

Introduction to Econometric Methods (EC420)
Spring Semester 2021 – Section 002
Michigan State University



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Meeting	Tu/Th 3:00pm – 4:20pm https://msu.zoom.us/j/99795818695 Passcode: GOGREEN
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Credits	3 credits

We've all heard the quote "correlation is not causation." But when can we say something is causal? In economics, we often need causality to make claims about the effects of policies or economic phenomenon. The purpose of this course is to equip you with the tools and the intuition necessary to read, digest, criticize, and design research that makes causal claims. One fundamental part of this is to be able to identify and analyze sources of endogeneity and bias - for instance, cities with strict gun control tend to have high rates of gun violence; a naive person would conclude that gun control causes violence, but in reality, cities with gun crime problems tend to respond by introducing stricter gun control. Another fundamental part is what we'll call the "mechanics" of inference – regression and other tools of applied statistics.

Course Overview

This course will focus on preparing you to design and execute your own research projects and introduce you to econometric tools and causal inference. We will examine t-tests, ordinary least squares (OLS) regression with one and multiple variables, time series, and statistical methods for addressing the most common sources of bias in these methods. We will then move to more advanced causal methods found in the current literature. Evaluation will come from periodic reading responses, problem sets, in-class quizzes, a midterm, and a final.

Instructional Objectives

By the end of this course, you will be able to:

1. Define an OLS estimator and state the underlying assumptions.
2. Explain the difference between correlational studies and causal inference.
3. Define endogeneity and list the most common types of endogeneity bias.
4. Compute and interpret regression estimates and statistical tests directly from data
5. Compare and contrast the main methods for causal inference and state the assumptions in each of them.
6. Critically evaluate causal claims made in economic literature
7. Proficiently work in R to estimate an econometric model

Prerequisites

This course builds on concepts from statistics (STT 315, 421, 430 or 441) and introductory microeconomics (EC 201 and 202). If you have not taken at least one STT course listed above

and at least one EC course listed above, please speak with me after class. Knowledge of calculus is a plus.

Course Website

We will use MSU D2L - <http://D2L.msu.edu>.

Required Texts

Wooldridge, Jeffrey M. *Introductory Econometrics*, 6th edition, Cengage 2015.

- Affectionately known as “Baby Wooldridge” in the economics community (where Prof. Wooldridge’s advanced book, “Econometric Analysis of Panel & Cross-Sectional Data” is known as “Papa Wooldridge”)
- You need only the paper version of this book. We will not use any online features. This will be the primary textbook and the only technical resource.

Angrist, Joshua D., and Jörn-Steffen Pischke. *Mastering 'metrics: The path from cause to effect*. Princeton University Press, 2014.

- This book will supplement lecture + Wooldridge. It provides additional intuition and real-world examples of the technical concepts introduced in the main text.
- Paperback versions sell for as little as \$26 on amazon, possibly cheaper at used book sites.

Optional Texts and Resources

In previous years, Mastering Metrics has been an optional resource. In an effort to emphasize the intuition behind regression in addition to the technical mechanics, I have added Mastering Metrics to the required list.

I recommend the *stats!* app (<https://apps.apple.com/us/app/stats-statistics-learning-and-decision-tool/id924564602>) for secondary reinforcement and explanation of concepts. It was developed by a former colleague of mine and students have found it to be a valuable secondary resource. It is priced reasonably at \$0.99. It is fully optional and will not be directly referenced at any time in this class.

Required Computing Resources

Part of this course’s objectives are to gain proficiency in using R for statistical analysis. As such, you must have access to a copy of R and R Studio. Both pieces of software are open source and are completely free.

Attendance Policy and Use of Electronics During Class

This course is taught synchronously. It requires active participation in class and completion of all assigned readings. Therefore, attendance is an important part of your grade. Frequent unexcused absences will directly impact your class participation score and will indirectly affect your reading responses and in-class quizzes.

Grading Criteria, Assignments, and Assessments

Please note: **no late work is accepted.**

Class participation	5%
Weekly-ish reading responses	10%
Problem sets (in R) (5 total)	25%
In-class quizzes (8 total)	10%
Midterm (Tuesday March 9th, 2021 during class)	20%
Final (Thursday April 29th, 2021 5:45pm – 7:45pm)	30%

Class participation (5%)

Class participation is an important aspect of this course. You are expected to ask questions and respond to prompts. Full credit will be given to those who attend all classes and make efforts to participate. Those who are on the brink of receiving less than full credit will be notified as the course progresses, and a workable solution can be discussed in office hours.

Participation can take many forms in an online synchronous course. Most preferred is active participation during class using the Zoom chat and hand-raising with camera and mic on. However, I know that myriad reasons may preclude you from this participation. The bare minimum can best be described as “showing your presence and having some engagement” – questions typed in chat and questions posed after class count towards participation. **To encourage some form of participation, I will often pose questions to the class. I am not above bribery - your response to these extra credit questions will earn extra credit points, up to 5, for participation.** Thus, you can easily pad your score by (1) meeting the minimum participation requirements such that I know you are present, and (2) earning extra credit by responding (through chat or mic, with or without video) to in-class extra credit prompts. I will clearly state which questions are extra credit. Wrong answers get the same credit as right answers. We are here to learn. If you knew everything already, you wouldn't be in the class.

Weekly-ish reading responses (10%)

A reading response of 2-3 paragraphs posted in the Discussion forums on D2L will be required as noted in the syllabus. The reading response is due by 11:59pm the day prior to class (as indicated).

- One paragraph of the response should be discussing an element of the reading (from either text) that interested you or that relates to current economic questions you are interested in.
- The other paragraph should posit a question or clarification that you had in regard to the reading. The things you may be unsure of will likely be things others are unsure of as well. I will read the course's postings and incorporate these questions into lecture.

Reading responses must be posted by the stated deadline. Zero credit is given for postings after the deadline. Your two lowest reading response grades will be dropped.

Problem sets (25%)

We will have five problem sets where you will use **R** to prepare data and estimate an econometric model. The lowest score of these five problem sets will be dropped. You will use R for data preparation and analysis, and the Rmarkdown package to generate your final work.

No late work is accepted. Zero credit is given for problem sets turned in after the deadline. However, partial credit for problem sets will be given for incomplete submissions, so *turn in what you have when it is due*. You may update any submission at any time up until the deadline.

In-class quizzes (10%)

There will be 8 short in-class quizzes that will cover the prior 1-2 weeks of material.

Attendance is mandatory and no makeups will be offered without prior notice. Your one lowest score will be dropped.

Midterm exam (20%)

There will be one midterm exam held during class on **Tuesday, March 9th**. It will cover all material introduced in lecture and reading up to that date.

You can miss the midterm without penalty only if (1) you have a conflict with a religious holiday or are participating in an MSU event, and you notify me in advance, or (2) if you have a verifiable (i.e. with documentation) personal or family medical emergency. All University processes for documenting excused absences must be followed.

Final exam (30%)

The final exam will be held **Thursday April 29th, 5:45pm – 7:45pm**. It will be open book and open note, but collaboration is strictly prohibited and will be considered a severe violation of the MSU academic code. The exam will cover all material from the course.

If you cannot take the final exam at the scheduled time because of illness or some other reason beyond your control, please notify the associate dean of your college immediately, and be prepared to document what caused you to miss the exam.

Grading

All grades are considered final. Any request for a re-grade beyond simple point-tallying mistakes will require that the entire assignment be re-graded. Any points previously awarded may be changed in either direction in the re-grade.

Resources

Mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. Services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about

the broad range of confidential mental health services available on campus via the Counseling & Psychiatric Services (CAPS) website at www.caps.msu.edu.

Accommodations

If you need a special accommodation for a disability, religious observance, or have any other concerns about your ability to perform well in this course, **please contact me immediately** so that we can discuss the issue and make appropriate arrangements. MSU has a specific policy for [religious observance available here](#).

Michigan State University is committed to providing equal opportunity for participation in all programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities at 517-884-RCPD or on the web at rcpd.msu.edu. Once your eligibility for an accommodation has been determined, you will be issued a verified individual services accommodation (“VISA”) form. Please present this form to me at the start of the term and/or two weeks prior to the accommodation date (test, project, etc). Requests received after this date will be honored whenever possible.

Academic Integrity

All students are required to understand and follow the Spartan Code of Honor: Academic Pledge (<https://ombud.msu.edu/academic-integrity/index.html>). Moreover, cheating reveals that you hold a low value of your education and of our class time. Students caught cheating will face the maximum possible penalties that may result in a failing grade or dismissal from the University.

Course Schedule as of 1-15-2021 ---- (We will meet 26 times)

No.	Topic	Reading (W = Wooldridge, MM = Mastering Metrics)	Reading Response Due	In- class Quiz?	Assignments Due
1 (Tue 1/19)	Course Overview & Stats review I				
2	Stats review II	W: Appendices A, B & C.1 – C.2	Yes, but only questions.		
3 (Tue 1/26)	Stats review II and Using R Part I	Watch the “using R” videos 1, 2a, 2b on D2L. Be <u>sure</u> to install R and Rstudio before class		Yes	
5	Single-variable regression: introduction	W: Ch. 2.1-2.3			
6 (Tue 2/2)	Single-variable regression: transformations	W: Ch. 2.4	Yes		

	and functional form				
7	Using R Part II	Watch "Using R" Part 3 on D2L Bring Laptop to class		Yes	Assignment #1 Due 11:59pm on Monday 2/8
8 (Tue 2/9)	Single-variable regression: inference	W: Ch. 2.5			
9	Multivariate Regression: Introduction & ceteris paribus	MM: Ch. 2 W: Ch. 3 (This is a lot of reading. Be forewarned)	Yes		
10 (Tue 2/16)	Multivariate Regression: Interpretation	(same as previous)		Yes	
11	Multivariate Regression: Inference	W: Ch. 4	Yes		
12 (Tue 2/23)	Multivariate Regression: assumptions; dummy variables and fixed effects	W: Ch. 5.1 - 5.2 W: Ch 7.1-7.3			
13	Multivariate Regression: interactions and interpretations + Review	W: Ch 7.4		Yes	
-- (Tue 3/2)	MSU Break Day (No Class)				
14 (Th 3/4)	Regression Wrap-Up / Midterm Review				
15 (Tue 3/9)	MIDTERM EXAM	-----			
16	Counterfactuals and selection bias	MM Ch. 1	Yes		
17 (Tue 3/16)	Experiments and Randomization	MM Ch. 1		Yes	
18	Instrumental Variables	MM: Ch. 3	Yes		
19	Two-stage least	W: Ch 15.1 - 15.6			

(Tue 3/23)	squares				
20	Simultaneous equations	W: Ch 16.1 – 16.4, 16.6 (skim 16.5)		Yes	
21 (Tue 3/30)	Instrumental Variables wrap-up/review				
22	Difference-in-differences	MM: Ch. 5 W: Ch. 13	Yes		
23 (Tue 4/6)	Synthetic controls + general panel data methods.	<i>Abadie & Gardeazabal</i> (2003) annotated on D2L; <i>Kirkpatrick & Benneer</i> (2014) annotated on D2L.		Yes	
24 (Tue 4/13)	Regression Discontinuity	MM: Ch. 4	Yes		
25	Time series: introduction and serial correlation	W: Ch 10			
26 (Tue 4/20)	Time series: advanced	W: Ch 11, Ch 12.1 – 12.3		Yes	

Acknowledgements

This syllabus and course structure draws heavily from EC420 course offerings by Prof. Anderson, Prof. Elder, Prof. Herriges, and Prof. Woodbury.

Letters of Recommendation / References

If you are applying for further study or another pursuit that requires letters of recommendation and you'd like me to recommend you, I will be glad to write a letter on your behalf if your final grade is a 4.0. Grades below a 4.0 may be handled on a case-by-case basis. In addition, you should have held at least three substantial conversations with me about the course material or other academic subjects over the course of the semester.

Mandated Reporting

Essays, journals, and other materials submitted for this class are generally considered confidential pursuant to the University's student record policies. However, students should be aware that University employees, including instructors, may not be able to maintain confidentiality when it conflicts with their responsibility to report certain issues to protect the health and safety of MSU community members and others. As the instructor, I must report the following information to other University offices (including the Department of Police and Public Safety) if you share it with me:

- Suspected child abuse/neglect, even if this maltreatment happened when you were a child;
- Allegations of sexual assault, relationship violence, stalking, or sexual harassment; and
- Credible threats of harm to oneself or to others.

These reports may trigger contact from a campus official who will want to talk with you about the incident that you have shared. In almost all cases, it will be your decision whether you wish to speak with that individual. If you would like to talk about these events in a more confidential setting, you are encouraged to make an appointment with the MSU Counseling and Psychiatric Services.