Nishi-Izu Seminar

March 6 - 8, 2014

Fujiya Hotel

(http://www.toi-fujiya.co.jp/)

Toi, Nishi-Izu

Supported by Kiban (A) (23244011) (M.Taniguchi)
& Government Pension Investment Fund (GPIF), Japan

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Program

(* speaker)

March 6, 2014

14:00 - 15:30
Presentations by graduate students of Taniguchi's lab:

Coffee Break

16:00 - 16:30
(1) Frequency domain GMM approach to hypothesis testing and its optimality for alpha-stable linear processes
Fumiya Akashi (Waseda Univ.)

16:30 - 17:00
(2) Tail index estimation by self-normalized method
Yan Liu (Waseda Univ.)

17:00 - 17:30
(3) Efficient influence function of coefficient functions in quantile regression
Hiroyuki Taniai (Waseda Univ.)

17:30 - 18:00
(4) Consideration on a serial correlation
Hiroaki Ogata (Waseda Univ.)

March 7, 2014

9:30 - 10:00
(5) Universal Portfolios with Optimal Categorized Side Information
Hiroshi Shiraishi (Jikei Medical Univ.)

10:00 - 10:30
(6) FCLT for short- and long- memory locally stationary processes in frequency domain
Junichi Hirukawa (Niigata Univ.)

Coffee Break

10:45 - 11:15
(7) Functional clustering of mouse ultrasonic vocalization data
Xiaoling Dou* (ISM), Shingo Shirahata, Hiroki Sugimoto and Tsuyoshi Koide

11:15 - 11:45
(8) Bayesian Unit Root Test in Double Markov Switching Heteroskedastic Models
Cathy W. S. Chen* (Feng Chia Univ), Sangyeol Lee and S. Y. Chen

Lunch

13:30 - 14:00
(9) Prediction Based Estimation function for the COGARCH(1,1) model
Ilia Negri (Univ. Bergamo)

14:00 - 14:30
(10) Asymptotics for the Spatial Extremogram
Richard A. Davis (Columbia Univ.)

14:30 - 15:00
(11) Fluctuations of subexponential Levy processes with infinite mean
Claudia Klüppelberg (Munich Univ. Technology)

Coffee Break

15:30 - 16:00
(12) Nagaev-type large deviations for random walks with dependent heavy-tailed steps
Thomas Mikosch (Univ. Copenhagen)

16:00 - 16:30
(13) Associated sequences and Demimartingales
B.L.S. Prakasa Rao (Univ. Hyderabad Campus)

March 8, 2014

9:30 - 11:00
Discussion on "Stable Process, Semimartingale, Finance & Pension Mathematics"
Chaired by Masanobu Taniguchi (Waseda Univ.)

Abstracts

(1) Frequency domain GMM approach to hypothesis testing and its optimality for alpha-stable linear processes

Fumiya Akashi (Waseda Univ.)

Abstract: This talk provides the asymptotic theory of hypothesis testing for time series models. The model concerned is defined nonparametrically and generated by infinite variance innovation sequence. We consider functional of a so-called normalized power transfer functions, which summarizes information about pivotal quantities of the model. It is well known that many important quantities of time series models are expressed as a functional of the spectral density and this setting is still useful in the case of heavy tailed data. We consider test statistics based on the generalized method of moments (GMM) and frequency domain generalized empirical likelihood (FDGEL) saddle-point problem as in Kakizawa (2013). We consider a sequence of local contiguous alternatives to elucidate the local power of the tests, and discuss the local asymptotic optimality of the test statistics. Some simulation studies are presented to compare the performance of the test statistics.

(2) Tail index estimation by self-normalized method

Yan Liu (Waseda Univ.)

Abstract: In this talk, we introduce a new way to estimate the tail index of the underlying distribution of samples. It is known that there is an asymptotic distribution for any self-normalized sum made from an i.i.d. distribution function which belongs to a domain of attraction of a stable law. We give a general and explicit formula for the moments of the asymptotic distribution of symmetric self-normalized sums. As an application, tail index can be estimated by self-normalized method using moment estimators. The numerical results of the estimator compared with Hill's estimator will also be presented.

(3) Efficient influence function of coefficient functions in quantile regression

Hiroyuki Taniai (Waseda Univ.)

Abstract: As in Koenker and Xiao (2006), the Quantile Regression model has an interpretation as the Random Coefficient Regression model where the coefficients are function of uniform random variables. In this talk, we regard this as a kind of Mixture model by looking at the covariate as a "random nuisance parameter" whose distribution serves as mixing distribution. So this can be seen as a infinite-dimensional version of Pfanzagl (1982), Chapter 14. Consequently I derive the tangent space for the coefficient functions (infinite-dimensional), and then present the form of efficient influence function (for fixed probability u) as well. This will yield, together with the Donsker result for the Regression Quantile Process indexed by u, the efficient inference of the coefficients as functions. Further, if time allows, the corresponding estimation scheme may also be discussed.

(4) Consideration on a serial correlation

Hiroaki Ogata (Waseda Univ.)

Abstract: One of the most widely used indices describing the relevancy of two random variables is

the (Pearson product-moment) correlation coefficient. It measures the linear correlation between two random variables. Besides the correlation coefficient, many other measures of association have been proposed. Here, the term "association" indicates not only linear relationship but also any relationship between two random variables. In this talk, several ordinal measures of association, including the quadrant association, Kendall's τ, Spearman's ρ and copula, are reviewed. Then we apply them to describe a serial correlation of time series data.

(5) Universal Portfolios with Optimal Categorized Side Information
Hiroshi Shiraishi (Jikei Medical Univ.)
Abstract: Cover (1991) proposed a "universal portfolio" (UP) strategy which is a sequential portfolio selection procedure for investing in the stock market. He showed that the strategy achieves, to first order in the exponent, the same wealth as the best constant rebalanced portfolio (BCRP) without any distributional assumption. Cover and Ordentlich (1996) extended his result to the case with side information. They showed that the UP with side information strategy achieves asymptotically the same wealth as the best state-constant rebalanced portfolio (BSCRP) which invests in the market using one of k distinct portfolios depending on the current state of side information. We consider a UP with Optimal Categorized Side Information which is the same as Cover and Ordentlich's UP, but the number of states k is estimated at each time. We also shows that the UP achieves asymptotically the same wealth as the BSCRP with an optimal number of states (k^*).

(6) FCLT for short- and long- memory locally stationary processes in frequency domain
Junichi Hirukawa (Niigata Univ.)
Abstract: Since the work of McLeish (1974) many different sets of conditions for the central limit theorems (CLT) and invariance principles (FCLT) for discrete time series have been considered. The key to the approach for linear process is an algebraic decomposition of the linear filter that is known in the econometric literature as the Beveridge-Nelson (BN) decomposition. However such decomposition in frequency domain is not often discussed. In this talk we will consider FCLT for short- and long- memory locally stationary processes in frequency domain.

(7) Functional clustering of mouse ultrasonic vocalization data
Xiaoling Dou* (ISM), Shingo Shirahata, Hiroki Sugimoto and Tsuyoshi Koide
Abstract: Mouse ultrasonic vocalizations (USVs) are studied in various fields of science. However, background noise and varied USV patterns in observed signals make complete automatic analysis difficult. We propose a series of methods to cluster nonharmonic mouse USV data automatically. The procedure includes noise reduction, detecting USV calls, transforming USV calls as functions and functional clustering. The proposed methods are shown useful with two data sets taken from laboratory mice.

(8) Bayesian Unit Root Test in Double Markov Switching Heteroskedastic Models
Cathy W. S. Chen* (Feng Chia Univ), Sangyeol Lee and S. Y. Chen
Abstract: This study proposes a Bayesian testing procedure to detect the presence of local nonstationarity in double Markov switching autoregressive GARCH models. To implement a test, a

new posterior odds analysis is proposed that uses an adaptive Markov Chain Monte Carlo scheme, which includes a new extension to solve the likelihood identification problem of the autoregressive coefficient with a unit root. Our simulation study demonstrates that the proposed Bayesian test performs properly. Further, our empirical study confirms that the proposed method successfully detects the local non-stationarity in the double Markov switching autoregressive GARCH model.

(9) Prediction Based Estimation function for the COGARCH(1,1) model
Ilia Negri (Univ. Bergamo)
Abstract: The COGARCH (COntinuous Generalized Auto-Regressive Conditional Heteroschedastic) model can be considered as a continuous version of the well known GARCH discrete time model. They are driven by general Lévy processes and the resulting volatility process satisfies a stochastic differential equation. The prediction-based estimating functions (PBEF's) method is applied to draw statistical inference about the COGARCH(1,1) model from discrete observed data. PBEF's can be seen as a generalization of martingale estimation functions. To find the optimal PBEF, a general method to calculate the moment of higher order of the COGARCH(1,1) model is also presented.

(10) Asymptotics for the Spatial Extremogram
Richard A. Davis (Columbia Univ.)
Abstract: The extremogram and its empirical counterpart is a useful tool for measuring extremal dependence and checking model adequacy in a time series. We define the extremogram in the spatial domain when the data is observed on a lattice or at locations distributed as a Poisson point process in d-dimensional space. Under heavy-tailed and mixing conditions, we establish a central limit theorem for the spatial empirical extremogram. These limit results can be used in a semiparametric fashion for estimating parameters in a Brown-Resnick process. (This is joint work with Yongbum Cho and Souvik Ghosh.)

(11) Fluctuations of subexponential Levy processes with infinite mean
Claudia Klüppelberg (Munich Univ. Technology)
Abstract: We consider the first passage time problem for Levy processes, emphasising heavy tailed cases, with a view to applications in insurance and operational risk. Under mild assumptions, namely, drift to $-\infty$ a.s. of the process, possibly at a linear rate (the finite mean case), but possibly much faster (the infinite mean case), together with subexponential growth for the positive tail of the underlying distribution or canonical measure, and regular variation or maximum domain of attraction conditions for the negative tail, we obtain very explicit and detailed descriptions of the asymptotic behaviour of the processes. No overt moment conditions are imposed. Particular attention is paid to the passage time itself, as well as to the position of the process just prior to passage, and the overshoot of a high level.
References
Asmussen, S., and Klüppelberg, C. (1996)
Large deviations results in the presence of heavy tails, with applications to insurance risk.
Stochastic Processes and their Applications 64 (1), 103-125.
Doney, R.A., Klüppelberg, C., and Maller, R.A. (2013)

Passage time and fluctuation calculations for subexponential Lévy processes.
Submitted for publication.

(12) Nagaev-type large deviations for random walks with dependent heavy-tailed steps
Thomas Mikosch (Univ. Copenhagen)
Abstract: This is joint work with Olivier Wintenberger (Paris VI).

Nagaev-type large deviations are precise first order approximations for the probability that a random walk hits a set which is far away from the origin. By classical theory of A.V. and S.V. Nagaev from the 1960s and 1970s for random walks with heavy-tailed steps, these probabilities are proportional to the probability that the largest step of the random walk hits the same rare set. This fact is sometimes also called "heavy-tailed large deviations heuristics" and it often helps one to understand a wide spectrum of heavy-tail phenomena related to random walks with iid steps, e.g. the event of ruin.

In this talk, we consider a random walk with heavy-tailed dependent steps and show how the theory needs to be changed to take into account cluster effects of the largest steps of the random walk.

(13) Associated sequences and Demimartingales
B.L.S. Prakasa Rao (Univ. Hyderabad Campus)
Abstract: The concept of association of random variables was introduced by Esary, Proschan and Walkup (1967). In several situations, for example, in reliability and survival analysis, the random variables of lifetimes involved are not independent but are generally associated. In the classical case of statistical inference, the observed random variables of interest are generally assumed to be independent and identically distributed. However in several real life situations, the random variables need not be independent.

In reliability studies, there are structures in which the components share the load, so that failure of one component results in increased load on each of the remaining components. Failure of one component will adversely effect the performance of all the minimal path structures containing it. In such a model, the random variables of interest are not independent but are 'associated'. We give a short review of probabilistic properties of associated sequences of random variables and related notion of demimartingales.