Introductory Econometrics
Econ 410 (4 Credits), Summer 2025
University of Wisconsin-Madison

Instructor: Christopher McKelvey
Office: Social Science 7321
E-mail: cmckelvey@wisc.edu

Course Overview

This six-week online course provides an introduction to econometrics – the statistical methods that economists use to evaluate empirical relationships and test economic theory. Attention will be given both to econometric theory and to the problems that arise when applying econometric techniques to real world data. We begin with an extended discussion of univariate and multivariate regression analysis. Later in the term, we tackle more advanced topics, such as instrumental variables, limited dependent variable models, and the application of regression models to time series and panel data.

Note: Our department offers two introductory econometrics courses: Econ 400 and Econ 410. Econ 400 places less emphasis on theory and a correspondingly greater emphasis on applied techniques. Econ 410 takes a more mathematical & theoretical approach, deriving formulas and proving results wherever possible. Econ 400 and 410 are not a sequence. Students take only one of the two. Students doing our math emphasis major, including all those pursuing honors in the major, must take Econ 410.

Prerequisites

Prerequisites for this class are Econ 310 and Math 221.

Course Webpage

Begin the course on Monday, June 30 by going to our course website on Canvas:
  https://canvas.wisc.edu/courses/455783

Class Meetings and Office Hours

This is an online course. There is no need for you to be physically present in Madison at any point during the six week term. However, you must have access to a reliable internet connection for the duration of the course (June 30 - August 10).

I will be holding online office hours throughout the semester. A schedule of office hours along with instructions on how to attend will be available via the course website.

Textbook and Required Materials

As noted in the Course Guide, this course uses an **Engage eText**, which is available via our course webpage (see above). Our textbook is: Introductory Econometrics: A

Modern Approach by Jeffrey M Wooldridge, Seventh Edition. There is no need to purchase the textbook from the publisher, since the cost of the eText is already bundled into your tuition bill. For more information, including opt-out instructions, see the Engage eText [Frequently Asked Questions](#).

This course requires frequent use of a **computer** (Mac or Windows) with **Stata** installed. Because UW-Madison has a site-license, Stata can be downloaded for free from the Campus Software Library. You will also need a **calculator** and access to a **reliable internet connection**. For the problem sets, you'll need a **cell phone** or some other way to take photos so they can be uploaded to Canvas.

<u>Evaluation</u>

Your overall grade for the course will be based on four components:

- Problem Sets: Each Monday through Thursday, problem sets will be due daily by 11pm Central Time (UTC−5:00). The problem sets are worth 36% of your overall grade for the course, so completing them will be critical to your success. To give everyone a bit of scheduling flexibility, it will be possible to work several days ahead, if you so desire. Late problem set submissions are accepted, although not for full credit.

- Participation: You may wonder how participation, which is worth 10% of your overall grade, is assessed in an asynchronous online class. For each day of the course, read the lecture notes, watch all the videos, and attempt the practice problems that I provide (on your own <u>before</u> proceeding to the solutions to check your answers). During the weekly quizzes and the final exam, never use artificial intelligence or any other form of electronic assistance (e.g., writing assistants, translators, or grammar checkers), never copy & paste in responses, and never access the internet for help on a question (e.g., Google, Chegg, Discord, etc.). Finally, I encourage you to set up appointments during office hours to ask any substantive questions you have about the material, being sure to show up on-time for the meetings you schedule and avoiding any same-day cancellations. At the end of the course, I'll dig into the Canvas course analytics and construct a participation grade for each student based on these participation criteria.

- Weekly Quizzes: Each Friday for the first 5 weeks, there will be an open-book, open-note quiz covering that week's material. These quizzes will be time constrained and must be completed at some point in the 24 hour period corresponding to Friday in the Central Time Zone (UTC−5:00). Together the quizzes will make up 40% of your overall grade for the course. ***Quizzes will not be rescheduled for any reason.*** On a case by case basis, in the event of a truly unavoidable circumstance, I may elect to shift the weight of one missed quiz to other quizzes or the final exam. In order to quality, you must notify me in advance of the quiz, the circumstance must make completion of the quiz impossible, and must be fully documented.

- Final Exam: On the final Friday of the term (August 8), there will be an open-book, open-note cumulative final exam. As with the quizzes, the final exam will be time constrained and must be completed at some point in the 24 hour period corresponding to Friday in the Central Time Zone (UTC–5:00). The final exam is worth 14% of your overall grade for the course.

The quizzes and the final exam are open-book, meaning that it is fine to reference the textbook, your notes, and any material posted on our Canvas website However, you must work alone and everything you submit must be your own work, meaning that you are <u>not</u> permitted to receive outside help of any kind.

Your overall grade for this class will be curved. This curve can help your grade, but cannot hurt it. I achieve this by computing your grade using two different methods. First, I assign grades according to a percentage scale, where A = [92,100], AB = [88,92), B = [82,88), BC = [78,82), C = [70,78), D = [60,70), F = [0,60). (In other words, if you receive a grade in the class of 92% or better, then you'll receive an A.) Second, I assign grades according to a percentile scale, where A = [80,100], AB = [60,80), B = [40,60), BC = [20,40), C = [6,20), D = [3,6), F = [0,3). (In other words, if you perform better than 80% of the class, then you'll receive an A). Your overall grade in the class is the higher of these two grades.

I strive to make all of the grading transparent and fair. If you are unhappy with the way a problem has been graded, I encourage you to discuss it with me, but you must bring the concern to me within 7 days of when you were first able to view the graded problem set or quiz.

Learning Outcomes

Following the completion of this course, students will be able to:

- Derive an ordinary least squares (OLS) estimator for a linear regression model

- Test theories about the true model using formal hypothesis tests

- Evaluate the expected value and variance of an estimator

- Prove that the OLS estimator is unbiased, BLUE, and consistent

- State the assumptions underpinning OLS, check for violations of these assumptions, determine the consequences of such violations, and – where possible – suggest alternative statistical approaches that are more appropriate given the circumstances

- Evaluate the extent to which econometric methods can be used to determine whether a statistical association represents a causal relationship

- Use statistical software to apply all of these statistical techniques to analyze the relationship between real-world economic variables

Credits

The credit standard for this course is met by an expectation of a total of 180 hours of student engagement with the course learning activities (at least 45 hours per credit), which includes watching video lectures, completing problem sets, working on practice problems, taking exams, and other student work as described in the syllabus.

Course Outline

This course covers the following topics (readings from Wooldridge in parentheses):

• Day 1: Overview (Chapter 1)
• Day 2: Statistics Review (Appendix B)
• Day 3: Simple Regression (2-1, 2-2, 2-2a, and appendix 2A)
• Day 4: Simple Regression (2-3a, 2-3b, and 2-3c)
• Day 6: Simple Regression (2-4a, 2-4c, 2-5a, and 2-5b)
• Day 7: Simple Regression (2-5c and 2-4b)
• Day 8: Multiple Regression (3-2a, 3-2g, 3-2h, and 3-3b)
• Day 9: Multiple Regression (3-2b, 3-2c, 3-2e, 3-2f, 3-3, appendix 3A.1 and 3A.3)
• Day 11: Multiple Regression (3-4, 3-4a, 3-4b, 3-5, appendix 3A.5, and 6-2b)
• Day 12: Inference (6-2c, 4-1, 4-2, and 4-2f)
• Day 13: Inference (4-2, 4-2a, 4-2b, 4-2c, 4-2d, and 4-3)
• Day 14: Inference (4-2e, 4-4, 4-5, 4-5a, 4-5b, 4-5c, and 4-5e)
• Day 16: Asymptotics (5-1 and 5-2)
• Day 17: Dummy Variables (7-1, 7-2, 7-4b, and 7-4c)
• Day 18: Dummy Variables (7-2a, 7-3, 7-3a, 7-4a, and 7-5)
• Day 19: Heteroskedasticity (8-1, 8-2, 8-3, and 8-3a)
• Day 21: Heteroskedasticity (8-4, 8-4a, 8-4b, and 8-4c)
• Day 22: Data Issues (9-4, 9-4a, 9-4b, 9-5, 9-5a, 9-5b, and 9-6)
• Day 23: Time Series (10-1, 10-2a, 10-2b, 10-3a, 10-3b, 10-3c, 10-5b, 10-5c, 10-5e)
• Day 24: Panel Data (13-1, 13-2, and 14-2)
• Day 26: Panel Data (13-3, 14-1, and 14-2b)
• Day 27: Instrumental Variables (15-1, 15-1a, 15-1b, 15-2, and 15-3a)
• Day 28: Limited Dependent Variables (7-5 and skim all of 17-1)

Students with Disabilities

If you have approval from the McBurney Center for disability-related accommodations, please contact me to discuss how these accommodations will be implemented for this course. This should be done as soon as possible, and no later than two days before the first weekly quiz.

Grievance Procedure

The Department of Economics has developed a grievance procedure through which you may register comments or complaints about a course, an instructor, or a teaching assistant. The Department continues to provide a course evaluation each semester in every class. If you wish to make anonymous complaints to an instructor or teaching

assistant, the appropriate vehicle is the course evaluation. If you have a disagreement with an instructor or a teaching assistant, we strongly encourage you to try to resolve the dispute with him or her directly. The grievance procedure is designed for situations where neither of these channels is appropriate.

If you wish to file a grievance, you should go to room 7238 Social Science and request a Course Comment Sheet. When completing the comment sheet, you will need to provide a detailed statement that describes what aspects of the course you find unsatisfactory. You will need to sign the sheet and provide your student identification number, your address, and a phone where you can be reached. The Department plans to investigate comments fully and will respond in writing to complaints.

Your name, address, phone number, and student ID number will not be revealed to the instructor or teaching assistant involved and will be treated as confidential. The Department needs this information, because it may become necessary for a commenting student to have a meeting with the department chair or a nominee to gather additional information. A name and address are necessary for providing a written response.

Misconduct Statement

Academic integrity is critical to maintaining fair and knowledge based learning at UW-Madison. Academic dishonesty is a serious violation: it undermines the bonds of trust and honesty between members of our academic community, degrades the value of your degree, and defrauds those who may eventually depend upon your knowledge and integrity.

Examples of academic misconduct include, but are not limited to: cheating on an examination (copying from another student's paper, referring to materials on the exam other than those explicitly permitted, continuing to work on an exam after the time has expired, turning in an exam for regrading after making changes to the exam), copying the homework of someone else, submitting for credit work done by someone else, stealing examinations or course materials, tampering with the grade records or with another student's work, or knowingly and intentionally assisting another student in any of the above. Students are reminded that online sources, including anonymous or unattributed ones like Wikipedia, still need to be cited like any other source; and copying from any source without attribution is considered plagiarism.

The Dept. of Economics will deal with these offenses harshly following UWS14 procedures (http://students.wisc.edu/saja/misconduct/UWS14.html):

1. The penalty for misconduct in most cases will be removal from the course and a failing grade,

2. The department will inform the Dean of Students as required and additional sanctions may be applied.

3. The department will keep an internal record of misconduct incidents. This information will be made available to teaching faculty writing recommendation letters and to admission offices of the School of Business and Engineering.

If you think you see incidents of misconduct, you should tell your instructor about them, in which case they will take appropriate action and protect your identity. You could also choose to contact our administrator (Tammy Herbst-Koel: therbst@wisc.edu) and your identity will be kept confidential.