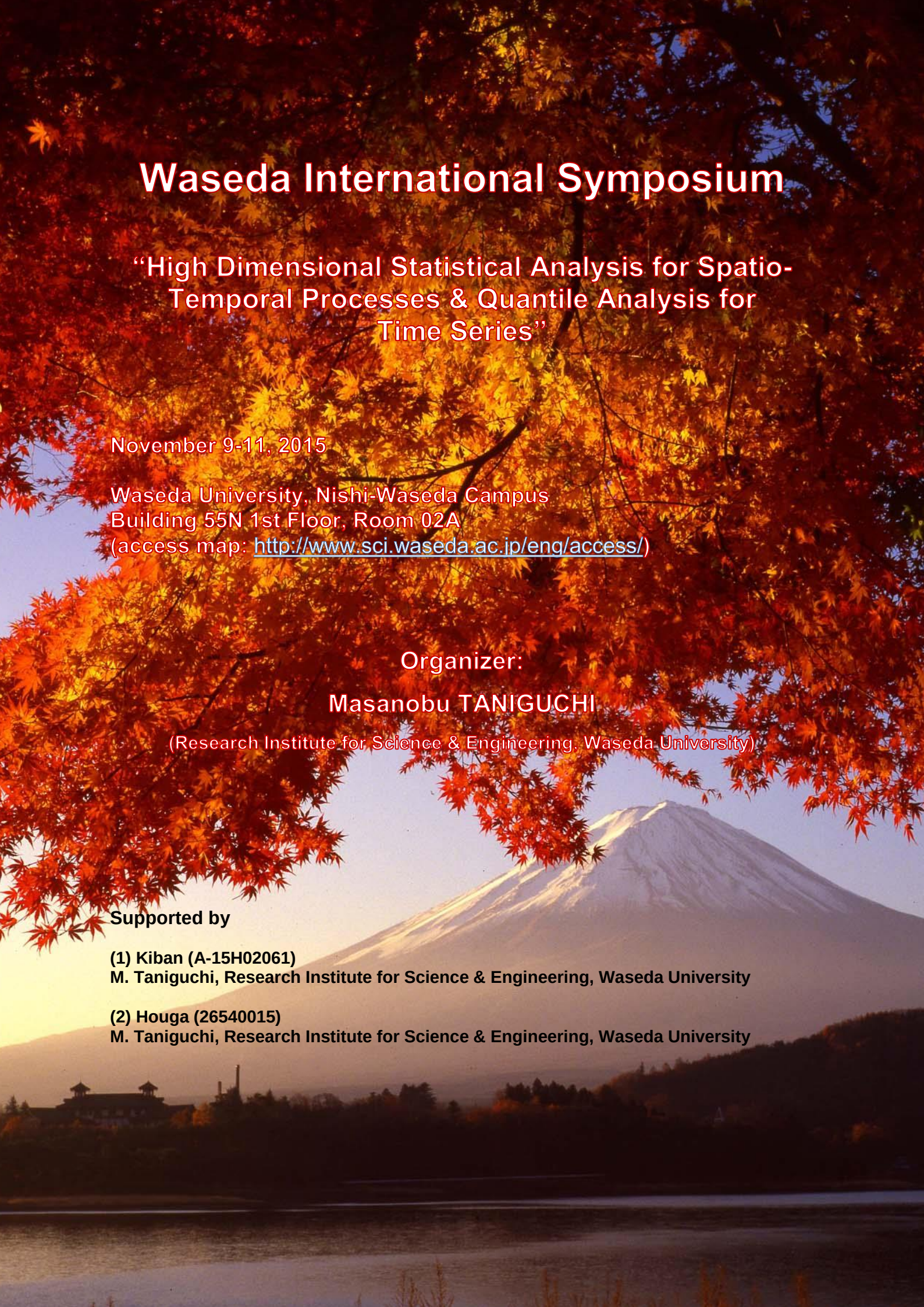

Waseda International Symposium

"High Dimensional Statistical Analysis for Spatio-Temporal Processes & Quantile Analysis for Time Series"

November 9-11, 2015

Waseda University, Nishi-Waseda Campus
Building 55N 1st Floor, Room 02A
(access map: http://www.sci.waseda.ac.jp/eng/access/)

Organizer:

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) Houga (26540015)
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Program

*** Speaker**

November 9

13:20 - 13:30: Masanobu Taniguchi (Waseda Univ.)
Opening

Session (I): 13:30 - 15:30 chaired by Y. Kutoyants

13:30 - 14:10: Fumiya Akashi (Waseda Univ.)
Self-weighted empirical likelihood for heavy-tailed autoregressive processes

14:10 - 14:50: Yasutaka Shimizu (Waseda Univ.)
Some statistical problems in ruin theory: discretely observed Levy insurance risk process

14:50 - 15:30: Yoichi Nishiyama (Waseda Univ.)
A stochastic maximal inequality, strict countability, and related topics

Coffee break

Invited Session (II): 15:50 - 17:30 chaired by Y. Nishiyama

15:50 - 16:40: Ilia Negri* (Univ. of Bergamo) and Yoichi Nishiyama
Z-process method for statistical change point problems

16:40 - 17:30: Yury Kutoyants (Univ. du Le Mans)
On approximation of the solution of backward stochastic differential equation and multi-step MLE-processes

November 10

Session (III): 9:30 - 10:50 chaired by I. Negri

9:30 - 10:10: Yan Liu* (Waseda Univ.), Yujie Xue and Masanobu Taniguchi
Minimax Extrapolation Error of Predictors

10:10 - 10:50: Kazuyoshi Yata* (Univ. of Tsukuba) and Makoto Aoshima
Two-sample tests of high-dimensional means under the strongly spiked eigenvalue model

Coffee break

Session (IV): 11:10 - 12:30 chaired by X. He

11:10 - 11:50: Teruko Takada (Osaka City Univ.)
Nonparametric density estimation based methods for robust risk analysis of trend reversals

11:50 - 12:30: Shogo Kato* (Institute of Statistical Mathematics) and M.C. Jones
A tractable and interpretable four-parameter family of unimodal distributions on the circle

Lunch

Session (V): 13:50 - 15:10 chaired by R. Koenker

13:50 - 14:30: Kengo Kato* (Univ. of Tokyo) and Antonio Galvao
Smoothed quantile regression for panel data

14:30 - 15:10: Hiroshi Shiraishi* (Keio Univ.), Masanobu Taniguchi, Yoshihiro Suto, Ching-Kang Ing and Takashi Yamashita
High order asymptotic theory of shrinkage estimation for general statistical models

Coffee Break

Invited Session (VI): 15:30 - 17:10 chaired by M.Taniguchi

15:30 - 16:20: Xuming He (Univ. of Michigan)
Single-index Quantile Regression with Profile Optimization

16:20 - 17:10: Roger Koenker (Univ. of Illinois)
Pessimistic Portfolios and Multivariate Risk

18:00 - Dinner Party

November 11:

Session (VII): 9:30 - 11:30 chaired by H.C. Huang

9:30 - 10:10: Toshihiro Abe, Hiroaki Ogata* (Tokyo Metropolitan Univ.), Takayuki Shiohama and Hiroyuki Taniai
Modeling circular Markov processes with time varying autocorrelation

10:10 - 10:50: Yoichi MIYATA (Takasaki City Univ. of Economics)
Some asymptotic properties of Bayesian information criteria in misspecified models

10:50 - 11:30: Junichi HIRUKAWA (Niigata Univ.)
Locally stationary time series factor models

Coffee break

Invited Session (VIII): 11:50 - 13:30 chaired by J. Hirukawa

11:50 - 12:40: Ming-Yen Cheng, Toshio Honda* (Hitotsubashi Univ.) and Jin-Ting Zhang
Forward variable selection for sparse ultra-high dimensional varying coefficient models

12:40 - 13:30: Hsin-Cheng Huang (Academia Sinica)
Regularized Estimation for Spatial Random-Effects Models

Abstracts

Akashi, F.
Self-weighted empirical likelihood for heavy-tailed AR processes

Abstract: This talk applies the empirical likelihood (EL) method to parameter estimation problems of autoregressive (AR) processes generated by the symmetric alpha-stable innovations, called the stable AR process. The stable process does not have the finite variance, and the probability density function of the innovations can not be expressed in closed form. Hence the classical method of moment or maximum likelihood method are not available. To overcome these hurdles, we consider the self-weighted EL ratio statistic based on a least absolute deviation (LAD) score. As a result, it is shown that the EL statistic is asymptotically chi-square distributed, and the limit distribution does not contain any unknown quantity of underlying data generating processes. We also make a comparison between the EL and the classical LAD-based test statistic by simulations, and elucidate the advantage of our approach.

Shimizu, Y.
Some statistical problems in ruin theory: discretely observed Levy insurance risk process

Abstract: We consider an insurance risk process, whose outgoing process is given by a Levy subordinator. Our goal is to statistically estimate the expected discounted penalty function from given surplus data, which are discretely observed in time. The estimator is constructed by inverting a semiparametric estimator of the Fourier transform of the objective function. Although the estimator includes a tuning parameter, the L_2-consistency is shown with the rate optimality by a suitable choice of the tuning parameter. We shall give a data-adaptive choice of the tuning parameter from given data. A simulation study is also presented to show the performance of the estimator under finite sample setting.

Nishiyama, Y.
A stochastic maximal inequality, strict countability, and related topics

Abstract: As an alternative to the well-known methods of "chaining" and "bracketing" that have been developed in the study of random fields, a new method, which is based on a stochastic maximal inequality derived by using It\^o's formula, is presented. The main results are some weak convergence theorems for sequences of separable random fields of locally square-integrable martingales under the uniform topology with the help also of entropy methods. As special cases, some new results for i.i.d. random sequences, including a new Donsker theorem and a moment bound for suprema of empirical processes indexed by classes of sets or functions, are obtained. An application to statistical estimation in semiparametric models is presented with an illustration to construct adaptive estimators in Cox's regression model.

Negri, I.
Z-process method for statistical change point problems

Abstract: We present a general, unified approach, based on some partial estimation functions which we call ``Z-process'', to some change point problems in mathematical statistics. The method proposed can be applied not only to ergodic models but also to some models where the Fisher information matrix is random. Applications to some concrete models, including especially a parametric model for volatilities of diffusion processes are presented. Simulations for randomly time-transformed Brownian bridge process appearing as the limit of the proposed test statistics are performed with computer intensive use. (Joint work with Y. Nishiyama)

Kutoyants, Y.
On approximation of the solution of backward stochastic differential equation and multi-step MLE-processes

Abstract: We consider the problem of approximation of the solution of backward stochastic differential equation by the observations of the forward equation depending on some unknown finite-dimensional parameters. We propose the lower minimax bounds on the risks of all estimators and then we construct asymptotically optimal estimator-processes. As the models of observations we consider the following forward equations: small volatility equation and parameter in the drift, discrete time observations and parameter in the volatility and ergodic diffusion process with parameter in the drift. This construction is based on the solution of special partial differential equation and a new class of estimator-processes called multi-step MLE-processes. The obtained results are illustrated by numerical simulations. (Joint work with L. Zhou, S. Gasparyan and A. Abakirova)

Liu, Y.
Minimax Extrapolation Error of Predictors

Abstract: We consider minimax predictors in line with the seminal work by Huber, who introduced the minimax variance to the field of statistics. Prediction problem, as known as the extremal problem, can be regarded as a linear approximation on the unit circle in the complex plane. Although robust one-step ahead predictor and interpolator has already been considered separately in the previous literature, we will give a general framework from both a point of linear approximation on the unit circle and a point of the error evaluated under the L^p norm. We show that there exists a minimax predictor for the class of spectral distributions ε-contaminated by unknown spectral distributions. With examples of multiple step prediction and interpolation, we also illustrate the result with prediction problem that there are several missing observations in the past. (Joint work with Y. Xue and M. Taniguchi)

Yata, K.
Two-sample tests of high-dimensional means under the strongly spiked eigenvalue model

Abstract: In this talk, we consider two-sample tests of high-dimensional means under the strongly spiked eigenvalue (SSE) model such as several eigenvalues are significantly large. We emphasize that high-dimensional data often have the SSE model. In this talk, we introduce the findings by Aoshima and Yata (2015). First, we show that typical high-dimensional two-sample tests do not work for the SSE model. We investigate two-sample tests under the SSE model by considering strongly spiked eigenvalues and their eigenvectors. Next, we consider estimation of eigenstructures by using the noise-reduction methodology given by Yata and Aoshima (2012). Based on the theoretical background, we propose a new effective test procedure for the SSE model. We show that the proposed test procedure gives an adequate performance for the SSE model even in non-Gaussian cases. Finally, we demonstrate the test procedures by using microarray data sets. (Joint work with M. Aoshima)

Takada, T.
Nonparametric density estimation based methods for robust risk analysis of trend reversals

Abstract: Sudden trend reversals often cause serious troubles, and its prediction and control is highly demanded. However, they are tail phenomena having inherent difficulties to analyze: The behavior generated from complex system involving many factors has to be explained based on noisy little available information. The aim of this presentation is to propose robust and efficient nonparametric density estimation based methods, developed for capturing comprehensive behavior and dependence structure without any prior assumptions. They enable precise measurement and prediction of risks from abrupt switches. The efficiency and robustness of the methods are illustrated through the comparative studies. The methods are applied to daily and high frequency stock data and text data from the web, where several new facts are found and superior performances in measuring/predicting risks of sudden trend reversals relative to conventional approaches are shown.

Kato, S.
A tractable and interpretable four-parameter family of unimodal distributions on the circle

Abstract: On the circle, as on the line, families of unimodal distributions with parameters controlling location, scale or concentration, skewness and, in some appropriate sense, kurtosis, are useful for robust modelling. Although numerous such families now exist on the line, fewer exist on the circle. In this talk we present a family of four-parameter distributions for circular data by taking a new approach. Properties of the proposed family include: unimodality; a simple characteristic function and tractable density and distribution functions; interpretable parameters individually

measuring location, concentration, skewness and kurtosis, respectively; a wide range of skewness and "kurtosis"; some submodels including the wrapped Cauchy and cardioid distributions; closure under convolution and multiplication by certain constants; straightforward parameter estimation by both method of moments (suitable for smaller samples and moderate parameter values) and maximum likelihood. We will show that our new proposal compares favourably with some of the current four-parameter unimodal families on the circle. Finally, an illustrative application of the proposed model is given. (Joint work with M.C. Jones)

Kato, K.
Smoothed quantile regression for panel data

Abstract: : This paper studies fixed effects estimation of quantile regression (QR) models with panel data. Previous studies show that there are two important difficulties with the standard QR estimation. First, the estimator can be biased because of the well-known incidental parameters problem. Secondly, the non-smoothness of the objective function significantly complicates the asymptotic analysis of the estimator, especially in panel data models. We overcome the latter problem by smoothing the objective function. Under an asymptotic framework where both the numbers of individuals and time periods grow at the same rate, we show that the fixed effects estimator for the smoothed objective function has a limiting normal distribution with a bias in the mean, and provide the analytic form of the asymptotic bias. We propose a one-step bias correction to the fixed effects estimator based on the analytic bias formula obtained from our asymptotic analysis. Importantly, our results cover the case that the observations are dependent in the time dimension. We illustrate the effect of the bias correction to the estimator through simulations. (Joint work with A. Galvao)

Shiraishi, H.
High order asymptotic theory of shrinkage estimation for general statistical models

Abstract: We develop the high order asymptotic theory of shrinkage estimators for general statistical models, which include dependent processes, multivariate models and regression models, i.e., non-i.i.d. models. Introducing a shrinkage estimator of MLE, we compare it with that of MLE by third-order mean squares error (MSE). A sufficient condition for the shrinkage estimator to improve the MLE will be given in a very general fashion. Our model is described as a curved statistical model $p(\cdot\,; \theta(u))$, where θ is a parameter of larger model and u is a parameter of interest with dim $u <$ dim θ. This setting is especially suitable for estimation of portfolio coefficients u based on mean and variance parameters θ. We also mention the advantage of our shrinkage estimators when the dimension of parameter becomes large. Numerical studies are given, and illuminate an interesting feature of the shrinkage estimator.

He, X.
Single-index Quantile Regression with Profile Optimization

Abstract: Single-index models offer greater flexibility in data analysis than linear models but retain some of the desirable properties such as the interpretability of the parameters. Single-index quantile regression models have been considered in recent literature, but the theory for inference appears challenging. In fact, some of the recent publications derived the asymptotic distributions of the index coefficient estimator without cognizance of the intrinsic singularity of the covariance matrix. In this talk we focus on the profile approach to the quantile objective function. This approach defines naturally a single objective function over the index parameter, making it convenient for statistical inference. For instance, the profile objective function can be penalized easily for variable selection. We also develop a quantile rank score test based on the profile objective function. When the nonparametric link function is approximated by a spline, the profile objective function is non-differentiable with respect to the index parameter, so the "score" test statistic needs to be formulated with care. (Joint work with S. Ma of the University of California at Riverside)

Koenker, R.
Pessimistic Portfolios and Multivariate Risk

Abstract: Recent developments in the theory of choice under uncertainty and risk yield a pessimistic decision theory that replaces the classical expected utility criterion with a Choquet expectation that accentuates the likelihood of the least favorable outcomes. A parallel theory has recently emerged in the literature on risk assessment. It will be shown that a general form of pessimistic portfolio optimization based on the Choquet approach may be formulated as a problem of linear quantile regression. The approach will be illustrated with performance on a small portfolio of hedge funds. Some general conclusions will be drawn about characterizing multivariate distributions based on the lower tail behavior of linear functionals.

Ogata, H.
Modeling circular Markov processes with time varying autocorrelation

Abstract: A simple model with time varying autocorrelation for circular Markov processes is proposed. For this purpose, we introduce a time varying concentration parameter in the underlying circular Markov processes. Maximum likelihood estimation as well as the estimation via nonlinear and non-Gaussian state space models are considered. The proposed models are used to illustrate the non-linear relationships between the wind directions and the wind speeds through by time-varying autocorrelations.

Miyata, Y.
Some asymptotic properties of Bayesian information criteria in misspecified models

Abstract: Model selection has an important role in modern statistical analysis. Although the Bayesian information criterion (BIC) is given by an approximation to the log-marginal likelihood functions, to show the validity of the approximation, we usually assume that a class of parametric models includes a correctly specified model. Lv and Liu (2014, Journal of the Royal Statistical Society Series B 76, 141-167) derives valid asymptotic expansions for the marginal likelihood functions in misspecified generalized linear models under some reasonable conditions, and proposes the generalized BIC. In this talk, we derive a higher-order asymptotic expansion for the marginal likelihood functions under conditions similar to those of Lv and Liu, and present an alternative BIC criterion. In addition, we apply the approach of Sin and White (1996, Journal of Econometrics 71, 207-225) to present some consistency results for the higher-order-term-based information criterion. We also present several numerical examples to illustrate the finite-sample performance of the alternative BIC in both correctly specified and misspecified logistic models.

Hirukawa, J.
Locally stationary time series factor models

Abstract: The factor modeling for multivariate time series from a dimension-reduction viewpoint has been well developed under stationary and non-stationary setting. The inference is simple in the sense that both the number of factors and the factor loadings are estimated in terms of an eigenanalysis for a nonnegative definite matrix. However, many results are described by the consistency of the estimators. In this talk we will consider the factor modeling for multivariate locally stationary processes. Since we are interested in the comparison between stationary setting and locally stationary setting, the consistency results are not enough. The asymptotic normality or the mean squares error will be required. Here, we will consider the asymptotic normality of the estimators for locally stationary factor models.

Honda, T.
Forward variable selection for sparse ultra-high dimensional varying coefficient models

Abstract: Varying coefficient models have numerous applications in a wide scope of scientific areas. While enjoying nice interpretability, they also allow flexibility in modeling dynamic impacts of the covariates. But, in the new era of big data, it is challenging to select the relevant variables when there are a large number of candidates. Recently several work are focused on this important problem based on sparsity assumptions; they are subject to some limitations, however. We introduce an appealing forward variable selection procedure. It selects important variables sequentially according to a sum of squares criterion, and it employs an EBIC- or BIC-based stopping rule. Clearly it is simple to implement and fast to compute, and it possesses many other desirable properties from both theoretical and numerical

viewpoints. We establish rigorous selection consistency results when either EBIC or BIC is used as the stopping criterion, under some mild regularity conditions. Notably, unlike existing methods, an extra screening step is not required to ensure selection consistency. Even if the regularity conditions fail to hold, our procedure is still useful as an effective screening procedure in a less restrictive setup. We carried out simulations and empirical studies to show the efficacy and usefulness of our procedure. (Joint work with M-Y. Cheng, J-T. Zhang)

Huang, H-C.
Regularized Estimation for Spatial Random-Effects Models

Abstract: The spatial random-effects model is effective in modeling spatial covariance functions, and is computationally efficient for spatial prediction via fixed rank kriging. The success of this model depends on an appropriate set of basis functions. In this talk, a class of multiscale basis functions constructed from linear transformations of thin-plate splines is introduced. These functions can be ordered in terms of their degrees of smoothness with higher-order functions corresponding to larger-scale features and lower-order ones corresponding to smaller-scale details. In addition, a regularization approach is proposed for parameter estimation, which enables effective control of estimation variability even when the number of basis functions is large. A computationally efficient method is proposed for solving the regularization problem. Some numerical examples are provided to demonstrate the effectiveness of the proposed method.