, and assume that the returns of these assets are distributed as bivariate normal. In order to predict the returns of the assets and to know how they will be influenced by correlation, we establish the correlation between the worst performances of these assets, which is evaluated by order statistics. In addition, we estimate Value-at Risk (VaR) of the portfolio and try to find the optimal portfolio. Several simulations and case studies are executed. We show that choosing optimal portfolio assets by previous results can reduce the losses on the portfolio effectively.

Hallin, M.

R-estimation in semiparametric dynamic location-scale models

Abstract: We propose rank-based estimation (R-estimators) as a substitute for Gaussian quasi-likelihood and standard semiparametric estimation in time series models where conditional location and/or scale depend on a Euclidean parameter of interest, while the unspecified innovation density is an infinite-dimensional nuisance. Applications include linear and nonlinear models, featuring either homo- or heteroskedastic conditional distributions (e.g. conditional duration models, AR-ARCH, discretely observed diffusions with jumps, etc.). We show how to construct R-estimators achieving semiparametric efficiency at some predetermined reference density while preserving root-n consistency and asymptotic normality irrespective of the actual density. Contrary to the standard semiparametric estimators (in the style of Bickel, Klaassen, Ritov, and Wellner), our R-estimators neither require tangent space calculations nor innovation density estimation. Numerical examples illustrate their good performances on simulated data. A real-data analysis of the log-return and log-transformed realized volatility of the USD/CHF exchange rate concludes the talk. (Joint work with D. La Vecchia)

Lin, G.D.

Correlation Structure of the Marshall--Olkin Bivariate Exponential Distribution

Abstract: We first review the basic properties of Marshall--Olkin bivariate exponential distribution (BVE) and then investigate its correlation structure. We provide the correct reasonings for deriving some properties of the Marshall--Olkin BVE and show that the correlation of the BVE is always smaller than that of its copula regardless of the parameters. The latter implies that the BVE does not have Lancaster's phenomenon (any nonlinear transformation of variables decreases the correlation in absolute value). The dependence structure of the BVE is also investigated. (Joint work with C.D. Lai and K. Govindaraju)

Taqqu, M.

A unified approach to self-normalized block sampling

Abstract: The inference procedure for the mean of a stationary time series is usually quite different under various model assumptions because the partial sum process behaves differently depending on whether the time series is short or long-range dependent, or whether it has a light or heavy-tailed marginal distribution. We develop an asymptotic theory for the self-normalized block sampling, and prove that the corresponding block sampling method can provide a unified inference approach for the aforementioned different situations in the sense that it does not require the a priori estimation of auxiliary parameters. (Joint work with Shuyang Bai and Ting Zhang)

Yajima, Y.

On a discrete Fourier transform of irregularly spaced spatial data and its applications

Abstract: Let $\mathrm{X} = \{\mathrm{X_t};\ \mathrm{t} = (\mathrm{t_1}, \ldots, \mathrm{t_d})' \in \mathrm{R^d}\}$ be a stationary Gaussian random field with mean zero and autocovariance function $\mathrm{Cov}(\mathrm{X_t}, \mathrm{X_s}) - \gamma(\mathrm{t} - s),\ \mathrm{t}, s \in \mathrm{R^d}$, where $\mathrm{R} = (-\infty, \infty)$and $\mathrm{d} = 1, 2, \ldots$. We assume that $\gamma(h)$ is expressed by $\gamma(h) = \int_{R^d} \exp i(h'\,\omega) f(\omega) d\omega$, where $f(\omega)$ is the spectral density function. The sampling points, $t_p\ (p = 1, \ldots n)$ are i.i.d. random variables located in $[-\lambda_n/2, \lambda_n/2\,]^d$ and define the discrete Fourier transform and the raw periodogram by

$$J_n(\omega) = (2\pi)^{-d/2} \lambda_n^{d/2} n^{-1} \sum_{p=1}^{n} X_{t_p} \exp(-i t_p' \omega)$$

(Discrete Fourier Transform for Irregularly Spaced Data),

$$I_n(\omega) = |J_n(\omega)|^2 \quad \text{(Raw Periodogram)}.$$

We derive their asymptotic properties as $n \to \infty$ and $\lambda_n \to \infty$. Next we apply them to testing hypothesis for $f(\omega)$.

Taneichi, N.

Improvement of deviance for binary models

Abstract: A logistic regression model, complementary log-log model and probit

model are frequently used for a generalised linear model of binary data. We consider deviance as a goodness-of-fit statistic. In this presentation, using the continuous term of asymptotic expansion for the deviance under the null hypothesis that each model is correct, we obtain the Bartlett adjusted deviance statistic for each model that improves the speed of convergence to chi-square limiting distribution of deviance. Performance of each adjusted deviance statistic is also investigated numerically. (Joint work with Y. Sekiya and J. Toyama)

Aoshima, M.

High-dimensional classification in non-sparse settings

Abstract: We consider high-dimensional quadratic classifiers in non-sparse settings. The target of classification rules is not Bayes error rates in the context. The classifier based on the Mahalanobis distance does not always give a preferable performance even if the populations are normal distributions having known covariance matrices. The quadratic classifiers proposed in this paper draw information about heterogeneity effectively through both the differences of expanding mean vectors and covariance matrices. We show that they hold a consistency property in which misclassification rates tend to zero as the dimension goes to infinity under non-sparse settings. We verify that they are asymptotically distributed as a normal distribution under certain conditions. We also propose a quadratic classifier after feature selection by using both the differences of mean vectors and covariance matrices. Finally, we discuss performances of the classifiers in actual data analyses. The proposed classifiers achieve highly accurate classification with very low computational costs.

Nishii, R.

Sparse modeling of gene networks based on time series of gene expressions

Abstract: Our aim here is to implement gene expression data in vitro to growth model. A role of each gene has been elucidated little by little. It is also known that gene expression patterns and those network structure are changing

according to growth of plants. Furthermore, the network changes dynamically by the part of the plants. A study proposed here is to identify key genes about the plant growth by sparse modeling for time-series of gene expressions. (Joint work with S. Koda, K. Mochida, Y. Onda, T. Sakurai and T. Yoshida)

Takahashi, R.
On von Mises' condition for the domain of attraction of the generalized Pareto distribution

Abstract: Let F be a continuous distribution function (df) and suppose that F satisfies the von Mises condition. Then, for large enough threshold, the conditional excess df of the df F over threshold is approximated by the generalized Pareto distribution (GPD). For some commonly used distributions, we illustrate how their excess dfs are approximated by the GPDs.

Yanagimoto, T.
Three Innovative Techniques for Reducing the Variance of an Estimator: What is the Fourth?

Abstract: We begin with the innovating contributions by Professor Takada, Kumamoto University. Then this expository talk moves to a review of historical developments of the variance reduction of an estimator. It is our understanding that three notable innovative techniques can be listed as follow: a) Sample mean $\bar{x}$, b) Estimator based on the sufficient statistic t, and c) Posterior mean $\mathrm{E}\{\mu|\pi(\mu|\boldsymbol{x})\}$. We learn that the contributions on mathematical statistics provided us with the framework of the estimation problem, and enhanced the progress of researches on this subject. The aim of this review is to examine the possible existence of the fourth one.

Hyakutake, H.
Profile analysis for random effect model with missing data

Abstract: For random effects models, the profile analysis in two sample problem is considered with monotone missing. The model considered in this paper has an intraclass correlation structure. Exact testing procedures for parallelism hypothesis are given. Under parallelism, we give approximation to the distribution for constructing a confidence interval of the level difference. The accuracy of approximation is examined by simulation. (Joint work with K. Sawatsuhashi)

Key Words: Intraclass correlation, Monotone missing, Parallelism, Profile analysis, Random effects.

Eguchi, S.

A reconsideration of mathematical statistics

Abstract: In mathematical statistics there is a pair of the most important ideas in which one is an exponential family and the other is a log-likelihood function. The ideas of sufficiency, efficient estimation, the most powerful test and so forth developed on the exponential model and the methods of maximum likelihood, likelihood ratio test by the use of the log likelihood function are both necessary tools to understand mathematical statistics. We discuss a possible generalization by replacing from exp and log functions to a strictly increasing convex function and the inverse function. Then we observe that there are many properties similar to standard framework in mathematical statistics; while there are many aspects different from the standard one. Finally we summarize several issues to be solved in the extension of framework of statistics.

Kanagawa, S.

Identification of jump times of large jumps for the Nikkei 225 stock index from daily share prices via a stochastic volatility model

Abstract: We investigate daily share prices of the Nikkei 225 stock index to identify jump times of the stock index using a jump-diffusion model which consists of the Black-Scholes model with a stochastic volatility and a compound Poisson process. Since the data of daily share prices of the Nikkei 225 stock index are observed at discrete times, it is difficult to find real jump-times from the

data. In this talk we consider how to separate jump-times from the observed times. The volatility of the stock index is estimated by the historical volatility from the observation of some daily share prices. We also refer to the number of daily share prices for the historical volatility and show that the number is essential for the accuracy of the identification of jump times. (Joint work with S. Ishida)

Maesono, Y.

Direct kernel type estimator of a conditional density and its application to regression

Abstract: In this talk, we propose a new direct kernel type estimator of a conditional density function. Cwik and Mielniczuk (1989) have proposed a direct kernel type estimator of a density ratio. Extending their idea, we propose the kernel type estimator of the conditional density function. A new direct estimator of a regression function is also proposed, which is a competitor of the Nadaraya-Watson estimator. We will discuss mean squared errors of the ordinary and proposed estimators. (Joint work with T. Moriyama)