Econ 220D, Fall 2025

Instructor:

James Hamilton (jhamilton@ucsd.edu)

Class meetings:

Tuesdays and Thursdays, 8:00-9:20 a.m., Social Science Building 107

Office Hours:

Thursdays 10:00-11:00 in Supercomputer Center 188E (or online or by appointment)

Grades

Grades for the course will be assigned as follows:

10% Attendance. Attendance is defined as either (a) being seated and ready to learn each day at 8:02 a.m., or (b) sending an acceptable excuse by email by 7:59 a.m.

20% Assignment 1: Data description (due Thursday Oct 30)

30% Assignment 2: Original research (due Friday Dec 5)

40% Final exam (Tuesday Dec 9 at 8:00 a.m.)

Textbooks

The primary text for the course is James D. Hamilton, *Vector Autoregressions,* forthcoming from Cambridge University Press. Manuscript will be available on Canvas. A useful supplementary text is James D. Hamilton, *Time Series Analysis,* Princeton University Press, 1994.

Extra credit

A student who is the first person to notify Professor Hamilton by email of an error or unnecessary confusion in the text will receive 1 point extra credit (out of 300 possible points for the course) and in addition will receive $5.00 for each error identified.

Assignment 1: Data description (due Thurs Oct 30 at 8:00 a.m.)

Your assignment is to describe a data set that is of interest to you. Note that in this assignment you should only try to describe the data and not offer any structural interpretations. You should not use words like "effect," "impact," "cause," or "model" anywhere in this assignment (other than possibly the first paragraph).

The assignment should be typed, double-spaced, with 12-point font and 1.5-inch margins, about 5 pages, with references in *American Economic Review* format (e.g., include author full names, not just abbreviations, and full citations). The assignment needs to include the following items.

1. Opening paragraph. Explain why these variables are of interest to economists, citing some previous research. The citations could be to either theoretical or empirical papers.

2. Assemble and plot the data. Collect data on at least 3 different variables with at least 40 observations on each. Provide graphs of the data and comment briefly on

any salient features evident in the graphs. If you have a large number of variables, pick 2 or 3 that are of most interest and summarize the rest using an average or the first principal component.

3. Estimate a vector autoregression and reduced-form impulse-response function. This should include a self-contained detailed description of what the procedure is, what its assumptions are, and exactly how it is implemented. Do not assume that the reader of your paper is familiar with the method or is convinced that it is appropriate. The goal of this section is to explain clearly to a nonspecialist what the method is, why it should be used, and what it tells us in your application.

4. Extend your results using Bayesian methods. Again this should be a self-contained description of what you do and how Bayesian methods may be helpful in this instance.

5. Test your variables for stationarity and structural breaks. Again you should provide a self-contained description of the procedures you used, what their assumptions are, and exactly how they are implemented. Discuss whether and in what way stationarity may be relevant for your methods or conclusions.

In addition, you must submit a replication package for your assignment. This should be a zip file in *.zip format. It must include data files, codes to reproduce *all* the results and figures in your paper, along with instructions for how to run the code and the programming language. Lines of code should be annotated clearly.

Assignment 2: Structural interpretation of an observed correlation (due Friday Dec 5 at noon)

For this assignment you should apply a method of your choice from the second part of the book (Chapters 7-12). Your write-up should be in the same typed format as the first assignment and include the following.

1. Identify the question. The opening paragraph should describe the question you are asking, again with reference if possible to previous research. The papers referenced can be either theoretical or empirical.

2. Explain the method on which you propose to base structural conclusions. This should be a self-contained detailed description of what the procedure is, what its assumptions are, and how it is implemented. Do not assume that the reader of your paper is familiar with the method or is convinced that it is appropriate for the question you are asking. The goal of this section is to explain clearly to a nonspecialist what the method is, why it should be used, and what it can tell us.

3. Apply the method and report the results. It's OK if your conclusion here is a negative one, e.g., if you end up concluding that we can't answer the question due to xyz, or highlighting the shortcomings of the method you used for purposes of answering the questions of interest. Examples of methods you could consider are calibration of a theoretical model, Cholesky identification, use of instrumental variables, rotation of factors so that they could be interpreted as causal factors of interest, or identification using heteroskedastiticy. Pick just one method of your choice for this assignment.

In addition, you must submit a replication package for your assignment. This should be a zip file in *.zip format. It must include data files, codes to reproduce *all*

the results and figures in your paper, along with instructions for how to run the code and the programming language. Lines of code should be annotated clearly.

Academic integrity guidelines for Assignments 1 and 2

Students are free to seek assistance from the professor, other students, or AI programs like ChatGPT for either assignment. However, students are warned that it is the instructor's opinion that AI tools are unable to complete the assignment in a way that would receive an A grade. Any insights you obtained from written sources must include a citation. If you repeat verbatim a phrase of ten words or more it must appear in quotation markets with citation to the original source with page number. Data sources must be unambiguously identified, e.g., as "BEA NIPA Table 1.2," not "Source: Bureau of Economic Analysis."

Academic integrity guidelines for final exam

The final exam will be a closed-book, closed-note exam.

Course schedule

Thurs Sept 25 Introduction to vector autoregressions (Chapter 1)
Tues Sept 30 Reduced-form impulse-response functions (Chapter 2)
Thurs Oct 2 Introduction to Bayesian analysis (Section 3.1)
Tues Oct 7 Analytical Bayesian methods (Sections 3.2-3.4)
Thurs Oct 9 Numerical Bayesian methods (Sections 4.1-4.6)
Tues Oct 14 State-space representations and time-varying dynamic systems (Sections 4.7-4.8)
Thurs Oct 16 Unit roots in univariate time series (Sections 5.1-5.2)
Tues Oct 21 Unit roots in multivariate time series (Sections 5.3-5.4)
Thurs Oct 23 Structural breaks (Chapter 6)
Tues Oct 28 Principal component analysis and dynamic factor models (Sections 7.1-7.2)
Thurs Oct 30 Other approaches to large data sets (Section 7.3) [**Assignment 1 due at the start of class**]
Tues Nov 4 Introduction to structural analysis (Sections 8.1-8.2)
Thurs Nov 6 SVAR applications (Section 8.3)
Tues Nov 11 Instrumental variables (Sections 9.1-9.3)
Thurs Nov 13 IV applications (Section 9.4)
Tues Nov 18 Stuctural inference using large data sets and heteroskedasticity (Sections 10.1-10.2)
Thurs Nov 20 Other approaches to structural inference (Sections 10.3-10.4)
Tues Nov 25 Inexact identifying information (Sections 11.1-11.3)
Tues Dec 2 Empirical application (Sections 11.4-11.5)
Thurs Dec 4 Identification using sign restrictions (Chapter 12)
Fri Dec 5 Assignment 2 due at 12:00 p.m.
Tues Dec 10 **Final exam 8:00 - 11:00 a.m.**