Eco 307 - Introduction to Econometrics, Forecasting and Time Series

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Contact Information

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Course Description

Econometrics is the application of advanced statistical methods to economic data. Econometrics is useful for testing economic theory; forecasting future values of economic variables; and analyzing historical data to examine how changes in demographics, the economy, or policies affect an outcome(s). Much of modern applied econometrics is focused on identifying *causal* relationships. Randomized experiments are the "gold standard" for identifying causality. However, such experiments are rare in economics, which results in a reliance on data from surveys. Inferring causality from survey data is difficult, as there are often unobserved factors confounding one's attempt to identify the causal effect of one variable on another variable. As a result, care is needed when interpreting estimates from an econometric model based on survey data. Econometricians have developed a variety of statistical techniques aimed at identifying causality. A number of these techniques will be covered in this course, including multiple regression, fixed effects models, difference-in-differences estimation, and instrumental variables estimation. Put differently, students will learn to estimate various regression-based models, test hypotheses, address the problem of selection bias, and perform policy analysis.

Course Objectives

1. Comprehend the fundamental aspects of econometric analysis via a mix of theoretical and practical applications.

2. Describe the selection problem inherent in the application of econometric modeling to survey data.

3. Evaluate how selection bias could lead to misleading conclusions regarding the relationship between two variables.

4. Apply the econometric methods covered in the course to data using the statistical package STATA (or R).

5. Develop an econometric analysis to either test an economic theory or analyze historical data to examine how changes in demographics, economic conditions, or policies affect outcomes.

6. Compose a research project as a formal academic paper and poster presentation.

7. Compare, contrast and evaluate studies from the empirical economics literature.

Student Expectations

Econometrics is an extension of mathematical statistics. As a result, students must be prepared use mathematics and statistics on a regular basis. A basic but solid understanding of statistics is the only requirement for this class. However, knowledge of differential calculus is a plus. Throughout the course, notes or in-class reviews covering the mathematics and statistics necessary for specific topics will be provided.

Students should expect to spend 10-12 hours per week outside of class studying, reading the textbook and class notes, working applied problems, and preparing their research project. More time may be required toward the end of semester, as the due date of the research project approaches.

Econometrics can be fun and interesting, but learning to apply econometric analysis will require significant effort. This is a difficult course, and no instructor can magically make it easy. A lot of material will be covered, and the majority of it is technical. If students are not willing to devote a significant amount of time to studying the course material, I suggest taking a different course, one that requires less of a time commitment.

My advice for doing well in this course is the following: (a) attend each class, (b) read the relevant material before class, (c) review the content outside of class, (d) complete and submit assignments on time, (f) participate in classroom activities and (f) ask questions before and after class and during office hours. If a student adheres to this advice, the student is likely to receive (and earn!) a high grade.

Critical Thinking and Communication Courses

The economics department has implemented a department-wide instructional strategy for several of the 300- and 400-level courses. The focus of the change is on strengthening students' critical thinking and communication skills. A nested goal in the revision of the curriculum is an attempt to make the economics major result in a more integrative experience for students. To date, approximately eight courses have been redesigned to fit the Critical Thinking and Communication (CTC) classification, including this course. Courses under the CTC classification have common critical thinking and communication expectations and assessment procedures.

CTC courses require (1) students to draw knowledge from readings in fields outside the course content; (2) students to apply knowledge from other fields to new situations; (3) students to communicate results in formal and informal writing assignments and oral presentations; and (4) collaboration among faculty in designing the CTC curriculum, assuring complementarity across courses, common expectations of students, and a common means for evaluating and assessing student work. Note that grades on assignments are based on my evaluation, not that of other instructors.

Lecture Notes and Textbook

I have prepared a set of lecture notes, which effectively serve as a textbook. The lecture notes were written in a way to make econometrics more accessible to undergraduate students. However, Stock and Watson's *Introduction to Econometrics* (3rd edition) is available from Textbook Rental, which provides more in-depth coverage of certain topics and different examples.

Grading

The final grade is composed of six components: (1) participation, (2) two informal writing assignments, (3) two regular exams, (4) a final exam, (5) a poster presentation, and (6) a research paper. The following equation displays the weights attached to each of the six components:

$$g = 0.075\,(part) + 0.125\,(\overline{informal}) + 0.25\,(\overline{exams}) + 0.25\,(final)$$
$$+\, 0.05\,(poster) + 0.25\,(paper).$$

The variable g is the final average; $part$ is class participation; $\overline{informal}$ is the average of the two informal writing assignments; $\overline{exams}$ is the average of the two regular exams; $final$ is the final exam; $poster$ is the poster presentation; and $paper$ is the research paper. A final average (g) of 93 or above is an "A"; 89 to 92 is an "A/B"; 83 to 88 is a "B"; 79 to 82 is a "B/C"; 70 to 78 is a "C"; 60 to 69 is a "D"; and below 60 is an "F". More information is provided below on each component of the final grade.

1. *Participation*

   Participation is determined by attendance and active engagement in the course. We meet 28 times throughout the semester. About half of these meetings consist of applied-problem-solving sessions, which consist of students using data to estimate econometric models, interpret the output from such regressions and conducting hypothesis tests. In-class problem solving provides an opportunity for students to practice what I cover in the lectures, with the benefit that I'll be there to help students who need clarification and assist with applying the theory to real-world data. It is important to attend each class!

2. *Informal Writing Assignments*

   There are two mandatory informal writing assignments, which require students to read articles outside of the course content and to write a short, critical essay about the articles. I have prepared the these assignments in advance, and they are available for download through D2L. The first informal writing assignment is due **Friday, October 17th**. The second informal writing assignment is due **Monday, December 1st**.

3. *Regular Exams*

   There will be two regular exams given during the semester. These exams are similar to problem sets. More information on the exams will be provided before the exam dates, and there will be a review session before each exam. The first regular exam will take place in mid-October, while the second regular exam will take place in late-November.

4. *Final Exam*

   The final exam is scheduled for **Tuesday, December 16th from 10:00 am until 12:00 pm**. The date for the final exam is set by the university. All students **must** take the final exam at the scheduled time. No exceptions!

5. *Poster Presentation*

   Students must create a poster presentation of their research project and attend the Critical Thinking and Communication (CTC) biannual conference held by the economics department. Students who do not complete a poster *and/or* do not attend the CTC conference receive a zero for the poster-presentation portion of the final grade. As soon as the date for the CTC conference is set, students will be notified so that arrangements to attend can be made. In the past, the conference has been held on the last Friday of the semester.

6. *Research Paper*

   Students are required to produce an original research paper, which should be approximately 12-15 pages in length, excluding tables, figures and references. Students will work in groups of two on the research project. Detailed guidelines for the research project are provided in a separate document. These detailed instructions are available for download through D2L. Let me add that it is important for students to decide on a research topic as soon as possible!

Double Counting Papers Across Courses

I have *no* objection to students using their paper to satisfy requirements in multiple courses, independent studies, or thesis projects. However, the following criteria must be met:

- Students request permission from me and the other instructor(s) to double-count a project across two courses. Everyone involved needs to be in agreement on the project.

- Students take responsibility for meeting all deadlines and assignment criteria in each course. Do not expect concessions to accommodate double counting projects.

- The project must have a clear, econometric component, and the analysis conducted must meet my course's standards. It is possible to receive different project grades across courses.

- Students outline specific aspects of the project that would not be accomplished without double counting. Alternatively, students must demonstrate the synergy from producing one project for two courses instead of two separate projects.

- Projects that double-count across courses are likely to be individual projects, not those based on group work. Exceptions to this are possible but not likely.

- The idea behind double counting projects is that students should be able to produce a more extensively researched and higher-quality project. Therefore, the assessment of a double-counted project is met with greater scrutiny.

Desire2Learn Webpage

I make extensive use of the Desire2Learn (D2L) course management system to provide course materials and information. There are four features of D2L that are used frequently, and students should check these on a regular basis:

1. *News* - Important information about the course and links to interesting newspaper articles or blog posts that have econometric content are posted in the *News*. Reminders of deadlines and other important events are also provided via the *News.*

2. *Content* - Links to the syllabus, lecture notes, informal writing assignments, data sets, problem sets and solutions to the problem sets are available via *Content.*

3. *Discussion* - Although discussions are not a part of the final grade, there will be a general discussion board for students to post questions concerning the course and its content. The purpose of having a general discussion board is to allow everyone to see what questions are being asked and my answers to those questions. If one student has a question, other students likely have similar questions. The general discussion board will be accessible via the *Discussion* tab.

4. *Grades* - Because of privacy issues, I **will not** email grades to students. Grades can be viewed via D2L or a face-to-face meeting in my office.

Computing Resources

The applied problems that students work during and outside of class require the use of the statistical package STATA, which will be accessible in UW-L's computer labs. A listing of the computer labs and their hours can be found at the following websites, respectively: http://uwlax.edu/its/gca/html/Facilities.htm and http://uwlax.edu/its/gca/html/LabHoursOld.htm. Students are able to purchase their own copy of STATA for their home computer or laptop, which costs in the neighborhood of $100. I recommend this option for students who prefer to work from home rather than from campus. Students interested in purchasing their own copy of STATA should visit the following website for details on pricing: http://www.stata.com/order/new/edu/gradplans/. It would also be a good idea to check with me before making a purchase, as there are several options available. I am able to help students figure out which version of STATA would best fit their needs.

If students prefer to work from home but are not willing to spend the $100, there are free statistical packages available for download, such as R. The examples used in class will be completed using STATA. As a result, the use of a different statistical package means that students are responsible for figuring out how to use it. I have limited experience with R. There is a very significant learning curve associated with R. As a result, I only recommend R for students who have experience using it in other classes.

Students with Disabilities

Any student with a documented disability (e.g., physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact the instructor and the Disability Resource Services office

(165 Murphy Library, 608-785-6900) at the beginning of the semester. Students who are currently using the Disability Resource Services office will have a copy of a contract that verifies that they are qualified students with disabilities who have documentation on file in the Disability Resource Services office. It is the student's responsibility to communicate their needs with the instructor in a timely manner.

Academic Misconduct

UW-L and the College of Business Administration operate under an academic integrity system whereby it is assumed that students understand the rules and agree to abide by them. There are penalties for academic dishonesty. Cheating on exams and/or quizzes and plagiarism are the most obvious forms of academic dishonesty.

Cheating includes giving or receiving unauthorized assistance in an academic exercise or receiving credit for work that is not your own. The Council of Writing Program Administrators has defined plagiarism "as taking credit for someone else's language, ideas, or other original (not common-knowledge) material without acknowledging its source." This definition is extended to printed, digital and internet materials, manuscripts, and other works. Plagiarism has been equated with lying and stealing. Plagiarism can take the form of direct plagiarism, paraphrase plagiarism, or patchwork plagiarism. Patchwork plagiarism has been defined as copying from a source text and then deleting some words, altering grammatical structures, and representing the work as your own without acknowledging the source.

In addition, any actions intended to subvert the grading process are also included under the academic dishonesty heading. This includes misrepresenting your own work, misrepresenting your presence and/or attendance in an internet or regular class or assisting someone else to do so.

All incidents of academic dishonesty will be reported and acted upon. The consequences for academic dishonesty can include a failing grade on a paper or test, a failing grade in the course, or even a possible suspension from the institution. Below is UW-L's formal statement and definition of academic misconduct. Examples are also provided.

Statement of Principles

The Board of Regents, administrators, faculty, academic staff, and students of the University of Wisconsin system believe that academic honesty and integrity are fundamental to the mission of higher education and of the University of Wisconsin System. The University has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others' academic endeavors. Students who violate these standards must be confronted and must accept the consequences of their actions.

What is Academic Misconduct?

Academic misconduct is an act in which a student (a) seeks to claim credit for the work or efforts of another without authorization or citation; (b) uses unauthorized materials or fabricated data in any academic exercise; (c) forges or falsifies academic documents or records; (d) intentionally impedes or damages the academic work of others; (e) engages in conduct aimed at making false representation of a student's academic performance; or (f) assists other students in any of these acts.

Examples

Examples of academic misconduct include, but are not limited to cheating on an examination; collaborating with others in work to be presented, contrary to the stated rules of the course; submitting a paper or assignment as one's own work when a part or all of the paper or assignment is the work of another; submitting a paper or assignment that contains ideas or research of others without appropriately identifying the sources of those ideas; stealing examinations or course materials; submitting, if contrary to the rules of a course, work previously presented in another course; tampering with the laboratory experiment or computer program of another student; knowingly and intentionally assisting another student in any of the above, including assistance in an arrangement whereby any work, classroom performance, examination or other activity is submitted or performed by a person other than the student under whose name the work is submitted or performed.

Technical Support

There are several tutorials and handbooks about D2L listed on the following website: http://www.uwlax.edu/ats/d2l/student.htm. In addition, you can contact ITS Support Center at (608) 785-8774 or itssupport@uwlax.edu for any questions about D2L or other issues. The hours for ITS are as follows: Monday through Thursday from 7:30 am to 6:30 pm, and Friday from 7:30 am to 4:30 pm, Central Time.

Syllabus Changes

I reserve the right to change the course syllabus. If changes are made, adequate notice will be provided. I *will not* change the ways in which grades are assigned, with the exception of a possible change in policy regarding tardiness. As I mentioned above, there is no formal policy on tardiness, but I reserve the right to adopt one should it become necessary. The most likely changes will be to the course outline (see below).

Course Outline

1. Introduction

2. Economic Data

3. The Selection Problem

4. Simple Regression

5. Ordinary Least Squares (OLS) Estimates

6. Multiple Regression

7. Hypothesis Testing

8. Binary (or Dummy) Variables

9. Heteroskedasticity

10. Proxy Variables

11. Pooled Cross Sections Across Time

12. Panel Data Methods

13. Instrumental Variables Estimation