2011 Workshop on Time Series Analysis and Applications

Date:

March 16, 2011

Location:

Room 440, Astro-Math. Building
National Taiwan University, 1 Sec 4 Roosevelt Road, Taipei, Taiwan

Organizer:

Ming-Yen Cheng (National Taiwan University)

Sponsor:

Mathematics Division, National Center for Theoretical Sciences, Taipei Office.

Program

Non-regular Estimation Theory for Piecewise Continuous Spectral Densities

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Mar. 16, 2011

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Abstract

For a class of Gaussian stationary processes, the spectral density $f_\theta(\lambda), \theta = (\tau', \eta')'$, is assumed to be a piecewise continuous function, where τ describes the discontinuity points, and the gain is smoothly parameterized by η. Although estimating the parameter θ is a very fundamental problem, there has been no systematic asymptotic estimation theory for this problem. This paper develops the systematic asymptotic estimation theory for piecewise continuous spectra based on the likelihood ratio for contiguous parameters. It is shown that the log-likelihood ratio is not locally asymptotic normal (LAN). Two estimators for θ, i.e., the maximum likelihood estimator $\widehat{\theta}_{ML}$ and Bayes estimator $\widehat{\theta}_B$ are introduced. Then the asymptotic distributions of $\widehat{\theta}_{ML}$ and $\widehat{\theta}_B$ are derived and shown to be nonnormal. Furthermore we observe that $\widehat{\theta}_B$ is asymptotically efficient, but $\widehat{\theta}_{ML}$ is not so. Also various versions of step spectra are considered.

Tail Risk for Integrated Stochastic Volatility Processes

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Mar. 16, 2011

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Abstract

This paper evaluates the long-term risk for integrated sequences that follow the stochastic volatility model and allow the model's latent volatility component to be short- or long-memory. The explicit form for both the quantile reserve (Value at Risk) and the conditional expected expectation (CTE) are derived. We also investigate the asymptotic properties of estimates for the two kinds of risks. We use a common type of equity-linked insurance product with guaranteed minimum maturity benefits, usually called GMMBs, to demonstrate the applications of the theory. To illustrate the effect of long- memory volatility, we use the S&P 500 index as an example of the linked equity. Simulation studies are performed to examine the accuracy of the quantile reserve and to demonstrate the consequence of low coverage probability if model misspecification takes place. The empirical results show that the confidence interval of quantile reserve could be severely underestimated if the long-memory effect in equity volatility is ignored.

Causal Relationship of the Stock Market Index between Developed and Developing Countries

Feng Yao

Mar. 16, 2011

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Abstract

In this paper we apply the Wald test of one-way effect causal measure presented by Yao and Hosoya (2000) to the analysis of causal relationships between stock markets of Tokyo, New York and Shanghai. In view of modelling Dow Jones Industrial Average, Nikkei 225 and Shanghai Composite Index, we see that the causal effects of New York stock market and Tokyo stock market to Shanghai stock market are strong and short-run. The reverse, the effect of Shanghai stock market to Tokyo and also to New York stock markets are statistically significant but comparatively weak and very steady. The empirical results show us that the stock market information flow between New York and Tokyo is bi-directional. The causal effect of New York stock market to Tokyo stock market is greater than that of the reverse.

Empirical Likelihood Approach to Discriminant Analysis for Stationary Processes

Tomoyuki Amano

Mar. 16, 2011

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Abstract

Empirical likelihood is a non-parametric method and it does not need the knowledge of the distribution which the data comes from and it is widely used. However this method is not usually applied to discriminant analysis. Hence we shall apply this method to discriminant analysis and propose an empirical discriminant function. Then we prove its consistency, which means misclassification probability converges to 0. Furthermore under contiguous hypotheses the limit of its misclassification probability is derived and its lowerbound is obtained. We also evaluate its properties by some statistical methods and its interesting features are obtained by simulation.

Doubly Constrained Factor Models: Estimation and Applications

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Mar. 16, 2011

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Abstract

Factor models have been widely used in recent years to improve the accuracy of forecasting when many explanatory variables are available. However, the models often encounter the difficulties of over-parameterization and factor interpretation. In this paper, we first consider constrained factor analysis to obtain a parsimonious factor model and propose likelihood ratio statistics to test the adequacy of factor constraints. Real and simulated examples are used to demonstrate the proposed analysis. In an application, we show that the constrained factor analysis can provide a deeper understanding of variations in monthly financial asset returns. We then extend the constrained models to the doubly constrained factor models by incorporating external information on both rows (e.g., subjects) and columns (e.g., variables) of a data matrix. Maximum likelihood estimates and likelihood ratio statistics of the proposed models are derived. Finally, we consider the applications of doubly constrained factor models in economics and finance. (This is a joint work with Ruey Tsay of the University of Chicago).

Linear Regression with Deterministic Regressors and Unit Root in the Variance

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Mar. 16, 2011

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Abstract

The first part of this paper derives the asymptotic distribution of the ordinary least squares estimator in a linear regression model with deterministic regressors when the variance of the innovations is a function of an integrated time series. In the second part of this paper we study the impact of heteroscedasticity on the standard t-test for the slope coefficient in a linear trend model.