研究集会「確率解析と統計的推測 III」

Workshop on "Stochastic Analysis and Statistical Inference III"

この集会は次の資金による支援を受けています.

・統計数理研究所共同研究（重点型研究・重点テーマ３　コーディネータ・西山陽一）
　20-共研-4301　確率微分方程式モデルの統計解析（代表・内田雅之）
　20-共研-4302　確率過程に対する極限定理と統計解析の研究（代表・吉田朋広）
　20-共研-4303　レヴィ過程の統計的漸近推測の研究とその応用（代表・増田弘毅）
・東京大学大学院数理科学研究科グローバル COE プログラム「数学新展開の研究教育拠点」
・JST さきがけ数学領域”数学と諸分野の協働による ブレークスルーの探索”研究テーマ「確率過程の統計推測法の基礎理論およびその実装」
・科研費補助金　基盤研究（Ｂ）「確率過程に対する漸近展開理論，統計推測理論の研究とその応用」（課題番号 193440021　研究代表・吉田朋広）

日程：２００８年１１月２６日（水）～２７日（木）
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アクセス：　http://www.ms.u-tokyo.ac.jp/access/index.html

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========== *Program* ==========

Wednesday 26th, Afternoon (Chair: Hiroki Masuda) **********

13:30-14:10　**Michael Soerensen** (Univ. of Copenhagen)
Efficient estimation for ergodic SDE models sampled at high frequency

Simple and easily checked conditions are given that ensure rate optimality and efficiency of estimators for ergodic SDE models in a high frequency asymptotic scenario, where the time between observations goes to zero while the observation horizon goes to infinity. For diffusion models rate optimality is important because parameters in the diffusion coefficient can be estimated at a higher

rate than parameters in the drift. The criteria presented in the talk provide, in combination with considerations of computing time, much needed clarity in the profusion of estimators that have been proposed for parametric diffusion models. The focus is on approximate martingale estimating functions for discrete time observations. This covers most of the previously proposed estimators, and the few that are not covered are likely to be less efficient, because non-martingale estimating functions, in general, do not approximate the score function as well as martingales. Optimal martingale estimating functions in the sense of Godambe and Heyde have turned out to provide simple estimators for many SDE models. These estimating functions are approximations to the score functions, which are rarely explicitly known, and have often turned out to provide estimators with a surprisingly high efficiency. This can now be explained: the estimators are, under weak conditions, rate optimal and efficient in the high frequency asymptotics considered in the talk.

14:15-14:55 **Yoichi Nishiyama** (Inst. Statist. Math.)

Asymptotic theory of semiparametric Z-estimation

We give a general theorem to derive the asymptotic behavior of semiparametric Z-estimators. We apply it to ergodic diffusion processes. We show that an estimator for a finite-dimensional parameter of the drift coefficient, with the diffusion coefficient being an infinite-dimensional nuisance parameter, is asymptotically normal and efficient. We also present a similar result in a time series model.

15:00-15:40 **Yasushi Ishikawa** (Ehime Univ.)

Composition with distributions of Wiener-Poisson variables and its asymptotic expansion (I)

We define the composition of the random variables on the Wiener-Poisson space with distributions, and consider an asymptotic expansion of it with respect to a parameter.

15:45-16:25 **Yasutaka Shimizu** (Osaka Univ.)

Threshold selection in jump-discriminant filters for infinite activity jump-diffusion models

``Threshold estimation'' is an useful technique of inference for discretely observed jump processes. In the method, we judge that there is no ``large'' jump

in the interval if the corresponding increment of neighboring data is smaller than the threshold that is meaningfully selected by observers. However, how to select the threshold is critical in practice since the statistics constructed via the filter is sensitive to the change of the threshold. In this talk, we propose a systematic way to select the ``good'' threshold, which can be applied to both finite and infinite activity cases.

16:30-17:10 **Alexandre Brouste** (Univ. du Maine)

Asymptotical properties of the Maximum Likelihood Estimator for partially observed fractional diffusion system

We study long time asymptotic properties of the Maximum likelihood Estimator (MLE) for the signal drift parameter in a partially observed fractional diffusion system. Using the method of week convergence of likelihoods due to I. Ibragimov and R. Khasminskii (1981), consistency, asymptotic normality and convergence of the moments are established for MLE. The proof is based on Laplace transform computations. Results for a totally observed fractional Ornstein-Uhlenbeck diffusion problem will also be discussed.

17:15-17:55 **Nakahiro Yoshida** (Univ. of Tokyo)

Estimation of Lag by the nonsynchronous covariance estimator

We discuss an application of the nonsynchronous covariance estimator to estimation of the delay of a stochastic process from another process. Consistency will be discussed.

Thursday 27th, Morning (Chair: Kengo Kamatani) **********

10:00-10:40 **Masayuki Uchida** (Osaka Univ.)

Asymptotic property of AIC for discretely observed ergodic diffusions

We consider the model selection problem based on AIC for discretely observed diffusion processes. In the situation where a family of statistical models includes misspecified models, the asymptotic property of AIC is derived.

10:45-11:25 **Masaaki Fukasawa** (Osaka Univ.)

Realized volatility with stochastic sampling

A central limit theorem for the realized volatility based on a general stochastic sampling scheme is proved. More efficient sampling schemes for the

Euler-Maruyama approximation than the usual equidistant scheme are given as an application.

11:30-12:10 **Marc Hoffmann** (ENSAE)

Volatility representation across scales under microstructure noise

We assume we can observe the price process (in some sense, e.g. mid-price or traded price) of a financial asset almost continuously (every few seconds say) over a large temporal scale (a couple of months say). We are interested in recovering the (normalised) integrated volatility $$¥Lambda_t(¥tau):=¥tau^{-1}¥int_{t-¥tau}^{t}¥sigma^2_s ds t ¥geq 0$$ simultaneously for several temporal scales $¥tau >0$ as we let t shift through time, and where $¥sigma_s$ is the volatility process of the underlying asset. This question can have some relevance in so-called variance trading or in statistical arbitrage issues. If the temporal scale $¥tau$ is large, the problem is essentially parametric, whereas at small time scales $¥tau$ it becomes genuinely nonparametric and depends on the underlying (generally unknown) smoothness of the volatility process. Besides, microstructure noise effects must be incorporated in a small $¥tau$ regime. We will develop a simple adaptive estimator based on wavelet thresholding for recovering $¥Lambda_t(¥tau)$ at all scales $¥tau$, optimal in a certain sense.

Thursday 27th, Afternoon (Chair: Masaaki Fukasawa) **********

13:30-14:10 **Kengo Kamatani** (JSPS fellow)

Convergence properties of the Gibbs sampler and related algorithms

The Gibbs sampler is a well known tool to compute the Bayesian estimator. We show some properties of the Gibbs sampler when a sample size is large enough. Properties of some related algorithm such as the Rao-Blackwellization of the Gibbs sampler are also addressed.

14:15-14:55 **Hiroki Masuda** (Kyushu Univ.)

A normality test for the driving noise of a SDE

For a parametric family of discretely observed Markovian SDE driven by a Levy process, we provide a simple test procedure for the normality of the unobserved driving Levy process against the presence of any nontrivial jump part. This is

considered under large-time asymptotics. The proposed test statistic is of Jarque-Bera type consisting of the 3rd and 4th self-normalized partial sums of the Euler residuals. It is asymptotically distribution-free under null and consistent.

15:00-15:40 **Yury Kutoyants** (Univ. du Maine)

Identification of threshold models

A review of some results concerning threshold models is presented. As threshold models we consider the Ornstein-Uhlenbeck process with the trend coefficient switching as the value of the process fits some regions. The statistical problems concern the estimation of the parameters of these regions. A discrete time version of such models is well known in econometrics. The parameter estimation for discrete time model is also discussed.