Theory and Applications for Time Series Analysis

Organizer: Taniguchi, M. (Waseda University),
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March 1 – March 2 , 2011.
Waseda University, School of Science & Engineering,
Building 55S, Room 3 (2nd Floor)
(http://www.waseda.jp/jp/campus/okubo.html)

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Program

March 1(Tuesday)

13:00 – 13:50 : Rank tests for PCA.
Paindaveine, D.*, Hallin, M. and Verdebout, T.
(Universite Libre de Bruxelles, Belguim).

13:50 – 14:40: Meta-analysis for differential gene expression to estimate an optimum threshold related to T-category of breast cancer.
H. Solvang Kato (Institute for Cancer Research, Oslo, Norway).

14:40 – 15:00: Coffee Break

15:00 – 15:50: Nonparametric tests for distribution specification in multiparameter local likelihood models.
Cheng, M. Y. (National Taiwan University, Taiwan).

15:50 – 16:40: Long Memory in Aggregate Squared GRACH (1, 1) Process.
Kawai, K. and Maekawa, K. *
(Beppu University and Hiroshima University of Economics).

16:40—17:30: Variance-parameter plots and nonparametric variance stabilization.
DiCiccio, T. J. (Cornell University, USA).

18:30 – Dinner

March 2(Wednesday)

Special Survey Talk Session

9:00 – 10:30 : Rank-based inference in linear models with stable errors.
Hallin, M.*, Swan, Y., Verdebout, T. and Veredas, D.
(Universite Libre de Bruxelles, Belgium).

10:30 – 10:50 : Coffee Break

10:50 – 12:20: Skewness-invariant measures of kurtosis.
Pewsey, A. (University of Extremadura, Spain).

Lunch

13:30 – 14:20: Optimal statistical estimation of portfolios for non-Gaussian dependent returns. Shiraishi, H.* and Taniguchi, M.
(Jikei Medical University, Japan).

14:20 – 15:10: Falling and explosive, dormant and rising markets via multiple-regime financial time series models.
Cathy W. S. Chen(1) *, Richard H. Gerlach(2), and Ann M. H. Lin(1)
((1)Feng Chia University, Taiwan (2)University of Sydney, Australia)

15:10 – 15:30 : Coffee Break

15:30 – 16:20: Factor modeling for time series: a dimension-reduction approach. Yao Qiwei (London School of Economics, UK).

16:20 – 17:10 : Estimating and testing of extreme value copulas.
Dette, H. (University of Ruhr, Germany).

（1）

Rank tests for PCA

Paindaveine D.*, Marc Hallin and Thomas Verdebout
(Univ. Libre de Bruxelles)

Abstract: We construct parametric and rank-based optimal tests for eigenvectors and eigenvalues of covariance or scatter matrices in elliptical families. The parametric tests extend the Gaussian likelihood ratio tests of Anderson (1963) and their pseudo-Gaussian robustifications by Davis (1977) and Tyler (1981, 1983), with which their Gaussian versions are shown to coincide, asymptotically, under Gaussian or finite fourth-order moment assumptions, respectively. Such assumptions however restrict the scope to covariance-based principal component analysis. The rank-based tests we are proposing remain valid without such assumptions. Hence, they address a much broader class of problems, where covariance matrices need not exist and principal components are associated with more general scatter matrices. Asymptotic relative efficiencies moreover show that those rank-based tests are quite powerful; when based on van der Waerden or normal scores, they even uniformly dominate the pseudo-Gaussian versions of Anderson's procedures. The tests we are proposing thus outperform daily practice both from the point of view of validity as from the point of view of efficiency. The main methodological tool throughout is Le Cam's theory of locally asymptotically normal experiments, in the nonstandard context, however, of a "curved" parametrization.

(2)

Meta-analysis for differential gene expression to estimate an optimum threshold related to T-category of Breast Cancer

H. Solvang Kato
(Institute for Cancer Research, Oslo, Norway)

Abstract: Tumor size (indicated by the T-category) is known as a strong prognostic indicator for breast cancer and is one of the factors taken into account when deciding how and if to treat a patient, independently on lymph node status with significantly better survival in T1 tumors. It is common practice to distinguish the groups T1 and T2 by the 2cm rule. It is well known that T1 and T2 distinction is reflected in prognosis: T2 are more aggressive and might be spread already. However, the 2cm rule is unlikely to be optimal. We now try to find optimum threshold for identification of genes related to variability for tumor size (or other clinical parameters as well). For that, we apply meta-analysis based on *Fisher's inverse chi-square*[Fisher Oliver & Boyd, Edinburgh, 11,1950] and *DEDS* (differential expresion via distance synthesis) *aggregating* [Campain and Yang, BMC Bioinformatics 11, 2010] for differential gene expression. The goal is to find an optimum threshold with regards to size which is best to distinguish breast cancer patients in two groups, so that their expression patterns differ at most.

(3)

Nonparametric tests for distribution specification in multiparameter local likelihood models

Cheng, M. Y.
(National Taiwan University, Taiwan)

Abstract: Multiparameter local likelihood models have been widely accepted as a flexible tool for modeling the relationship between responses and covariates, and the corresponding methodology has been used to analyze data arising from climatology, environmetrics, finance, medicine, and so on. Although both point and interval estimation for the unknown parameter functions in the model have been investigated in the literature, how to formally test goodness-of-fit of the specified form of the conditional density function remains an unsolved problem. Testing the specification of the conditional density is an important issue, the inference becomes inclusive or misleading and the estimated parameter functions become meaningless if the form of the true conditional density is different from the specified one. We address this specification test problem.
Our tests are developed using ideas of probability integral transformation and the well-known Kolmogorov-Smirnov and Cramer-von Mises test statistics. We show that formal tests can be constructed if undersmoothing is employed. The asymptotic null distributions of the proposed test statistics depend on the unknown parameter functions, so bootstrap tests are suggested. We conduct a simulation study to assess finite sample properties of the proposed test and apply it to validate the generalized extreme value local likelihood model for an environmental data set.

(4)

Long Memory in Aggregate Squared GRACH (1, 1) Process

Kawai, K. and Maekawa, K. *
(Beppu University and Hiroshima University of Economics)

Abstract: Granger (1980) showed that the aggregated series of AR(1) process have univariate long memory dynamics by assuming that the AR parameter is distributed as the Beta distribution among the contemporaneous cross section units. We extend the Granger's approach to the aggregated squared GARCH (1, 1) process and show that it has the long memory by assuming that GARCH(1,1) parameters are distributed as the bivariate Beta distribution. As empirical evidence we show the long memory property in the time series of the stock returns in the Japanese stock market.

(5)

Variance-parameter plots and nonparametric variance stabilization

DiCiccio, T.J.
(Cornell University)

Abstract: There is considerable evidence in the literature that variance stabilization can be an extremely useful device for improving the accuracy of procedures for nonparametric inference. The use of variance-stabilizing transformations in the context of bootstrap inference about a scalar parameter has been discussed extensively by Davison and Hinkley in their book *Bootstrap Methods and Their Application.* Such transformations are typically deduced from scatterplots of variance estimates against parameter estimates, where the estimates are derived from bootstrap samples drawn from the data. Of course, these scatterplots merely elucidate the joint distribution of the parameter estimate and the variance estimate under the empirical distribution for the data; it is not immediately clear why these plots are relevant for showing how the variance of the parameter estimate changes as the value of the parameter is changed in the underlying model for the data. In this talk, by considering variance stabilization along least favorable families, a connection is established between the variance-estimate versus parameter-estimate scatterplots and the traditional notion of a variance-stabilizing transformation. Applications to parametric models for inference about a scalar parameter in the presence of nuisance parameters are also discussed. This work is joint with Anna Clara Monti and Alastair Young.

(6)

Rank-based Inference in Linear Models with Stable Errors

Marc Hallin(*), Yvik Swan(*), Thomas Verdebout(**) and David Veredas(*)
((*)Universite Libre de Bruxelles, Belgium and (**)Universite de Lille, France)

Abstract: Linear models with stable error densities are considered, and their local asymptotic normality (with root-n rate) with respect to the regression parameter is established. We use this result to derive local powers and asymptotic relative efficiencies for various classical rank tests (Wilcoxon, van der Waerden and median test scores) under $¥alpha$-stable densities with various values of the skewness parameter and tail index. The same results are used to construct new rank tests, based on ``stable scores", achieving parametric optimality at specified stable densities. The same local asymptotic normality also allows us to construct one-step R-estimators. These estimators, irrespective of the tail index and skewness of the error density, remain root-n consistent under the usual assumptions on the asymptotic behavior of the regressors. The only estimator available so far in the literature that achieves such rate is the LAD estimator. Asymptotic relative efficiencies with respect to the LAD are provided for our R-estimators, showing that the R-estimator associated with the $¥alpha =1.4$ stable scores, for instance, uniformly dominate the LAD for all tail index values between $¥alpha=1$ (the Cauchy distribution) and $¥alpha=2$(the Gaussian), and any value of the skewness parameter.

(7)

Skewness-Invariant Measures of Kurtosis

Arthur Pewsey
(Department of Mathematics, Escuela Polit´ecnica,
University of Extremadura, 10003 C´aceres, Spain)
(apewsey@unex.es)

Abstract: Measures of kurtosis, when applied to asymmetric distributions, are typically much affected by the asymmetry which muddies their already murky interpretation yet further. Certain kurtosis measures, however, when applied to certain wide families of skew-symmetric distributions display the attractive property of skewness-invariance. In my talk I will concentrate mainly on quantile-based measures of kurtosis and their interaction with skewness-inducing transformations, identifying classes of transformations that leave kurtosis measures invariant. Further miscellaneous aspects of skewness-invariant kurtosis measures will be considered briefly, these not being quantile-based and/or not involving transformations.

Keywords: Asymmetry; Johnson distributions; Quantile measures; Sinh function; Sinharcsinh
transformation.

This is joint work with Chris Jones of the Open University, UK and Juan Francisco Rosco of the University of Extremadura, Spain.

(8)

Statistical Estimation of Optimal Portfolios for Dependent Returns

Shiraishi, H. and Taniguchi, M.
(Jikei Medical University and Waseda University)

Abstract: In this talk, we discusses the asymptotic property of estimators for various optimal portfolios when returns are vector-valued non-Gaussian stationary or locally stationary processes. In the theory of portfolio analysis, mean-variance optimal portfolios are determined by the mean _ and variance _ of the portfolio return which implies that the optimal portfolios can be written as a function $g = g(\_; \_)$ of _ and _. Several authors proposed the estimators $\hat{g} = g(\hat{\_}; \hat{\_})$ as the functions of the sample mean $\hat{\_}$ and the sample variance $\hat{\_}$. We _rst give the asymptotic distribution of $\hat{g}$ when the returns are Gaussian or non-Gaussian stationary processes. It is shown that there are some cases which $\hat{g}$ are not asymptotically e_cient. From this point of view we propose to use maximum likelihood type estimators for g, which are asymptotically effcient. Next we report that the results are extended to the case when the processes are locally stationary. Assuming parametric models for non-Gaussian locally stationary processes, we propose a parametric portfolio estimator based on a quasi-maximum likelihood estimator, which is asymptotically e_cient by the LAN theorem. We also propose nonparametric or semiparametric portfolio estimators and derive these asymptotic distributions. In addition, we treat other portfolios of which the risks are not written as variance of the portfolio return.

(9)

Falling and explosive, dormant and rising markets via multiple-regime financial time series models

Cathy W. S. Chen[(1)], Richard H. Gerlach[(2)], and Ann M. H. Lin[(1)]
([(1)]Feng Chia University, Taiwan. Email: chenws@fcu.edu.tw)
([(2)]University of Sydney, Australia)

Abstract

A multiple-regime threshold nonlinear financial time series model, with a fat-tailed error distribution, is discussed and Bayesian estimation and inference is considered. Further, approximate Bayesian posterior model comparison among competing models with different numbers of regimes is considered: effectively a test for the number of required regimes. An adaptive MCMC sampling scheme is designed, while importance sampling is employed to estimate Bayesian residuals for model diagnostic testing. Our modeling framework provides a parsimonious representation of well-known stylized features of financial time series and facilitates statistical inference in the presence of high or explosive persistence and dynamic conditional volatility. We focus on the three-regime case: the main feature of the model is the capturing of mean and volatility asymmetries in financial markets, while allowing an explosive volatility regime. A simulation study highlights the properties of our MCMC estimators and the accuracy and favorable performance as a model selection tool, compared to a deviance criterion, of the posterior model probability approximation method. An empirical study of eight international oil & gas markets illustrates strong support for the three-regime model over its competitors, in most markets, in terms of model posterior probability and in showing three distinct regime behaviors: falling/explosive, dormant and rising markets.

KEY WORDS: Asymmetry; Markov chain Monte Carlo method; model selection; Deviance Information Criterion (DIC).

(10)

Factor modelling for time series: a dimension-reduction approach.

Yao Qiwei
(London School of Economics, UK)

Abstract: Following a brief survey on the factor models for multiple time series in econometrics, we introduce a statistical approach from the viewpoint of dimension reduction. Our method can handle nonstationary factors. However under stationary settings, the inference is simple in the sense that the estimation for both the factor dimension and the loadings is resolved by an eigenanlysis for a non-negative definite matrix, and is therefore applicable when the dimension of time series is in the order of a few thousands. Asymptotic properties of the proposed method are investigated. In particular, our estimators for zero-eigenvalues enjoy the faster convergence rates even when the dimension goes to infinity together with the sample size. Numerical illustration with both simulated and real data will also be reported.

(11)

New estimators of the Pickands dependence function
and a test for extreme-value dependence

Holger Dette
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Abstract: Pickands dependence function A is convex and satis_es the boundary conditions maxft; 1 □ tg _ A(t) _ 1 for t 2 [0; 1]. We propose a new class of estimators for Pickands dependence function which is based on the best L2-approximation of the logarithm of the copula by logarithms of extreme-value copulas. The estimators Aˆ(t) are obtained by replacing the unknown copula by its empirical counterpart and weak convergence of the process pnfAˆ(t)□A(t)gt2[0;1] is shown. A comparison with the commonly used estimators is performed from a theoretical point of view and by means of a simulation study. Our asymptotic and numerical results indicate that some of the new estimators outperform the rank-based versions of Pickands estimator and an estimator which was recently proposed by Genest and Seegers (2009). As a by-product of our results we obtain a simple test for the hypothesis of an extreme-value copula, which is consistent against all alternatives with continuous partial derivatives of rst order satisfying C(u; v) _ uv.