

Syllabus

Introduction to Econometrics - Economics 4818-001

Fall 2006, MWF 2:00-2:50, Econ 117

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Hours: Tuesday 11-12, Wednesday 11-1

Introduction

Economics 4818 is an introduction to the practice of econometrics, which has a range of applications in economic research. I like to think of econometrics as methods of using data and statistics to provide evidence for economic theory. This course will feature a mixture of learning both basic econometric methods (think of this as a “tool kit”) and learning how to apply these methods to answer economic questions. The goal of this course is to provide you with enough understanding and experience to use econometric analysis in your career: in government, academic or commercial applications.

The text for this course will be: **Introductory Econometrics: A Modern Approach (3rd Edition)**, by Jeffrey Wooldridge. New copies are expensive, but there should be used copies available if you buy early. You may be able to find a copy online that is less expensive, but keep in mind you will need it by Aug. 30th. The second edition is usable; its text is identical to the 3rd edition, but it is missing some practice problems.

Economics 3818 is the prerequisite for this course. This is because econometrics requires the use of probability and statistics. Appendices B and C of our text summarize the necessary concepts in probability and statistics. It will be useful to review these, and I will spend some time on them in class. If you have taken a statistics course in the applied math department, such as “Introduction to Mathematical Statistics” 4520 or “Statistical Methods” 4570, this will certainly substitute for the prerequisite. Of course, to understand probability and statistics you need a basic understanding of algebra and calculus. I encourage you to review these independently. A good starting point would be appendix A of our text.

In accordance with the recommendations from Disability Services, I will make reasonable accommodations for students with disabilities. If you have a disability and anticipate requiring changes in the testing or teaching environment, please submit a letter from Disability Services during the first week of class describing such changes.

Information about Disability Services can be found at:

<http://www.colorado.edu/disabilityservices/>

Conflicts in scheduling between religious observances and exam dates should be brought to my attention at least two weeks in advance, so that I can make an alternate exam to be taken prior to the scheduled exam. I will adhere to the university policy as stated at: http://www.colorado.edu/policies/fac_relig.html

This is a 4000 level class, and I expect each lecture to be an exercise in civil discourse. Please be aware of university regulations concerning classroom conduct, as stated in: <http://www.colorado.edu/policies/classbehavior.html>. Use of cell phones and laptops is prohibited while class is in session – if you are browsing the web you are clearly not paying attention in class, and distracting other students as well. Also, please keep entry and exit of the classroom to a minimum while class is in session.

Academic honesty is a must. You may find the University Honor code at: <http://www.colorado.edu/academics/honorcode>. Cheating on the exams is strictly forbidden. You may help each other complete the econometrics project (see below), but the draft you turn in must be original; plagiarism of anyone, both inside or outside the class, is a violation not only of the University Honor Code but also of your academic integrity. In general, collaboration on the problem sets and computer exercises is permitted, although separate assignments must be received from each of you. All assignments must be submitted in class, in person, on the day they are due, unless you notify me in advance of a reason that you must be absent.

Feel free to meet with me and discuss econometrics during my office hours, posted above. Unfortunately there is no TA for this class, and my ability to meet outside of those hours is limited. Individual appointments may be made in extraordinary circumstances, such as an extended illness.

Evaluation

Your grade will depend on both your understanding of econometric theory and your ability to apply it to economic questions. You will need to demonstrate your understanding of theory on the midterm and final exam, as well as many problem sets. The application part will consist of several computer exercises, and an econometrics project. The weighing of each of these is described below:

Grade decomposition:

30% - Final exam

20% - Midterm exam

20% - Econometric project

12% - Computer Exercises

18% - Problem Sets

Dates for the exams are shown on the schedule below. The final will be held in the classroom on Dec. 18th at 4:30 PM, and the midterm held in the classroom during the normal class time. The midterm is scheduled for October 27th. If you know you must be absent the day of the midterm or need special arrangements for the final, contact me at least two weeks in advance.

Assignments

The major assignment for this course is the **econometric project**. This should be a paper in the style of applied economic research. By now, in your senior or junior year as an economics major, you should be familiar some relationships between economic variables as suggested by theory. Your task will be to:

1. choose an economic relationship to study
2. find data that describe the related variables
3. estimate the direction and magnitude of the relationship, and
4. write a paper about the relationship based on your estimates.

Let me describe in each of these steps in detail:

Choose an economic relationship to study.

This is entirely up to you. The relationship doesn't have to be novel, and you can even duplicate studies that have been published in economic journals. Plagiarism, whether it is of a professional publication or of another undergraduate student, is of course strictly prohibited. The difference between duplication and plagiarism is that while you may choose the same relationship for part (1) as another study, the other parts must be unique to your paper, so that you end up studying the same relationship in a different way. Examples of relationships to study include demand functions for a particular product, labor supply in a particular market, the pricing of environmental public goods, household outcomes in a developing country or even a relationship between macroeconomic variables (interest and inflation, GDP growth and unemployment, etc). Think broadly when picking your topic. In general, you need to choose a causal relationship: your dependent variable should be some economic behavior that people exhibit, and your independent variables should be any variables, economic or not, that may influence such economic behavior. The more sophisticated your chosen relationship, the more lenient I will be with grading.

Find data for the variables.

One approach is to pick the relationship first and look for matching data. For very simple relationships this may work, but a better approach will be to find interesting data and formulate a relationship that it can describe. You will probably need to find your dependent variable first, and then think about possible explanatory variables to go with it and look those up separately. Here is a partial list of possible data sources:

- Wooldridge Data Sets: A diverse collection of simple data sets assembled by the textbook author. .
- World Bank *World Development Indicators*: Available online through Norlin Library, this provides hundreds of country level variables.
- International Monetary Fund *International Financial Statistics*: Also available online through Norlin, this provides country level financial variables.
- www.bls.gov: Detailed monthly data on U.S. unemployment and inflation, as well as wages and salaries.
- www.census.gov: Detailed data about the U.S. population from the U.S. census.

Also, the Economic Census collects data every five years about U.S. firms and industries.

- www.bea.gov: Macroeconomic variables such as U.S. GDP, gross state product and U.S. current account.
- Compustat database – Detailed data about U.S. and multinational companies. Available online through Wharton Research Data Services (WRDS), but only through terminals in the business library.
- <http://home.developmentgateway.org/Datastatistics>: A website with links to many agencies that collect data, including the IMF, OECD and UN.

This is a partial list, and I encourage you to look for data on your own. Another approach is to try to replicate an already published academic work. Only a few authors list where they got their data, or provide it on their website, so you may need to search a while to find one that you can replicate. You may find articles in journals such as the *Review of Economics and Statistics*, *Journal of Applied Econometrics*, *Applied Economics*, *the Journal of Labor Economics*, *the Journal of Development Economics*, *the Journal of Environmental Economics* or the *International Economic Review*. Don't try to replicate an article that you don't understand!

If your honors thesis contains an empirical component, you may submit this as your econometrics project. You may need to revise the econometric methods in your paper however, because it will be evaluated on how well you apply what you learn in this class. Also, when choosing data for your paper, try to pick data that is either cross-sectional or time-series in nature, not both, since we will not be covering panel data estimation methods in this class.

Estimate the direction and magnitude of the relationship.

You will need to write the relationship as an econometric model which can be estimated from your data. How to do this will be the subject of the first two months of class. You will also need to consider possible problems in the estimation, such as bias from omitted variables and endogeneity, multicollinearity and heteroskedasticity. For estimation with time-series, serial correlation should be considered as well. Any statistical program can be used for the estimation, but I recommend using E-views since I will be demonstrating how to use it in class. Other programs include Stata, SAS, SHAZAM, GAUSS, MATLAB and Excel.

Write a paper about the relationship based on your estimates.

The project should be submitted in the form of a paper, and include an introduction, discussion of the economic relationship and econometric model, discussion of the estimation method, results and a conclusion. The conclusion should discuss the relevance of the results. Your research may not be of earthshaking importance, but I want you to write like it is. You should make an effort to interpret and communicate your findings.

The econometric project will be evaluated on how well you apply your estimation method and how well you interpret your results. No extra points will be given for complicated data sets, a lengthy discussion. Please keep it simple and to the point. It should be a minimum of five pages.

The other assignments include problem sets and computer exercises. Problem sets of ten to fifteen questions will be chosen from the text. These assignments will be posted on the course website, as will answer keys after the due date. The due dates are shown on the schedule below. We spend some time discussing the answers to each assignment, and students may volunteer to demonstrate the problems for the class for extra credit. Periodically we will have in-class problem sets as well, which will be a small portion of the problem sets grade, and are not posted on the schedule.

The computer exercises are assignments that will also be posted online, and will be done with a computer program. The recommended program is E-views, which is installed in the computer lab in the department. A student version of E-views may be purchased for about \$32; I will take a group order in-class to save on shipping for those who want to put it on their personal computers. Details about the E-views product can be seen at: www.eviews.com.

Tentative Course Schedule

Text chapters to be discussed are in parentheses. Assignments are in bold-case. Due dates are in italics.

8/28/06: Introduction (Ch. 1)

8/30: Statistics Review (Appendices A and B)

9/1: Statistics Review (Appendices B and C)

9/4: Labor Day, no class

9/6: Simple linear regression (2.1, 2.2)

9/8: Functional Form, examples of linear regression (2.4)

9/11: Properties of Ordinary Least Squares (2.3, 2.5)

9/13: Simple OLS discussion and examples (all chapter 2)

9/15: **Computer Exercise 1 Due**, Multiple Linear Regression (3.1, 3.2)

9/18: Algebra and Assumptions of OLS (3.2, 3.3)

9/20: Irrelevant variables and omitted variable bias (3.3)

9/22: **Problem Set 1 Due** Unbiasedness and efficiency of OLS (3.3, 3.5)

9/25: Review problem set 1, Variance of OLS estimators (3.4)

9/27: Multicollinearity, Multiple regression discussion and examples (3.4)

9/29: **Problem Set 2 Due**, Inference of a single parameter with OLS (4.1, 4.2)

10/2: Review problem set 2, Two-sided tests and confidence intervals (4.2, 4.3)

10/4: F-tests (4.5)

10/6: Tests with more than one parameter; interpreting regression results (4.4, 4.6)

10/9: **Econometrics project introduced**; topics discussion

10/11: Consistency (5.1)

10/13: **Problem Set 3 Due**, Asymptotic normality and efficiency of OLS (5.2, 5.3)

10/16: Review problem set 3, Scaling, log and quadratic forms (6.1, 6.2)

10/18: Goodness of fit, selection of regressors, residual analysis (6.3, 6.4)

10/20: **Computer Exercise 2 Due**, Dummy and categorical variables (7.1, 7.2, 7.3)

10/23: Binary dependent variables (7.5, 17.1)

10/25: Review for midterm

10/27: **MIDTERM EXAM**

10/30: Static time-series models (10.1, 10.2)
11/1: Form of functions and variables in time series estimation (10.3, 10.4)
11/3: Trends and Seasonality; examples of time-series regressions (10.5)
11/6: Proxy variables (9.2)
11/8: Measurement error (9.3)
11/10: **Problem Set 4 Due**, Examples of econometric studies
11/13: Review problem set 4, Sampling Bias (9.4)
11/15: (class optional) Discuss econometrics project progress, more examples
11/17: **Econometrics Project Due**, Endogeneity and functional form (9.1)
11/20: Fall break
11/22: Fall break
11/24: Fall break
11/27: Heteroskedasticity in cross-sectional models (8.1, 8.2)
11/29: Testing for heteroskedasticity (8.3)
12/1: **Problem Set 5 Due**, Correcting estimates with heteroskedastic errors (8.4)
12/4: Review problem set 5, Serial Correlation (12.1)
12/6: Testing for serial correlation (12.2)
12/8: **Computer Exercise 3 Due**, Correcting for serial correlation (12.3)
12/11: **Problem Set 6 Due**, Heteroskedasticity in Time Series Regressions (12.6)
12/13: Review problem set 6, review for final
12/15: Review for final
12/18: FINAL EXAM – 4:30 – 7:00 PM