Introduction to Applied Econometrics
Econ 400 (4 Credits), Fall 2025
University of Wisconsin-Madison

Instructor

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Teaching Assistants

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Instructional Mode

In-Person Classroom Instruction

Course Overview

This course provides an introduction to econometrics – the statistical methods economists use to evaluate empirical relationships and test economic theory. Because this is an applied course, our emphasis will be on (a) developing the econometric skills necessary to read and understand empirical papers in economics and (b) the application of econometrics to real-world data using modern statistical software. A wide range of statistical techniques will be covered, including: univariate & multiple regression, differences-in-differences, instrumental variables, limited dependent variables, fixed-effects models, and regression discontinuity. Throughout the course, we will be interested in the extent to which statistical models can be used to conduct causal inference.

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 prerequisite for this class is Econ 310.

Class Meetings and Office Hours

Lecture is **Tuesdays and Thursdays** from **9:30 to 10:45am** in **Ingraham 19**.

My office hours and those of your TA can be found on our class website.

Required Course Materials

As noted in the Course Guide, this course uses an **Engage eText**, which is available via our course webpage (see below). Our textbook is: Introduction to Econometrics by James H. Stock and Mark W. Watson, Fourth 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**.

Course Webpage

Lecture notes and other course materials will be posted on our course website:
   https://canvas.wisc.edu/courses/477566

Evaluation

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

- Attendance: We'll be tracking attendance in lecture and section using TopHat, and attendance will be worth 10% of your overall grade. TopHat uses Location Services and Bluetooth to verify your location when you enter the attendance code, so you must be in the classroom to be marked present. If you prefer not to give TopHat permission to verify your attendance or if TopHat otherwise erroneously marks you absent, then you must come to the front of the classroom and sign-in at the end of class. To allow everyone a bit of flexibility, **everyone is permitted twelve absences without penalty**. Save these excused absences for a rainy day (illnesses, family emergencies, etc), since **I will not, under any circumstances, excuse additional absences**.

- Midterm Exam: The midterm is worth 30% of your overall grade and will be held **in-person** during our regularly scheduled lecture on **Oct 23**. *Ensure you are available to attend this lecture.* If you are unable to take the midterm due to a circumstance that is beyond your control, let me know and we will discuss how best to proceed. To qualify for an accommodation, the circumstance must make it impossible for you to complete the exam at the scheduled time, it must be fully documented, and you must notify me in advance of the midterm.

- Final Exam: The (cumulative) final for this class is worth 30% of your overall grade and **must be taken in-person during our official final exam block from 10:05am - 12:05pm** on **December 12**.

- Problem sets: There will be weekly problem sets, which together are worth 30% 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 anyone else's answer as you write up your own response). **Problem sets with identical wording or where free-response answers have been written using artificial intelligence (e.g., ChatGPT) or by an electronic translator (e.g., Google Translate) 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. 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 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:

- Discuss the properties of an ordinary least squares (OLS) estimator for a linear regression model

- Test theories about the true model using formal hypothesis tests

- State the assumptions underpinning OLS, recognize violations of these assumptions, discuss 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 these statistical techniques to analyze the relationship between real-world economic variables

- Read and interpret results from applied economics journal articles that employ these statistical techniques

Credits

This 4-credit course meets for two 75-minute lectures and a single 50-minute discussion session each week, with the expectation that students will work on course learning activities (reading, completing problem sets, studying, etc) for about 8 hours per week outside of the classroom.

Course Outline

This course covers the following topics (readings from Stock & Watson in parentheses):

- Lecture 1: Introduction (1.1-1.3)
- Lecture 2: Ordinary Least Squares and Goodness of Fit (4.1-4.3)
- Lecture 3: Regression Assumptions and Normality (4.4-4.5)
- Lecture 4: Inference and Dummy Variables (5.1-5.3)
- Lecture 5: BLUE and Heteroskedasticity (5.4-5.6)
- Lecture 6: Multiple Regression (6.1-6.3)
- Lecture 7: Goodness of Fit and Properties for Multiple Regression (6.4-6.6)
- Lecture 8: Nuances of Interpretation in Multiple Regression Models (6.7)
- Lecture 9: Inference in Multiple Regression Models (7.1-7.3)
- Lecture 10: Model Selection (7.5-7.6)
- Lecture 11: Non-Linearities (8.1-8.2)
- Lecture 12: Interaction Terms (8.3-8.4)
- Lecture 13: Measurement Error, Missing Data, and Outliers (Chapter 9)
- Lecture 14: Limited Dependent Variables (Chapter 11)
- Lecture 15-16: Randomized Control Trials (3.5)
- Lecture 17-18: Difference-in-Differences (10.1 and pages 487-493)
- Lecture 19-20: Panel Data (10.2-10.6)
- Lecture 21-22: Instrumental Variables (Chapter 12)
- Lecture 23-24: Regression Discontinuity (pages 494-495)

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 within the first two weeks of the semester.

Religious Observances

If an exam or problem set conflicts with a religious observance, let me know and we'll work together to make an accommodation. This should be done as soon as possible, and no later than two weeks before the conflict.

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.