Overview: The specification, estimation, diagnostic testing, and practical usage of dynamic models for economic and financial time series present a host of unique challenges, requiring the use of specialized statistical tools and inference procedures. This course provides an overview of some of the most important of these approaches. The discussion will focus on the practical implementation of the different techniques, rather than formal proofs, including applications in macroeconomics and asset pricing finance.

Requirements: I will assume that you have an understanding of econometrics and basic statistics at the level of first-year graduate econometrics, equivalent to Econ.703D and Econ.707D at Duke.

Class Schedule: Lectures will be held in Room 327, Tuesdays and Thursdays, 12:45-2:00pm.

Office Hours: My office hours are Wednesdays, 1:30-3:00pm. My office is in Room 228E. If you are unable to see me during my office hours, or immediately after class, please email to set up an appointment. My email is: boller@duke.edu.

Course webpage: http://www.econ.duke.edu/~boller/Econ.883

Evaluation: Your grade for the course will be based on an equal weighting of your performance on the final exam and four problem sets. The final exam is scheduled for Tuesday, May 2, 7:00-9:00pm. You are strongly encouraged to work on the problem sets in groups of up to four people. Each group should hand in only one solution to the assignment. I may also consider your participation in the classroom discussion and contribution to the general classroom atmosphere when determining your final grade for the course.

Books: The main textbook for the course is:


This is a classic. It provides a detailed and comprehensive discussion of the most important ideas in time series econometrics as of ~twenty years ago. Some of the discussion is a bit dated by now. However, it is a great general reference book. In addition you might want to look at the more recent book:


This book offers a systematic approach to the specification, testing, and estimation of
empirically realistic time series models. It strikes an excellent balance between formal theory, intuition, and empirical applications, with an emphasis on maximum likelihood techniques. Parts of the book naturally complements some of my lectures. It also comes with a very comprehensive set of GAUSS, MATLAB and R routines.

Other more recent and classic books on the statistical and econometric analysis of economic and financial time series include:


Andrew C. Harvey (1990). *Econometric Analysis of Time Series, 2nd Ed*. MIT Press. (Although this was first published more than two decades ago, it remains a good reference for many of the basic topics.)


Course Outline and Readings:

In addition to the relevant chapters in the book by Hamilton, we will also touch on several journal articles and Handbook chapters. However, my lectures will generally be based on my own interpretation, and not directly following any of those readings.

1. Univariate ARMA Models

   Hamilton, Chapters 3, 4.

   Hamilton, Chapters 1, 2 (this is review material about difference equations and lag operators).

   Martin, Hurn and Harris, Chapter 13.

   Anderson, Chapters 5-7.
   Box and Jenkins, Chapters 1-9.
   Brockwell and Davis, Chapters 1, 3, 5, 7, and 9.
   Enders, Chapters 1, 2.
   Taylor, Chapter 3.
   Tsay, Chapters 2-3.

2. MLE, QMLE and Estimation-by-Simulation

   Hamilton, Chapter 5.

   Martin, Hurn and Harris, Chapters 1-2, 7, 9 and 12.


   Brockwell and Davis, Chapter 8.
   Harvey, Chapters 3-4.

3. Hypothesis Testing and Model Selection

   Hamilton, Chapter 5.

   Martin, Hurn and Harris, Chapter 4.


4. Spectral Analysis and Filtering

Hamilton, Chapter 6 and Sections 10.4-10.5.


Anderson, Chapters 8-9.
Brockwell and Davis, Chapters 4, 10, and Sections 11.6-11.8.
Priestley, Chapters 1, 4-11.

5. Vector Autoregressions

Hamilton, Sections 10.1-10.3 and Chapter 11.

Martin, Hurn and Harris, Chapters 14.


Enders, Chapter 5.
Gourieroux and Jasiak, Chapters 3, 4.
6. GMM

Hamilton, Chapter 14.
Martin, Hurn and Harris, Chapter 10.


7. Unit Roots

Hamilton, Chapters 15-18.

Martin, Hurn and Harris, Chapters 16-17.

Hamilton Chapter 7 (contains review material on standard asymptotic distribution theory for stationary processes).


8. Cointegration

Hamilton, Chapters 19-20.

Martin, Hurn and Harris, Chapter 18.


9. Long-Memory and Fractional Differencing


10. Volatility

Hamilton, Chapter 21.

Martin, Hurn and Harris, Chapter 20.


Jondeau, Poon and Rockinger, Chapters 4-6.
Gourieroux and Jasiak, Chapter 6.
Taylor, Chapters 8-12.
Tsay, Chapters 4-6.