ECONOMETRICS II
Time Series Econometrics

Course Syllabus

Professor: Norman Swanson, 304 NJH: 848-932-7432.
Class Location & Time: SC 121 - Wednesday 11:30-2:30
Recitation Location & Time: SC 116 - Wednesday 4:30-5:50
Email: nswanson@economics.rutgers.edu

Course Website: http://econweb.rutgers.edu/nswanson/econ508/

Office Hours: Swanson - W 10:30-11:30 (or by appointment)

Teaching Assistant: tba

Learning Goals and Assessment:

Departmental learning goals and assessment for graduate classes, and in general for the economics doctoral program, are detailed at the following website:

http://economics.rutgers.edu/graduate/program/learning-goals

Additionally, departmental learning goals and assessment for masters students are detailed at the following website:

http://economics.rutgers.edu/graduate/program/learning-goals-masters

In this course, and as fully detailed at the above referenced documents, learning goals and assessment will include:

(i) *Attain marked ability, scholarship, research and leadership skills in economics, with specialization in selected sub-disciplines*

(ii) *Engage in and conduct original research*

(iii) *Prepare to be professionals in careers that require training at the highest levels in economics and selected sub-disciplines*

Additionally, note that your course grade will be based on the results from 1 in class paper presentation (35%), 1 in class midterm examination (35%), and a final project (30%), or as to be determined by professor. The focus of this course is on time series econometrics. Throughout the course, we will discuss and review topics including LM, LR, and Wald tests, ARIMA models, and maximum likelihood estimation. We will also cover VAR models, unit roots, cointegration, spurious regression, and Granger causality. Finally, we will discuss other time series topics including forecasting, continuous time financial models, bootstrapping, Monte Carlo methods, and GARCH. The overall focus of the course will be on financial and macro econometrics

*Note to MSMF Students***:** This PhD level course syllabus is appropriate also for MSMF students, inasmuch as the same broad content is covered in both versions of 508 that I teach. However, the depth of coverage will vary, as will the course requirements, as appropriate for the class.

The course outline is meant only as a guide, and topic coverage and length of coverage may vary from the time allotted in the syllabus. After finishing each main topic I will summarize completely what we have learned and what you will be required to know for the test(s). Note that most advanced texts in econometrics cover all or most of the topics in the course, so that you may essentially use texts other than those listed. Finally, note that the course is meant to be self-contained, in the sense that full knowledge of class lecture material is essentially sufficient for testing purposes, and texts need be used only for extra study and clarification.

Disclaimer

Qualified persons with disabilities are encouraged to participate in all programs and activities at this university. If you anticipate needing any type of accommodation in this course or have questions about physical assess, please tell the instructor as soon as possible.

Textbooks

(H*) Hamilton, James D.: **Time Series Analysis**, 1st Edition, Princeton University Press, 1994.

(DM) Davidson, Russell and James G. MacKinnon: **Estimation and Inference in Econometrics**, 1st Edition, Oxford University Press, 1993.

(GN) Granger, Clive W. J. and Paul Newbold: **Forecasting Economic Time Series**, 2nd Edition, Academic Press, 1986.

(G) Godfrey, L.G.: **Misspecification Tests in Econometrics**, 1st Edition, Cambridge, 1988.

(W) White, Halbert: **Asymptotic Theory for Econometricians**, 1st Edition, Academic Press, 1984.

(R) Ramanathan, Ramu: **Statistical Methods in Econometrics,** 1st Edition, Academic Press, 1993.

(JGHLL1) Judge, George, G., William E. Griffiths, R. Carter Hill, Helmut Lütkepohl, and Tsoung-Chao Lee, : **Introduction to The Theory and Practice of Econometrics**, 2nd Edition, Wiley, 1988.

(JGHLL2) Judge, George, G., William E. Griffiths, R. Carter Hill, Helmut Lütkepohl, and Tsoung-Chao Lee, : **The Theory and Practice of Econometrics**, 2nd Edition, Wiley, 1985.

(E) Enders, Walter: **Applied Econometric Time Series**, 1st Edition, Wiley, 1995.

(L) Lütkepohl, Helmut: **Introduction to Multiple Time Series Analysis,** Springer Verlag, 1991.

(JD) Johnston, Jack and John DiNardo: **Econometric Methods**, 4th edition, McGraw Hill, 1997.

* required text.

Course Notes

Swanson, Norman R. and Valentina Corradi: **Prediction and Simulation Based Specification Testing and Model Selection**

Swanson, Norman R.: **Economics 508 Lecture Notes (available on Sakai, not for distribution)**

Course Outline

PART I. ARIMA Models (week 1)
(i) AR, MA, and ARMA Models
(ii) Specification, Estimation and Testing
Readings: (H) Chapters 3,5, (GN) various.

PART II. Testing (week 2/3)
(i) Testing: F-tests, χ^2 tests and F approximations thereof - LM, LR, and Wald Tests, etc.
(ii) Nonlinearity, Serial Correlation, Heteroskedasticity, ARCH, Predictive Accuracy, Causality, and Related Tests
Readings: (G) various, (H) Chapter 5, (W) Chapter IV.2, (DM) Chapter 3.6 and various.

PART III. Nonstationarity Versus Stationarity (week 4)
(i) Random Walks and Spurious Regression
(ii) Stochastic and Deterministic Trends - Trend vs. Difference Stationarity
(iv) Unit Root Testing
Readings: (H) Chapters 15,16,17, (DM) Chapter 20, (GN) Chapter 1.

PART IV. Vector Processes (week 5)
(i) VARs: Estimation and Testing
(ii) VARs: Interpretation - IRFs and FEVDs
(iii) Cointegration - Introduction and Motivation
(iv) Error-Correction Models: Estimation and Testing
Readings: (H) Chapters 10,11,18,19,20 (DM) Chapter 20, (GN) Chapter 8.

PART V. Introduction to Forecasting (week 6-10) - see Lecture Notes
(i) Forecasting Time Series
(ii) Model Selection
(iii) Testing
Readings: (GN) all, (H) Chapter 4. Corradi, Valentina and Norman R. Swanson, 2006, Predictive Density Evaluation, in: Handbook of Economic Forecasting, eds. Clive W.J. Granger, Graham Elliot and Allan Timmerman, Elsevier, Amsterdam.

PART VI. Introduction to Monte Carlo Methods
(i) Experimental Design
(ii) Test and Estimator Assessment Methods
Readings: (DM) Chapter 21.

PART VII. Introduction to Financial Econometrics
(i) Single Factor Models - CIR, Geometric Brownian Motion and Related Models
(ii) Stochastic Volatility and other multi-factor and multi-dimensional Processes
(iii) Estimation (GMM, SGMM, ccf methods)
(iv) Specification Testing
Readings: (H) Chapter 14. See also:

"Empirical Evidence on the Importance of Aggregation, Asymmetry, and Jumps for Volatility Prediction," (with Diep Duong), 2015, Journal of Econometrics, 187, 2015, 606-621.

"Predictive Inference for Integrated Volatility", (with Valentina Corradi and Walter Distaso), Journal of American Statistical Association, 106, 2011, 1496-1512.

"Volatility in Discrete and Continuous Time Models: A Survey with New Evidence on Large and Small Jumps," (with Diep Duong), printed in David M. Drukker, 2011, Missing Data Methods: Advances in Econometrics vol. 27, Emerald, New York, pp. 179-233.

"In- and Out-of-Sample Specification Analysis of Spot Rate Models: Further Evidence for the Period 1982-2008," (with Lili Cai), Journal of Empirical Finance, 18, 2011, 743-764.

"Predictive Density Construction and Accuracy Testing with Multiple Possibly Misspecified Diffusion Models," (with Valentina Corradi), Journal of Econometrics, 161, 2011, 304-324.

"Predictive Density Estimators for Daily Volatility Based on the Use of Realized Measures," (with Valentina Corradi and Walter Distaso), Journal of Econometrics, 150, 2009, 119-138.

"A Simulation Based Specification Test for Diffusion Processes," (with Geetesh Bhardwaj and Valentina Corradi), Journal of Business and Economic Statistics, 26, 2008, 176-193.

PART VIII. Further Topics; as time permits and throughout course
(i) Generalized Autoregressive Conditional Heteroskedasticity (GARCH) Models
(ii) Bootstrapping Techniques
(iii) Nonparametric Techniques
Readings: (GT) all, (H) Chapters 13,14,21, (DM) Chapter 16.

PART IX. Further Topics; as time permits and throughout course
(o) Project discussion.
(i) TAR, STAR, LSTAR, and ESTAR Models
(ii) Nonlinear Cointegration
(iii) Neural Network Models
(iv) Panel Data Modeling:
    Fixed Effects Models, Random Effects Models, Simultaneity Problems
Readings: to be announced