Introductory Econometrics
Econ 410 (4 Credits), Fall 2020
University of Wisconsin-Madison

Instructor

Christopher McKelvey, Lecturer, cmckelvey@wisc.edu

Teaching Assistants

Sahber Ahmadi Renani, PhD Student, ahmadirenani@wisc.edu
Shilong Sun, PhD Student, ssun226@wisc.edu

Instructional Mode

Due to the COVID-19 pandemic, lectures will be held online this semester.

Mid-semester changes to the mode of instruction may be necessary as university policy responds to the evolving public health environment. But at this point, the plan is for three discussion sections (301, 303, and 304) to be held online, and for three discussion sections (302, 305, and 306) to be taught face-to-face until Thanksgiving break, and online thereafter.

Course Overview

The purpose of this course is to provide 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 semester, 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

The prerequisites for this class are Econ 310 and Math 221.
Class Meetings and Office Hours

Our scheduled lecture time is **Tuesday and Thursday** from **9:30 to 10:45am** in the North American Central Time Zone.

On a typical class day, because the lecture is **online** and **asynchronous**, rest assured that you may watch the lecture whatever time is most convenient for you.

But there are four days (**September 22, October 13, November 3, and November 24**) where we will use our class time for online quizzes, so you must be available at our **scheduled lecture time these four days**. For more information, see the “Evaluation” section below.

Instructor and TA office hours will be conducted online. A schedule of office hours and instructions on how to attend is available via the course website.

Required Course Materials

Because this is an online course, you must have a **reliable internet connection** for the duration of the course (**September 2** through **December 18**). Unless you are attending a face-to-face discussion section, there is no need for you to be physically present in Madison at any point during the term.


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. While completing the problem sets, quizzes, and the final exam, you will also need a **calculator**.

Course Website

All course materials will be posted on our course website on Canvas: [https://canvas.wisc.edu/courses/208642](https://canvas.wisc.edu/courses/208642)

Evaluation

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

- Quizzes: Four open-book, open-note quizzes will be administered online and **must be completed between 9:30 and 10:45am in the North American Central Time Zone on September 22, October 13, November 3, and November 24**. These quizzes make up 40% of your overall grade for the course, and will not be resched-
uled 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 qualify, you must notify me of the circumstance in advance of the quiz, it must make completion of the quiz impossible, and it must be fully documented.

- Final Exam: The open-book, open-note, cumulative final for this class will be administered online and must be completed from 2:45pm to 4:45pm in the North American Central Time Zone on December 18. The final will make up 20% of your overall grade for the course. As with the quizzes, in a class this size it is not possible to reschedule the final – even when students have multiple exams in a 24 hour period. However, if you have another exam at exactly the same time, then I am willing to reschedule so long as you provide evidence of enrollment in a class with a conflicting final and notify me at least two weeks in advance.

- Problem sets: There will be weekly problem sets, which together are worth 40% of your overall grade – so completing them will be critical to your success. For full credit, problem sets must be submitted in Canvas before the submission deadline. Late problem sets may be submitted after this deadline, but will receive a 20% per day deduction. In order to provide you with hands-on experience using the methods taught in this course, the computer package Stata will be used extensively on the problem sets. To receive full credit, you must submit your Stata log. To help prepare you for these assignments, Stata will be used during lectures and tutorials will also be provided during discussion section. You are encouraged to form a study group with your classmates, but you must write up your answers independently (meaning that you should not be looking at another student’s answers as you write up your own). Problem sets with identical answers will not be accepted (i.e., receive zero credit).

Your overall grade for this class will be curved. This curve can help your grade, but cannot hurt it. For those who like the gory detail, I compute 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 an overall 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 two weeks of when you were first able to view the graded problem set or exam.

**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
This class meets for two 75-minute class periods plus a single discussion session each week over the semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc) for about 3 hours out of the classroom for every class period. This syllabus includes more information about meeting times and expectations for student work.

Course Outline
This course covers the following topics (readings from Wooldridge in parentheses):
• Lecture 1: Overview (Chapter 1)
• Lecture 2: Statistics Review (Appendix B)
• Lecture 3: Simple Regression (2-1, 2-2, 2-2a, and appendix 2A)
• Lecture 4: Simple Regression (2-3a, 2-3b, and 2-3c)
• Lecture 5: Simple Regression (2-4a, 2-4c, 2-5a, and 2-5b)
• Lecture 6: Simple Regression (2-5c and 2-4b)
• Lecture 7: Multiple Regression (3-2a, 3-2g, 3-2h, and 3-3b)
• Lecture 8: Multiple Regression (3-2b, 3-2c, 3-2e, 3-3, appendix 3A.1 and 3A.3)
• Lecture 9: Multiple Regression (3-4, 3-4a, 3-4b, 3-5, appendix 3A.5, and 6-2b)
• Lecture 10: Inference (6-2c, 4-1, 4-2, and 4-2f)
• Lecture 11: Inference (4-2, 4-2a, 4-2b, 4-2c, 4-2d, and 4-3)
• Lecture 12: Inference (4-2e, 4-4, 4-5, 4-5a, 4-5b, 4-5c, and 4-5e)
• Lecture 13: Asymptotics (5-1 and 5-2)
• Lecture 14: Dummy Variables (7-1, 7-2, 7-4b, and 7-4c)
• Lecture 15: Dummy Variables (7-2a, 7-3, 7-3a, 7-4a, and 7-5)
• Lecture 16: Heteroskedasticity (8-1, 8-2, 8-3, and 8-3a)
• Lecture 17: Heteroskedasticity (8-4, 8-4a, 8-4b, and 8-4c)
• Lecture 18: Data Issues (9-4, 9-4a, 9-4b, 9-5, 9-5a, 9-5b, and 9-6)
• Lecture 19: Time Series (10-1, 10-2a, 10-2b, 10-3a, 10-3b, 10-3c, 10-5b, 10-5c, and 10-5e)
• Lecture 20: Panel Data (13-1, 13-2, and 14-2)
• Lecture 22: Instrumental Variables (15-1, 15-1a, 15-1b, 15-2, and 15-3a)
• Lecture 23: Limited Dependent Variables (skim 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 weeks before the first 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.