

Michigan State University
Public Policy 802: Quantitative Methods II
Spring 2025

Mondays 3:00pm-5:50pm
South Kedzie S222

Instructor: Professor Rene Crespin (he/him)

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Office hours: Tuesdays 1-2pm (by appt.: <https://calendly.com/crespin-msu/ppl802-office-hours>)

Required text:

Stock, James H. and Mark W. Watson. 2015. Introduction to Econometrics. Boston: Addison-Wesley. Any edition is fine, provided you read the correct material. I will be referencing the sections in the 3rd edition. [referred to as SW]

Optional texts/sources:

Angrist, Josh, and Jorn-Steffen Pischke. 2016. Mastering 'Metrics: The Path from Cause to Effect. Princeton, NJ: Princeton University Press. [referred to as AP]

Scott Cunningham. 2021. Causal Inference: The Mixtape. New Haven, CT: Yale University Press <https://mixtape.scunning.com/>

A webpage by Nick Huntington-Klein that explains causal inference using graphs: <https://nickchk.com/causalgraphs.html>

Required software: Stata (any version will do).

1. MSU provides students with a remote access (VDI) environment with several free applications, including STATA. You can access the environment and documentation here: <https://tech.msu.edu/technology/virtual-desktop/>. Once you've reviewed this and downloaded a small client, you access the environment directly at <https://vdi.msu.edu>.
2. Students may purchase a personal copy of the software from the Stata website: <https://www.stata.com/order/new/edu/gradplans/student-pricing/>.

Prerequisites:

PPL 801 or equivalent introduction to statistics course.

Course Objectives and Description

This course builds on the material presented in PPL 801. Quantitative Methods II aims to equip you with the statistical tools and reasoning necessary to produce solid empirical investigations of a variety of programs/policies as well as to read the evaluations of others critically. With the availability of statistical software and Excel, it's very easy to produce empirical research. What is more difficult is evaluating the *quality* of the findings and producing good and convincing empirical research. This class will help you learn to produce your own empirical research as well as become a critical consumer of empirical research. Regardless of where you find yourself after MSU, the tools we develop in this course are designed to serve you well whether you go into non-profit management, research, private sector, or government.

Most classes will consist of lectures with examples. This is not a mathematical statistics course. We will focus on "real world" applications, i.e., use examples similar to the ones you may come across once you leave graduate school. The primary text (Stock and Watson) has a variety of outstanding examples. In addition, I will also draw on examples discussed in *Mastering 'Metrics: The path from cause to effect*. This text is less technical and provides lots of real-world examples that you may find relevant to your own interests.¹

My goal in the lectures is to highlight and explain the material that I believe is important rather than walk through each section of the textbook. Students will also gain some insight into the material that I believe is most important with the problem sets. Students should not, however, interpret the absence of a topic from lectures or problem sets (a topic that is, however, mentioned in the assigned readings) as unimportant information. In that vein, we cannot cover all of the relevant material in class. The homework assignments are designed to deepen your understanding of the material we discuss in class.

Description of Course Requirements

1. Class Participation

Class participation will be based on your active participation in class. I expect you to come to class and actively participate and that you will inform your instructor if you are unable to attend class for any reason.

2. Homework

There will be six problem sets during the semester. These problem sets will be graded based on competent completion.

To allow students to plan ahead, *tentative* due dates are posted in this syllabus. If there is a change in the final due date, students will be given notice at least one week in advance

¹ Please note that this book is written in a "karate kid" style of a student learning from a Kung Fu master, which some might find problematic. That aside, I believe that the ways in which the authors write about econometrics in a more everyday language might be useful to a lot of students in the course. If you are uncomfortable reading this book, I will also provide suggestions of alternative places to read about these topics.

of the new due date. Completed assignments should be turned in via the appropriate folders via **D2L by 11:59pm on the given due date.**

Homework that is late will NOT be accepted. Solutions to the problem sets are posted on D2L after the deadline. **The lowest grade on your homework assignments will be dropped.**

Students are allowed to work in small groups to discuss the problems and develop solutions together. HOWEVER, each student must write-up the solutions that he/she submits independently. **Failure to write-up your solutions independently will be considered a breach of the academic integrity policy.**

3. *Exams*

There will be two exams: a midterm and a final. The midterm will be taken in-class and will reflect the material covered in the first half of the semester. The final will focus on the material in the second half of the semester and be taken during the scheduled final exam time for our class.

4. *In-class presentation*

Each student will give an individual presentation during class. Instructions will be provided during the second half of the semester.

Grading

- Class Participation -- 10%
- Homework -- 10%
- Midterm -- 30%
- In-class presentation -- 20%
- Final exam -- 30%

Each assignment will be graded out of 100 points. The final grade conversions are:

- 62% -- 1.0
- 67% -- 1.5
- 72% -- 2.0
- 77% -- 2.5
- 82% -- 3.0
- 87% -- 3.5
- 92% -- 4.0

Make Up Work

There will be no make-up exams or homework unless the student has an “excused absence” as defined by the following: illness of the student or serious illness of a member of the student’s immediate family ([MSU Policy on Grief Absence](#)); death of a member of the student’s immediate family; University sponsored trips; or major religious holidays ([MSU Policy on Religious Observance](#)). In each case, written verification will be required and permission to miss an exam must be secured before the scheduled exam time unless the cause of the absence is unforeseen. If the excused absence is due to the observance of a religious holiday, the student must notify the professor in writing prior to the last day for adding a class.

Computing

Much of the homework assignments will be done on a computer using Stata. Please do not simply hand in output from the Stata program. Instead, **please paste the relevant results into a word processor adding text to explain these results.**

Topics

The course will be divided into three parts. In Part I, we will discuss causal inference as distinct from statistical inference and contrast evidence from observational data with that from randomized trials (experiments). In Part II, we will develop the core analytic tool of linear regression. We will discuss single and multi-variable regression models, hypothesis testing, dummy variables, heteroskedasticity, model fit, multicollinearity, joint hypothesis testing, and transformations. This will comprise the middle 8 weeks of the course. Part III introduces fixed effects and panel data, as well as quasi-experimental methods such as differences-in-differences, event study, and regression discontinuity models. These are all techniques designed to control for unobserved factors that may confound the estimates from linear regression.

Academic Honesty:

The [Spartan Code of Honor](#), adopted by the Associated Students of Michigan State University and recognized by the Provost, President and Board of Trustees reflects the expectations in this course:

"As a Spartan, I will strive to uphold values of the highest ethical standard. I will practice honesty in my work, foster honesty in my peers, and take pride in knowing that honor is worth more than grades. I will carry these values beyond my time as a student at Michigan State University, continuing the endeavor to build personal integrity in all that I do."

Cheating is not tolerated at Michigan State University. This course adheres to the policies on academic honesty as specified in [General Student Regulations](#), Protection of Scholarship and Grades; the [all-University Policy on Integrity of Scholarship and Grades](#). See [Spartan Life Online](#) (splife.studentlife.msu.edu) and/or the [MSU Web site](#) (msu.edu) for more. Anyone caught cheating will be severely penalized as determined in consultation with the Chairperson of the Department of Economics.

Students are expected to abide by the academic honesty requirements set forth by the University (<https://ossa.msu.edu/academic-integrity>). Anyone caught cheating will be severely penalized as determined in consultation with the Chairperson of the Department of Economics. Written assignments for this course may be evaluated for possible plagiarism using Turnitin. The university's policy for use of Turnitin is copied here:

Consistent with MSU's efforts to enhance student learning, foster honesty, and maintain integrity in our academic processes, instructors may use a tool called Turnitin to compare a student's work with multiple sources. The tool compares each student's work with an extensive database of prior publications and papers, providing links to possible matches and a 'similarity score'. The tool does not determine whether plagiarism has occurred or not. Instead, the instructor must make a complete assessment and judge the originality of the student's work. All submissions to this course may be checked using this tool.

Students should submit papers to Turnitin Dropboxes without identifying information included in the paper (e.g. name or student number), the system will automatically show this info to faculty in your course when viewing the submission, but the information will not be retained by Turnitin.

Incompletes:

Incompletes are only provided in extraordinary circumstances and at the instructor's discretion. The MSU Registrar's office provides the following rules for the application of incomplete grades: *"The I-Incomplete may be given only when: the student (a) has completed at least 6/7 of the term of instruction, but is unable to complete the class work and/or take the final examination because of illness or other compelling reason; and (b) has done satisfactory work in the course; and (c) in the instructor's judgment can complete the required work without repeating the course"*

Use of Generative Artificial Intelligence

Generative AI refers to artificial intelligence technologies, like those used for ChatGPT, that can draw on a large corpus of training data to create new written, visual, or audio content.

AI can support your learning in this course, for example, by helping you consider points of view that had not occurred to you or polishing your spelling and grammar. It can also hinder your learning, for example, by generating ideas for you before you have had a chance to think of your own ideas; inhibiting the development of your own writing skills; or generating factually inaccurate statements or fictional reference sources.

You should always do your own work and only use AI tools for checking or improving your work. You may use AI tools in the following ways: for editing and proofreading; for writing computer code; for checking your work on problem sets.

Please know that you are responsible for the work you submit for this course, whether or not you use AI tools in the creation of that work. This means, among other things, that you should check the factual accuracy of what you submit, ensure that any sources you cite are not fictional, and be aware of potential biases in your work.

While you may use AI tools to enhance your learning in this course, please bear in mind that instructors for other courses will have different policies. If you're unsure about whether or not a specific tool or use of AI is permitted, please contact me.

Accommodations:

In compliance with section 504 and the Americans with Disabilities Act (ADA), Michigan State is committed to ensure that “no otherwise qualified individual with a disability...shall, solely by reason of disability, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity...” If you are a student who may need academic accommodations due to a disability, then please contact the [Resource Center for Persons with Disabilities](https://www.rcpd.msu.edu/) (<https://www.rcpd.msu.edu/>) at 120 Bessey Hall 353-9642.

Diversity, Equity, and Inclusion:

Economics provides a set of tools, using cost-benefit analyses, that helps us understand decision making in every part of life. Diversity is not only desirable but essential for economics. Without it, cost-benefit analyses will likely suffer from biases and blind spots. We can make better decisions, big and small, by embracing and learning from diverse experiences and perspectives. In this class I intend to create a learning environment that supports a diversity of thoughts, perspectives and experiences, and respects your identities (including race, color, gender, gender identity, religion, national origin, political persuasion, sexual orientation, marital status, disability, height, weight, veteran status, age or familial status). I am still in the process of learning about diverse perspectives and identities and will strive to create an inclusive environment and expect you to do the same.

Tentative Schedule

Part I: Causal Inference and Randomized Controlled Trials

01/13: Course Overview and Expectations; Introduction to Causal Inference

Readings:

- S&W Chapter 1;
- A&P Introduction and Chapter 1 [Alternatively: Mixtape Introduction and Chapter 4 through section 4.1.4]
- Carroll, Aaron. Workplace Wellness Programs Don't Work Well. Why Some Studies Show Otherwise. <https://www.nytimes.com/2018/08/06/upshot/employer-wellness-programs-randomized-trials.html?smid=tw-upshotnyt&smtyp=cur>

01/20: Randomized Controlled Trials

Readings:

- A&P Chapter 1 (cont.);
- S&W Chapters 2-3; (should mostly be review from PPL 801)
- Bertrand and Mullainathan, 2004. "Are Emily and Greg More Employable than Lakisha and Jamal? Evidence on Racial Discrimination in the Labor Market from a Large Randomized Experiment," September 2004, *American Economic Review*.
- Sendhil Mullainathan 2019. Biased algorithms are easier to fix than biased people. *New York Times*. <https://www.nytimes.com/2019/12/06/business/algorithm-bias-fix.html>

Part II: Regression Analysis

01/27: Review of bivariate regression; Measures of fit, Heteroskedasticity, and categorical variables

Readings:

- S&W Ch. 4.1-4.4, Appendix 4.1; Ch. 4.5, 5.1-5.2
- S&W Ch. 5.3, 5.4

Assignment #1 due January 30th at 11:59pm

02/03: Multiple Regression

Readings:

- S&W Ch. 6.1-6.6

Assignment #2 due February 6th at 11:59pm

02/10: Omitted Variable Bias and hypothesis testing in multiple regression

Readings:

- S&W Ch. 6.1-6.6 & Ch. 7

02/17: Multiple categorical variables and multicollinearity

Readings: S&W Ch. 6.7

Assignment #3 due February 20th at 11:59pm

02/24: Midterm (in-class)

03/03: Winter/Spring Break

03/10: Non-Linearity Polynomials

Readings:

- S&W Ch. 8.1-8.5

3/17: Non-linearity, continued: Polynomials and Logs, and Interaction terms

Readings:

- Butsic, V., Hanak, E. and Valletta, R.G., 2011. Climate change and housing prices: Hedonic estimates for ski resorts in western North America. *Land Economics*, 87(1), pp.75-91.

3/24: Binary dependent variables: linear probability models, probit, logit

Readings:

- S&W Ch. 11.1-11.5
- Munnell, A.H., Tootell, G.M., Browne, L.E. and McEneaney, J., 1996. Mortgage lending in Boston: Interpreting HMDA data. *The American Economic Review*, pp.25-53.

Part III: Panel data, fixed effects, and quasi-experimental techniques

3/31: Panel Data and fixed effects

- *Readings:* S&W Ch. 10
- Currie, Janet and Duncan Thomas, (1995). "Does Head Start Make a Difference?" *American Economic Review* 85(3): 341-364.

Assignment #4 due April 3rd at 11:59pm

04/07: Introduction to quasi-experiments: Difference-in-differences analysis

Readings:

- S&W Ch. 13.4; Mixtape Chapter 9 through section 9.5
- Card and Krueger, 1994. "Minimum Wages and Employment: A Case Study of the Fast Food Industry in New Jersey and Pennsylvania." *American Economic Review* 84 (September 1994).
- Currie, J. and Walker, R., 2011. Traffic congestion and infant health: Evidence from E-ZPass. *American Economic Journal: Applied Economics*, 3(1), pp.65-90.

4/14: Quasi-experiments continued: Regression Discontinuity Design with in-class exercise

Readings:

- S&W Ch. 13.4; Mixtape Chapter 6 through section 6.4
- Khanna, G., Medina, C., Nyshadham, A., & Tamayo, J. 2022. *Formal employment and organized crime: Regression discontinuity evidence from Colombia* (No. w26203). National Bureau of Economic Research.
- S&W Ch. 9, 13.1, 13.2, 13.5, 13.6
- Listen to podcast: <https://www.probablecausation.com/podcasts/episode-12-michael-lovenheim>

Assignment #5 due April 17th at 11:59pm

4/21: In-class presentations

In-class presentation. Detailed instructions will be provided a few weeks before presentation.

Homework #6 due Friday, April 24th at 11:59pm

Final Exam: Thursday, April 30th, 5:45-7:45pm