AAE 636: Applied Econometric Analysis I
Dept. of Agricultural and Applied Economics
University of Wisconsin - Madison
Fall 2023

INSTRUCTOR: Sarah Johnston

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TEACHING ASSISTANT: Ha Do

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CREDITS: This is a 3 credit course.

INSTRUCTIONAL MODE: Face-to-face.

COURSE DESCRIPTION: Introduction to the standard linear regression model with an emphasis on applications. Includes statistical foundations, hypothesis testing, functional form, model selection, and procedures for handling violations of model assumptions.

COURSE LEARNING OUTCOMES: By the end of this course, you should be able to do the following:

- understand the technical aspects of linear regression and statistical inference

- critically evaluate estimates of linear models

- gauge the appropriateness of different model assumptions for different types of applied problems

PREREQUISITES: Students should have completed undergraduate courses in derivative calculus and intermediate microeconomics, and an upper level statistics course.

LECTURES: Tuesdays and Thursdays, 1:00 pm - 2:15 pm in Taylor Hall 103. This three credit course has two 75 min lectures per week. Students are expected to work approximately

6 hours outside class to complete assignments and learn the relevant material.

LABS: Fridays, 8:50 am - 9:40 am in Taylor Hall B30. Labs will meet every week except the week of Thanksgiving (11/24), and the two Fridays after the midterm exams (10/13 and 11/17). Ha will lead the labs. Activities might include going over homework assignments, discussions on using R or Stata, and reviewing. The week of October 23, the lab will meet in the Thursday lecture time slot (10/26) and we will have a make-up lecture at the usual lab time (10/27).

TEXTBOOKS AND SOFTWARE:

- Required: Wooldridge, Jeffrey, 2019. *Introductory Econometrics: A Modern Approach*, 7$^{\text{th}}$ Edition, Cengage (W)

- Optional: Angrist, J. and J. Pischke, 2015. *Mastering 'Metrics: The Path from Cause to Effect*, Princeton University Press (AP)

The 5$^{\text{th}}$ or 6$^{\text{th}}$ editions of the Wooldridge book also work. The course will follow the Wooldridge book topically, so the Wooldridge book should be a helpful reference throughout the course. The relevant sections are listed in the syllabus for your convenience; they are not required reading. The Angrist and Pischke book provides a different perspective on the same material, which may be helpful for some students.

The course will include several applied homework assignments. You may use either R or Stata for these assignments. The TA will be responsible for providing instruction and assistance in R.

COURSE WEBSITE: All course material will be posted on Canvas.
Link: https://canvas.wisc.edu/courses/357366

CLASS FORMAT: Most class time will be lecture-based, but I want to encourage your active participation. You are encouraged to ask questions in class. Almost always, another student will have the same question or find the same explanation unclear. Please be considerate of your classmates by not emailing, texting, or surfing the internet during class time.

PIAZZA DISCUSSION: We will use Piazza for all questions on problem sets and course material. You are encouraged to help your classmates by responding to their questions. You will also receive course credit for posting on Piazza. If you make at least five substantive

contributions (posts or replies) over the course of the semester, you will receive full credit. Link: https://piazza.com/wisc/fall2023/fa23aae636001/home

EMAIL: Please include "636" in the subject.

ASSIGNMENTS: There will be six homework assignments, with the due date given at the top of each assignment. **Assignments must be submitted on Canvas by the start of class - 1:00 pm**. Assignments submitted after 1:10 pm will be considered late. Please do not wait until the last second in case of internet connectivity problems. If you have a valid reason, such as illness, for submitting an assignment late you must contact both the instructor and the TA by email **before** the assignment is due unless you are physically unable to do so. Our regular late policy is that assignments up to 1 day (24 hours) late receive 80 percent of the original points and assignments up to two days (48 hours) late receive 60 percent of the original points. We will not accept assignments more than 2 days late. **Collaboration is encouraged, but assignments must be written up individually**. No credit will be given for identical assignments.

EXAMS: There will be three exams during the semester, two midterm exams administered in class, and one final exam administered during the University's exam period. The dates are as follows:

- Midterm 1:   Tuesday, 10/10/2023, in class

- Midterm 2:   Tuesday, 11/14/2023, in class

- Final Exam: Saturday, 12/16/2023, 2:45 pm - 4:45 pm

Valid reasons for missing an exam are limited to illnesses and family emergencies. If a student has a valid reason for missing the midterm exam, there will be no make-up offered at an alternative time: the weight for the midterm exam will be placed proportionally on the other midterm and the final exam. If a student has a valid reason for missing the final, we can arrange a special date and time for a make-up exam.

ASSESSMENT: Your course grade will be based on your performance on two midterms and one final exam, as well as homework assignments and Piazza participation. The percentages are as follows:

25%: Problem Sets

20%: Midterm 1

20%: Midterm 2

30%: Final exam

 5%: Piazza discussion

I will assign letter grades based on total score at the end of the course. I plan to use the following cutoffs:

$\geq$92%	A
$\geq$88% & <92%	AB
$\geq$82% & <88%	B
$\geq$78% & <82%	BC
$\geq$70% & <78%	C
$\geq$60% & <70%	D
<60%	F

I reserve the right to adjust these cutoffs downward; they will not be adjusted upward.

ACKNOWLEDGEMENTS: Material in this course is adapted from similar courses taught by Daniel Phaneuf, Melvin Stephens, and Eric Chyn.

University-wide policies

ACADEMIC INTEGRITY: By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but is not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion.

DIVERSITY & INCLUSION: Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background - people who as students, faculty, and staff serve Wisconsin and the world.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES: The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform me of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. I will work either directly with you or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

Tentative course Schedule

Class	Approximate topic	Reading
9/7		**No Class**
I. Statistical Review		
9/12	Introduction	W:1 AP: Intro,1
9/14	Random Variables	W: Appendix B
9/19	Random Variables, Mathematical Statistics	W: Appendices B, C
II. Simple (Two Variable) Regression		
9/21	Mathematical Statistics	W: Appendix C
9/26	Simple Regression Function; OLS	W: 2.1, 2.2
9/28	Properties, Assumptions, Unbiasedness, Variance	W: 2.3, 2.5
10/3	Normality; Hypothesis Testing; Prediction	W: 4.1-4.3, 6.4
10/5	R2; Asymptotic Properties; ML; MoM	W: 2.3, 5.1-5.3
10/10		**Exam 1**
III. Multiple Regression		
10/12	Assumptions, Unbiasedness, Interpretation	W: 3.1-3.3
10/17	OLS Variance, Misspecification, Gauss-Markov	W: 3.3-3.5
10/19	Inference, Hypothesis Testing, F-Tests	W: 4.2, 4.4-4.5
10/24	**Async.** F-tests, Multicollinearity, Asymp. Properties	W: 3.4, 4.5, 5.2
10/27	**In Lab** Elasticity, Reciprocal, Higher Order Terms	W: 2.4, 6.2
10/31	Dummy Variables	W: 7.1, 7.2, AP: 2
11/2	Dummy Variables, Difference-in-Differences	W: 7.3, 7.4
VI. Some Assumption Violations		
11/7	Heteroskedasticity	W: 8.1, 8.2, 8.3
11/9	Heteroskedasticity; Weighted Least Squares	W: 8.4
11/14		**Exam 2**
11/16	Pooled Cross Sections, Two period panel	W: 13.1, 13.2, 13.3, 13.4
11/21	Fixed Effects	W: 14.1
11/28	Fixed Effects	
11/30	Differences-in-Differences revisited	AP: 5
12/5	Measurement error	W: 9.4
12/7	Instrumental Variables	W: 15.1-15.4
12/12	Instrumental Variables	AP: 3

ASSIGNMENT DUE DATES (SUBJECT TO CHANGE)

ASSIGNMENT	TENTATIVE DUE DATE
1	Thursday, September 21, 2023
2	Thursday, October 5, 2023
3	Tuesday, October 31, 2023
4	Tuesday, November 7, 2023
5	Tuesday, November 28, 2023
6	Tuesday, December 12, 2023