APPLIED TIME SERIES ECONOMETRICS
(ECON 797W: Spring 2013, UMass Amherst)

Instructor:
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Classes: Wednesday 6:15-8:45pm in 919 Thompson
Office Hours: Monday 1:00-3:00pm, or by appointment

About the course: This course will introduce students to the basic techniques of time
series econometric analysis and encourage them to apply some of these techniques to investi-
gate interesting issues in heterodox macroeconomics, radical political economy and the polical
economy of development. The material that will be discussed in the course can be divided
into two broad topics: (a) analysis of stationary time series processes (both univariate and
vector processes), and (b) analysis of non-stationary time series processes (both univariate
and vector processes).

Textbook: The following textbook will be used to organize discussion of the material: Ap-
plied Econometric Time Series (Third Edition), by Walter Enders, 2010 [Publisher: John
Wiley & Sons].

Supplementary Textbooks and Material The following textbooks can be used for reference:

- Time Series Analysis, by James D. Hamilton, 1994 [Publisher: Princeton University
  Press].

- Econometrics, by Fumio Hayashi, 2000 [Publisher: Princeton University Press].

- Lecture Notes.

Statistical Packages: We will work with two popular statistical packages in this course:
R and STATA. The following links can be used to familiarize oneself with these packages for
time series analysis:

- For R: http://www.stat.pitt.edu/stoffer/tsa2/R\_time\_series\_quick\_fix.htm

- For STATA: http://archive.nyu.edu/bitstream/2451/29569/2/Brief\%20Introduction\%
  20to\%20Stata%2010\%20Time\%20Analysis.pdf
**Grading:** A total of 200 points will be divided between 5 take-home assignments and a research paper as follows:

**Take-home assignments:** The 5 take-home assignments will be worth a total of 100 points, with each contributing 20 points. The assignments will be handed out in class and will be due in about 7-10 days; they will involve solving end-of-chapter problems, and data exercises. *Data exercises can be completed using R or STATA. Details of tutorial sessions to help familiarize students with R and/or STATA will be announced in class.*

**Research paper:** The research paper will be worth 100 points and will involve either (a) replicating the results of an existing paper, and critically extending it further (if possible), or (b) presenting original research. Typically the paper will be chosen by the student in consultation with the instructor and should have the following characteristics: (1) the paper must analyze a heterodox macro/PE/development question, and (2) the paper must use time series econometric analysis. (I have provided a small list of recent heterodox macro/PE papers that have used time series econometric analysis; students can choose a paper from this list or from any other appropriate source). *In addition to submitting it, students will be required to give a 20 minute presentation on their research paper during the exam week.*

**Tentative schedule:** The tentative schedule for the course is as follows:

- **Week 1-2:** Introduction to Time Series Analysis and Difference Equations (Chapter 1 of the textbook): after revising basic concepts from probability and statistics (random variable, probability density/mass function, expectation, variance, covariance, etc.), the first two weeks will help familiarize us with two of the basic building blocks of time series econometrics, deterministic difference equations and lag operators.

- **Week 3-5:** Univariate Stationary Time Series Models (Chapter 2 of the textbook): moving from the analysis of deterministic to stochastic difference equations will equip us with the tools to understand the widely used class of stationary time series models, the ARMA(p,q) model; here we will also go over basic notions of time series analysis and familiarize ourselves with the Box-Jenkins modeling strategy.

- **Week 6-8:** Univariate Time Series Models with Trends (Chapter 4 of the textbook): time series with trends, both deterministic (time trend) and stochastic (unit roots), are non-stationary random variables and require a whole new approach of analysis and statistical inference; this part of the course will introduce the basic issues involved in analyzing time series with trends (e.g., why do standard methods of inference, using t and F tests, completely break down when there is a unit root non-stationary regressor? how do we test for the presence of unit roots? what to do when there are unit root nonstationary variables in regressions?)

- **Week 9-11:** Multivariate Stationary Time Series Models (Chapter 5 of the textbook): having studied univariate time series models in some detail, we will now move to the
study of vector processes; in this part of the course we will study one of the widely used tools of *dynamic* macroeconomic analysis, vector autoregressions (VARs) and its three specific techniques - impulse response functions, variance decomposition and Granger causality.

- **Week 12-14:** Cointegration and Error Correction (Chapter 6 of the textbook): this part of the course will familiarize us with techniques used to study cointegrated random variables (i.e., unit root non-stationary random variables, a linear combinations which becomes stationary) and help answer questions like: how do we test for cointegration? what “meaning” can be attached to the notion of “cointegrated variables”? what is an error correction representation of a cointegrated system? how to carry out valid statistical inference on cointegrating vectors?

**References**


