Waseda International Symposium Asymptotic Sufficiency, Asymptotic Efficiency and Semimartingale

March 2 - 4, 2015 Waseda University, Nishi-Waseda Campus

Supported by Kiban (A) (23244011) (M. Taniguchi) and GPIF

Waseda International Symposium "Asymptotic Sufficiency, Asymptotic Efficiency and Semimartingale"

March 2 - March 4, 2015, Waseda University Nishi-Waseda Campus (i) 55S building 2th Floor, Meeting Room 3 on March 2 & 3, (ii) 55N building 1st Floor, Meeting Room 1 on March 4. http://www.sci.waseda.ac.jp/eng/access/

Organizers

Masanobu TANIGUCHI (Waseda Univ.), Kiyoshi INOUE (Waseda Univ.), Yoichi MIYATA (Takasaki Econ Univ.) & Xiaoling DOU (Waseda Univ.)

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Program

March 2

13:30 - 13:40: Masanobu TANIGUCHI (Waseda Univ.) Opening address

Session I: Chaired by M. Hallin

- 13:40 14:10: Fumiya AKASHI (Waseda Univ.) <u>Higher-order asymptotic properties of generalized empirical</u> <u>likelihood estimator for alpha-stable processes</u>
- 14:10 14:40: Yoichi NISHIYAMA (Inst. Stat. Math. Tokyo) <u>A stochastic maximal inequality, monotone convergence</u> <u>arguments, and related topics</u>

- 14:40 15:10: Satoshi KURIKI (Inst. Stat. Math. Tokyo), with Hsien-Kuei Hwang <u>A generalization of Anderson-Darling goodness-of-fit statistic</u> <u>based on multifold integrated empirical distribution functions</u>
- 15:10 15:30: Coffee break

Session II: Chaired by H. Dette

15:30 - 16:10: Stanislav VOLGUSHEV (Ruhr-Univ. Bochum), with Holger Dette, Marc Hallin and Tobias Kley <u>Quantile spectral analysis</u>

- 16:10 16:50: Qi-Man SHAO (The Chinese Univ. Hong Kong) <u>Perspective of self-normalized limit theory</u>
- 16:50 17:30: Marco LIPPI (Einaudi Inst. Economics & Finance), with Mario Forni, Alessandro Giovannelli and Stefano Soccorsi <u>Dynamic factor models with infinite dimensional factor space.</u> Forecasting US monthly macroeconomic series.

March 3

Session III: Chaired by S. Volgushev

- 10:00 10:30: Yan LIU (Waseda Univ.) <u>Empirical likelihood methods for quantile regression with long</u> <u>range dependent errors</u>
- 10:30 11:00: Xiaoling DOU (Waseda Univ.), with Satoshi Kuriki, Gwodong Lin and Donald Richards <u>Baker's distribution and the B-spline copula</u>
- 11:00 11:20: Coffee Break

Session IV: Chaired by X. Shao

11:20 - 11:50: Toshio HONDA (Hitotsubashi Univ.), with Ming-Yen Cheng and Jialiang Li

Efficient estimation in semivarying coefficient models for longitudinal/clustered data

11:50 - 13:30: Lunch

Session V: Chaired by M. Lippi

- 13:30 14:00: Shu-Hui YU (National University of Kaohsiung) <u>Toward optimal averaging in regression models with time series</u> <u>errors</u>
- 14:00 14:40: Xiaofeng SHAO (Univ. Illinois) <u>Martingale difference correlation and high dimensional feature</u> <u>screening</u>
- 14:40 15:20: Ching-Kang ING (Inst. Stat. Science, Academia Sinica) <u>Group and variable selection in high-dimensional regressions</u>
- 15:20 15:40: Coffee Break

Session VI: Chaired by M. Taniguchi

- 15:40 16:20: Holger DETTE (Ruhr-Univ. Bochum) <u>Detection of multiple structural breaks in multivariate time series</u>
- 16:20 17:00: Marc HALLIN (ECARES, Université libre de Bruxelles) <u>Generalized dynamic factor models and volatilities</u>
- 18:00 Buffet-style party (Cafeteria; Basya-Michi)

March 4

Session VII: Chaired by H. Heyer

10:00 - 10:30: Yoichi MIYATA (Takasaki city Univ. of Econ.) <u>The validity of Bayesian information criteria in misspecified</u> <u>models</u>

- 10:30 11:00: Tomoyuki AMANO (Wakayama Univ.), with Masanobu Taniguchi (Waseda Univ.) <u>Control variate method for time series</u>
- 11:00 11:30: Hiroaki OGATA (Tokyo Metropolitan Univ.) <u>Stationary circular time series</u>
- 11:30 13:00: Lunch

Session VIII: Chaired by C-K. Ing

- 13:00 13:30: Kenta KOIZUMI and Hiroshi SHIRAISHI (Keio Univ.) <u>Statistical estimation for optimal dividend barrier</u>
- 13:30 14:00: Kenichiro TAMAKI (Waseda Univ.) <u>One-step time series model-building by empirical likelihood</u>
- 14:00 14:30: Shunsuke Sakai and *Junichi Hirukawa (Niigata Univ.) <u>Rank tests for an ARMA model against other tv-ARMA models</u>
- 14:30 15:00: Coffee Break

Session IX: Chaired by Q-M. Shao

- 15:00 15:30: Yasutaka SHIMIZU (Waseda Univ.) <u>LSE-type estimation for stochastic processes with small Levy</u> <u>noise</u>
- 15:30 16:00: Ryozo MIURA (Hitotsubashi Univ.) <u>Asymptotic theory of R-estimators from iid to weakly dependent</u> <u>observations: the case of one sample models and simple linear</u> <u>regression models with generalized Lehmann's alternative</u> <u>models</u>
- 16:00 16:40: Herbert HEYER (Univ. Tuebingen) <u>Information functionals and applications to random walks and</u> <u>statistics</u>

16:40 - 17:00: Takeru SUZUKI (Waseda Univ.) *Closing address*

18:00 - Celebration Party for Prof. Suzuki's Retirement Sakaeya (さかえや 高田馬場總本店) http://r.gnavi.co.jp/g398506/

Abstracts

March 2

13:40 - 14:10: Fumiya AKASHI (Waseda Univ.) Higher-order asymptotic properties of generalized empirical likelihood estimator for alpha-stable processes

Abstract: Generalized empirical likelihood (GEL) estimator is one of the most popular econometric estimators, and has been applied to various models in i.i.d. and dependent case with finite variance. This talk considers applying the GEL estimator to the parameter estimation problem of the stable process, which is one of infinite variance time series models. We consider an over-identified estimating equation by using the empirical characteristic function, and the GEL estimator as a solution to a saddle point problem is defined. The stochastic expansion of the GEL estimators is given. In particular, a class of the score functions based on the Cressie-Read method is considered, and we discuss the higher-order asymptotic optimality of the GEL estimators for the stable process.

14:10 - 14:40: Yoichi NISHIYAMA (Inst. Stat. Math. Tokyo) A stochastic maximal inequality, monotone convergence arguments, 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 Itô'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.

14:40 - 15:10: Satoshi KURIKI (Inst. Stat. Math. Tokyo), with Hsien-Kuei Hwang *A generalization of Anderson-Darling goodness-of-fit statistic based on multifold integrated empirical distribution functions*

Abstract: Based on m-fold integrated empirical measure, a generalization of the goodness-of-fit statistic by Anderson and Darling (1952, Ann. Math. Statist.) is proposed. As the limiting null distribution, the generalized Anderson-Darling process is defined, and its Karhunen-Loeve expansion and covariance kernel are provided in explicit forms. In particular, the eigenvalues are shown to be $1/\{k(k+1)...(k+2m-1)\}, k=1,2,...$ Moreover, the explicit forms of the moment generating functions (mgfs) of the limiting null distributions of the goodness-of-fit statistics without using infinite product are provided. These explicit expressions for the mgfs are useful in the calculation of the cumulative distribution functions via the Smirnov-Slepian technique. It is also noted that similar generalizations are possible for the Cramer-von Mises statistic and Watson's (1961, Biometrika) statistic.

15:30 - 16:10: Stanislav VOLGUSHEV (Ruhr-Univ. Bochum), with Holger Dette, Marc Hallin and Tobias Kley *Quantile spectral analysis*

Abstract: In this talk we discuss an alternative method for the spectral analysis of a strictly stationary time series. We define a "new" spectrum as the Fourier

transform of the differences between copulas of the pairs with lag k and the independence copula. This object is called copula spectral density kernel and allows separating marginal and serial aspects of a time series. The copula spectral density kernel is substantially more informative than the "classical" spectral density obtained from the auto-covariances. In particular, it provides a complete description of the distributions of all pairs with arbitrary lag. We introduce a way to estimate of copula spectral density kernels, comment on the asymptotic properties of the proposed estimator, and discuss several possible extensions.

16:10 - 16:50: Qi-Man SHAO (The Chinese Univ. Hong Kong) *Perspective of self-normalized limit theory*

Abstract: In this talk we shall review recent developments on self-normalized limit theory, especially, on self-normalized Cramér type moderate deviation theorem for normal and non-normal approximation. Applications and open questions will also be discussed.

16:50 - 17:30: Marco LIPPI (Einaudi Inst. Economics & Finance), with Mario Forni, Alessandro Giovannelli and Stefano Soccorsi

Dynamic factor models with infinite dimensional factor space. Forecasting US monthly macroeconomic series.

Abstract: The paper studies the pseudo real-time forecasting performance of three different factor models. We compare the method recently proposed by Forni et al. (2015) and Forni et al. (2014) with those proposed in Forni et al. (2005) and Stock and Watson (2002a) within a real data forecasting exercise. A large panel of macroeconomic and financial time series for the US economy, which includes the Great Recession and the subsequent recovery, is employed. In a rolling window framework, we find that the first two methods, based on spectral estimation, outperform the third. Substantial gains from regularized combinations of different inflation forecasts produced with the model in Forni et al. (2015) are also found.

March 3

10:00 - 10:30: Yan LIU (Waseda Univ.) Empirical likelihood methods for quantile regression with long range dependent errors

Abstract: In this talk, we consider the quantile regression with long range dependent errors. To construct confidence regions for the pivotal quantity contained in the model, we apply the empirical likelihood method to the case. The problem for i.i.d. case and short range dependence case has been considered so far. In both cases, it has been shown that the smoothed empirical likelihood estimator has coverage errors of order n^{-1} and further of order n^{-2} after Bartlett correction. On the other hand, it is well known that the asymptotics of long range dependence is quite different from both cases. We investigate the asymptotic properties of the standard empirical likelihood method for quantile regression with long range dependent errors and compare them with the smoothed empirical likelihood ratio.

10:30 - 11:00: Xiaoling DOU (Waseda Univ.), with Satoshi Kuriki, Gwodong Lin and Donald Richards Baker's distribution and the B-spline copula

Abstract: Baker's distribution is a method proposed to construct multivariate distributions using order statistics with given marginal distributions. The copulas of this kind of distributions can be considered as the Bernstein copulas. We investigate the properties of Baker's distribution and the Bernstein polynomials, propose a new class of B-spline copulas and show that the B-spline copulas include the Bernstein copula as a special case. The B-spline copulas inherit nice properties from the Bernstein copula (or Baker's distribution) and have more flexibility in representing correlations.

11:20 - 11:50: Toshio HONDA (Hitotsubashi Univ.), with Ming-Yen Cheng and Jialiang Li

Efficient estimation in semivarying coefficient models for longitudinal/clustered data

Abstract: In semivarying coefficient models for longitudinal/clustered data, usually of the primary interest is usually the parametric component which involves unknown constant coefficients. First, we study semiparametric efficiency bound for estimation of the constant coefficients in a general setup. It can be achieved by spline regression provided that the within-cluster covariance matrices are all known, which is an unrealistic assumption in reality. Thus, we propose an adaptive estimator of the constant coefficients when the covariance matrices are unknown and depend only on the index random variable, such as time, and when the link function is the identity function. After preliminary estimation, based on working independence and both spline and local linear regression, we estimate the covariance matrices by applying local linear regression to the resulting residuals. Then we employ the covariance matrix estimates and spline regression to obtain our final estimators of the constant coefficients. The proposed estimator achieves the semiparametric efficiency bound under normality assumption, and it has the smallest covariance matrix among a class of estimators even when normality is violated. We also present results of numerical studies. The simulation results demonstrate that our estimator is superior to the one based on working independence. When applied to the CD4 count data, our method identifies an interesting structure that was not found by previous analyses.

13:30 - 14:00: Shu-Hui YU (National University of Kaohsiung) Toward optimal averaging in regression models with time series errors

Abstract: Consider a regression model with infinitely many parameters and time series errors. We are interested in choosing weights for averaging across generalized least squares (GLS) estimators obtained from a set of approximating models. However, GLS estimators, depending on the unknown inverse covariance matrix of the errors, are usually infeasible. We therefore construct feasible generalized least squares (FGLS) estimators using a consistent estimator of the unknown inverse matrix. Based on this inverse covariance matrix estimator and FGLS estimators, we develop a feasible autocovariance-corrected Mallows model

averaging criterion to select weights, thereby providing an FGLS model averaging estimator of the true regression function. We show that the generalized squared error loss of our averaging estimator is asymptotically equivalent to the minimum one among those of GLS model averaging estimators with the weight vectors belonging to a continuous set, which includes the discrete weight set used in Hansen (2007) as its proper subset.

14:00 - 14:40: Xiaofeng SHAO (Univ. Illinois) Martingale difference correlation and high dimensional feature screening

Abstract: In this talk, I will introduce a new metric, the so-called martingale difference correlation to measure the conditional mean dependence between a scalar response variable V and a vector predictor variable U. Our metric is a natural extension of the recently proposed distance correlation, which is used to measure the dependence between V and U. The martingale difference correlation and its empirical counterpart inherit a number of desirable features of distance correlation and sample distance correlation, such as algebraic simplicity and elegant theoretical properties. We further use martingale difference correlation as a marginal utility to do high dimensional feature screening to screen out variables that do not contribute to conditional mean of the response given the covariates. An extension to conditional quantile screening will be described and sure screening consistency for both screening procedures will also be presented. I will conclude the talk by showing selected simulation results and a real data illustration, which demonstrate the effectiveness of martingale difference correlation based screening procedures in comparison with the existing counterparts.

14:40 - 15:20: Ching-Kang ING (Inst. Stat. Science, Academia Sinica) *Group and variable selection in high-dimensional regressions*

Abstract: Group Lasso has received considerable attention in research and application of high-dimensional linear regression. The key idea is that when the predictors are grouped naturally or based on previous knowledge, the grouping

information can be exploited for a better regression analysis. The group Lasso approach selects the predictors in groups in a complete fashion in the sense that all the predictors in the same group are in or out at the same time. It is conceivable that in many applications, only some of the predictors in a relevant group are useful. Therefore, in our view, a general theory on model selection with group sparsity may allow variables in important groups to be excluded for parsimony of the overall model, which can improve the estimation accuracy of the regression function. In this talk, we shall develop a new group selection orthogonal greedy algorithm (GOGA) method called group and а high-dimensional group information criterion (HDGIC) to determine the number of GOGA iterations. We will prove the pathwise consistency of GOGA+HDGIC and introduce a group trimming method to achieve group selection consistency. Moreover, to exclude all irrelevant variables from relevant groups, we will introduce post-group-selection high-dimensional information criterion (PHDIC) and show that the four-step procedures: GOGA+HDGIC+G-trim+PHDIC, is variable selection consistency in high-dimensional regression models with group structures. Finally, we will apply our method to root-cause identification for real manufacturing data.

15:40 - 16:20: Holger DETTE (Ruhr-Univ. Bochum) Detection of multiple structural breaks in multivariate time series

Abstract: We propose a new nonparametric procedure (referred to as {MuBreD}) for the detection and estimation of multiple structural breaks in the autocovariance function of a multivariate (second-order) piecewise stationary process, which also identifies the components of the series where the breaks occur. {MuBreD} is based on a comparison of the estimated spectral distribution on different segments of the observed time series and consists of three steps: it starts with a consistent test, which allows to prove the existence of structural breaks at a controlled type I error. Secondly, it estimates sets containing possible break points and finally these sets are reduced to identify the relevant structural breaks and corresponding components which are responsible for the changes in the autocovariance structure. In contrast to all other methods which have been proposed in the literature, our approach does not make any parametric assumptions, is not especially designed for detecting one single

change point and addresses the problem of multiple structural breaks in the autocovariance function directly with no use of the binary segmentation algorithm. We prove that the new procedure detects all components and the corresponding locations where structural breaks occur with probability converging to one as the sample size increases and provide data-driven rules for the selection of all regularization parameters. The results are illustrated by analyzing financial returns, and in a simulation study it is demonstrated that {MuBreD} outperforms the currently available nonparametric methods for detecting breaks in the dependency structure of multivariate time series.

16:20 - 17:00: Marc HALLIN (ECARES, Université libre de Bruxelles) *Generalized dynamic factor models and volatilities*

Abstract: Decomposing volatilities into a common, market-driven, component and an idiosyncratic} item-specific one is an important issue in financial econometrics. This, however, as any study involving market-related features, requires the statistical analysis of large panels of time series, hence faces the usual challenges associated with high-dimensional data. Factor model methods in such a context are an ideal tool, but they do not readily apply to the analysis of volatilities. Focusing on the reconstruction of the unobserved market shocks and the way they are loaded by the various items (stocks) in the panel, we propose an entirely nonparametric and model-free two-step general dynamic factor approach to the problem, which avoids the usual curse of dimensionality. Applied to the S&P100 asset return dataset, the method provides evidence that a non-negligible proportion of the market-driven volatility of returns originates in the volatilities of level-idiosyncratic components.

March 4

10:00 - 10:30: Yoichi MIYATA (Takasaki city Univ. of Econ.) The validity of Bayesian information criteria in misspecified models

Abstract: Model selection has an important role in modern statistical analysis. Although BIC is derived by approximating the log-marginal likelihood functions, to show the validity of approximations, many authors 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 GLMs 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. However, the prior density requires a continuity condition on the parameter, which is not imposed in Lv and Liu. We also present several numerical examples to illustrate the finite-sample performance of the alternative BIC in both correctly specified and misspecified logistic models.

10:30 - 11:00: Tomoyuki AMANO (Wakayama Univ.), with Masanobu Taniguchi (Waseda Univ.) *Control variate method for time series*

Abstract: The sample mean is one of the most natural estimators for the population mean based on the i.i.d. sample. When some control variable vector is available (a random vector which is possibly correlated with the variable of interest), using the information about the control variate vector, it is known that the control variate method reduces the variance of the sample mean. This method has been discussed in the case when the sample and control variable are i.i.d. Lavenberg and Welch (1981) reviews analyses of the control variate developed up to the date. Rubinstein and Markus (1985) extends the results to the case when the sample mean is multidimensional vector. Nelson (1990) proves a central limit theorem of the control variate estimator. Since a lot of control variate theories have been discussed under a specific probability structure (usually normal distribution) for the sample and control variates, a number of authors introduced remedies for violations of these assumptions. Nelson (1990) gives a systematic analytical evaluation of them. In recent years this method is applied to financial engineering (e.g., Glasserman (2003), Chan and Wong (2006)). Since the control variate theory is usually discussed under the assumption that the sample and control variates are i.i.d, in this talk, when the sample is generated from a stationary process and some control variable process is available, we propose a control variate estimator for the mean of the

concerned process by using control variate method. Then it is shown that this estimator improves the sample mean in the sense of mean square error (MSE). The estimator is expressed in terms of nonparametric estimators for spectra of the concerned process and the control variate process. We also apply this analysis to the case when the mean dynamics is of the form of regression. A control variate estimator for the regression coefficients is proposed and is shown to improve the LSE in the sense of MSE. Numerical studies show how our estimators behave. Our results have potential application to various fields, including econometrics in particular.

11:00 - 11:30: Hiroaki OGATA (Tokyo Metropolitan Univ.) *Stationary circular time series*

Abstract: The stationary process on the circle is considered and its circular autocovariance/autocorrelation function is investigated. Especially, we focus on the circular Markov process whose transition density is defined by two circular distributions; one is uniform and the other is arbitrary. The relationship between circular autocovariance and (usual) autocovariance matrix of trigonometric functions process is noted. The asymptotic properties of the estimator of the circular autocorrelation and some numerical studies are given.

13:00 - 13:30: Kenta KOIZUMI and Hiroshi SHIRAISHI (Keio Univ.) Statistical estimation for optimal dividend barrier

Abstract: We consider a problem where an insurance portfolio is used to provide dividend income for that insurance company's shareholders. This is the apprication of risk theory. Whenever the surplus attains the level "barrier", the premium income is paid to shareholders as dividends until the next claim occurs. We consider the classical compound Poisson model of risk theory, in which dividends are paid to the shareholders according to a barrier strategy and discuss the problem of the estimation of the optimal dividend barrier. Optimal dividend barrier is de ned as the level of the barrier that maximizes the expectation of the discounted dividends until ruin. A dividends problem of ruin theory was initially proposed by [De Finetti, 1957] in the discrete time model.

Thereafter [Buhlmann, 1970] discussed this problem in the classical risk model and lay the foundation. We discuss the problem of the estimation of the optimal dividend barrier, which is not sufficiently discussed so far. We construct the estimator of the expectation of the discounted dividends and the optimal dividend barrier, and show its consistency.

13:30 - 14:00: Kenichiro TAMAKI (Waseda Univ.) One-step time series model-building by empirical likelihood

Abstract: The Box-Jenkins method is one of the most used model-building techniques and a three-stage iterative procedure based on identification, estimation, and diagnostic checking. In this talk, we propose one-step time series model-building by frequency domain empirical likelihood, which computes ARMA parameters and portmanteau test statistics simultaneously by combining estimating functions. The portmanteau test statistics is also used for order determination of ARMA models. The proposed procedure has attractive properties. The estimator has the same asymptotic variance as the maximum Whittle likelihood estimator. The portmanteau test is available for small lags. Simulation studies show that our approach to model selection is useful.

14:00 - 14:30: Shunsuke Sakai and *Junichi Hirukawa (Niigata Univ.) *Rank tests for an ARMA model against other tv-ARMA models*

Abstract: In this talk, for a class of locally stationary process introduced by Dahlhaus, we apply the idea to the problem of testing ARMA model against other non-stationary ARMA model. When testing the problem, we use linear serial rank statistics and contiguity of LeCam's notion. And then, if null hypothesis is white noise, under null and alternative, the asymptotic normality of the proposed statistics is established by using the locally asymptotic normality (LAN). We incorporate the locally stationary phenomena in the testing problem.

Abstract: Consider a stochastic differential equation whose driving noise is a semimartingale. The goal is to estimate the parameter in the drift from discrete samples in a fixed finite time interval under the asymptotics that the driving noise is vanishing. Our estimator is based on the least squares estimator (LSE) proposed by Long et al. (2013, J. Multivariate Analysis), but we further employ a filter to exclude some `large' shocks exceeding a given threshold that would affect the drift estimation. This filtered LSE can be asymptotically equivalent to the LSE under a suitable choice of the threshold, and the finite sample performance is much better than that of the LSE with much stability. We also show the "mighty convergence" of the proposed estimator under the small noise asymptotics. Although the asymptotic distribution of the LSE is not normal, we often observe that the filtered LSE behaves as if it is asymptotically normal. We shall try to justify this phenomenon by taking a threshold suitably under a certain situation.

15:30 - 16:00: Ryozo MIURA (Hitotsubashi Univ.)

Asymptotic theory of R-estimators from iid to weakly dependent observations: the case of one sample models and simple linear regression models with generalized Lehmann's alternative models

Abstract: Miura&Tsukahara (1993) defined R-estimators for generalized Lehmann's alternative models (or Transformation models) and proved their asymptotic normality under the assumption that the observations are independent and identically distributed. This model includes a usual one sample location models. We extend this result to the case where observations are not iid. but are weakly dependent. This means that a location parameter of a skew symmetric distribution (transformed symmetric distribution) and a skew (or transformation) parameter be estimated simultaneously. can and semi-nonparametrically based on rank statistics. Then, we apply this result to the error terms of a simple linear regression model, where the regression residuals are used to estimate parameters in generalized Lehmann's alternative models. Mathematical tools for proving asymptotic normality of R-estimators for weakly dependent cases can be found in Shao & Yu (1993) and Louhichi (2000), which study a weak convergence of an empirical distribution function of weakly

dependent random variables. Koul (1977) proved an asymptotic normality of R-estimators, derived from a rank statistic with a bounded score function, for a regression coefficient in a simple linear regression model with dependent error terms. Combining this with our results, it is understood that a simple linear regression model with weakly dependent errors whose identical distribution is skewed (asymmetric) can be treated with R-estimators all through. This result is good enough for the popular linear (bounded) score function in the class of score functions on the unit interval [0, 1]. However, we are interested in extending the results for the case of unbounded score functions for a wider variety of applications. We will show our recent attempt for this generalization. Our simple linear regression models may be important in the field of quantitative finance where a simple linear regression coefficient), and where, in the real financial market, the error distributions are often asymmetric and their time series error terms are rather weakly dependent in many cases.

16:00 - 16:40: Herbert HEYER (Univ. Tuebingen) Information functionals and applications to random walks and statistics

Abstract: Information functionals such as entropy and divergence will be discussed with respect to the relations between these notions and applied to convolution products of probability measures, to the Liouville property for harmonic functions related to random walks, and to the study of sufficient kernels between general measure spaces. In particular Blackwell's sufficiency and LeCam's deficiency for statistical experiments will be put into the unifying context of statistical decision theory. For the proofs of the various characterizations of sufficiency an extension of the classical Kullback-Leibler inequality will be crucial. The classical problem of testing statistical hypotheses in the spirit of Neyman and Pearson is designed to accompany the general approach as a special case.