Economics 275: Time Series Analysis

Professor Peter Hansen

Lectures: Tuesdays and Thursdays: 11:00am–12:50pm in Econ 139.
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Course Description:

The course will cover econometric topics of time-series analysis. First, we discuss stationarity, ergodicity, and mixing that are important concepts for dependent processes and we establish law of large numbers and central limit theorems in this context. Second, we study maximum likelihood estimation (MLE) and quasi maximum likelihood estimation (QMLE) in the context of time-series, where the latter motivates robust covariance estimation. Third, we analyze autoregressive and moving average process, their multivariate extensions, and unit roots and cointegration in this framework. Forth, we review some issues related to forecast evaluation and comparisons. Fifth, the course is ended with a brief introduction to the recent literature on volatility models and volatility estimation based on high-frequency data.

Required Textbook:


Other useful textbooks include:

• Davidson (1994): Stochastic Limit Theory, Oxford University Press;
• Davidson (2000): Econometric Theory, Blackwell Publishers;
• Johansen (1996): Likelihood-Based Inference in Cointegrated VAR Models, Oxford University Press;

Grading and Problem Sets:

Grading will be based on a number of problem sets. You must turn in your own solution to each of these problem sets. However, you are allowed/encouraged to work together, in particular on the problem sets that involve computer simulations. The computer simulations are meant to improve your understanding of the theoretical results – and their limitations. The simulations will require knowledge of matrix oriented packages, such as: Gauss, Matlab, or Ox.

Ox Console can be downloaded for free at: http://www.doornik.com/download.html

Course Homepage: See Stanford Coursework.

Announcements: No class on April 7th (Thursday) and May 24th (Tuesday).
Course Outline:

1. Stochastic Processes in Discrete Time. H:Ch.7
   (a) Stationarity, Ergodicity, and LLN for Dependent Processes.
   (b) Mixing and CLTs for dependent variables.

2. Maximum Likelihood Estimation (MLE) and Quasi-MLE (QMLE).
   (a) Heteroskedasticity and Autocorrelation Consistent (HAC) Estimators.

3. Univariate Times Series (stationary). H:Ch.3
   (a) Autoregressive processes (AR).
   (b) Moving average processes (MA).
   (c) Autoregressive moving average processes (ARMA).

4. Multivariate Time Series. H:Ch.11

5. Unit Roots and Cointegration. H:Ch.17-19
   (a) Univariate. Stock (1994).
   (c) Granger’s representation theorem. Hansen (2005a)

6. Forecasting.
   (a) Combination: Bates & Granger (1969).
   (b) Macro forecasting: Stock & Watson (1999), Stock & Watson (2002a), Stock & Watson (2002b)

7. Volatility Models and Realized Variance (RV). H:Ch.21
   (a) ARCH/GARCH. Engle (1982), Bollerslev (1986).
References


