Econ 871 (Fall 2021)

Time Series Analysis

Professor Peter Hansen

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Lectures: Tue & Thu14:00-15:15 in Gardner Hall 007

Office Hours (via Zoom): Time TBA.

Course website on Sakai: `https://sakai.unc.edu/portal/site/econ871-2021f`

Course Outline

The course provides an introduction to time series analysis. We will cover the following topics: stationarity/ergodicity, autoregressive and moving average models, unit root/spurious regression, vector autoregressive models, cointegration, GARCH, structural breaks/parameter instability and models with time-varying parameters. We will also spend time on some of the following topics: Forecasting, martingale, Markov chains, (quasi) maximum likelihood analysis, m-estimation, generalized method of moments, multiple comparisons testing.

We will draw on material from several textbooks, including *Econometrics* by Bruce Hansen (Chapters 14-16), *Time Series Analysis* by J.D. Hamilton, and *Econometrics* by F. Hayashi.

Prerequisites

Economics 770 (Introduction to Econometric Theory), Economics 771 (Econometrics), Graduate level probability theory and mathematical statistics (usually obtained through 1 and 2)

COVID-19 precautions, Face Masks

As noted in the Updated Community Standards, face masks are still required in all University buildings. As such, the following statement should also be included on course syllabi for in-person classes. Please share this statement with your department's Fall 2021 instructors:

"This semester, while we are in the midst of a global pandemic, all enrolled students are required to wear a mask covering your mouth and nose at all times in our classroom. This requirement is to protect our educational community — your classmates and me – as we learn together. If you choose not to wear a mask, or wear it improperly, I will ask you to leave

immediately, and I will submit a report to the Office of Student Conduct. At that point you will be disenrolled from this course for the protection of our educational community. Students who have an authorized accommodation from Accessibility Resources and Service have an exception. For additional information, see Carolina Together."

Problem Sets

A number of homework assignments will be given during the course. You may discuss and exchange ideas about how to solve the assignments, but each student must turn in her own work. Some assignments will require the use of computer software such as Matlab, R, Julia, Python, Ox. I will primarily use Julia and I encourage you to do the same.

Grading Policy

Grades will be based on problem sets (25%), a midterm exam (25%), and a final exam (50%). The final exam is schedule to take place on December 7th at 12:00. I will update the syllabus as new information becomes available.

Schedule (Preliminary)

- Week 1. Stationarity, Ergodicity, Martingales, (Markov)

- Week 2: Autocorrelation, ARMA, Lag operator, Linear Processes, Wold representation

- Week 3: Yule-Walker, Estimation of stationary AR.

- Week 4: Estimation of MA, ARMA... and GARCH?

- Week 5: Unit Root, Spurious Regression,

- Week 6 Vector Autoregressive Model (VAR)

- Week 7 Cointegration

- Week 8-9 QMLE (GMM?) Time Series models

- Week 10 HAC estimation

- Week 11 Testing for structural changes.

- Week 12 Models with time-varying parameters. Score-driven model.

- Week 13-14 Advanced topic related to testing, model selection, forecasting.