Introduction to Quantitative Methods
(POLS 60833)

Professor Erin Rossiter
erossite@nd.edu

Fall 2023

1 Course information

Location
Jordan Hall of Science 322

Time
Mondays and Wednesdays 11am - 12:15pm

Office hours
Mondays 5pm-6:45pm
Wednesdays 2pm-3:15pm
(or by appointment)
2077 Jenkins Nanovic Halls
Sign up here: calendly.com/erossite/officehours

Teaching assistant
Adriana Pilar Ferreira Albanus
aferrei3@nd.edu

Teaching assistant office hours
Tuesdays 1pm-3pm
Jenkins Nanovic Halls Graduate Student Lounge

2 Description

This the first course in the quantitative methods sequence for Ph.D. students in Political Science at Notre Dame. It provides a foundation of knowledge to draw from as you continue the methods sequence, take specialized and advanced courses, or want to apply or self-learn new methods for your own research. The material is designed to make you more comfortable speaking the "language" of quantitative research. The course provides a hands-on introduction to quantitative data analysis using the `R` computing and programming environment. You will learn how to describe and visualize politically relevant statistics. You will also learn probability theory and statistical inference.

The bulk of the learning in the course will take place outside of the classroom by reading, coding, analyzing data, completing assignments, and preparing for exams. Working together is key. Work with your classmates and attend office hours with the instructor and teaching assistant. The skills attained in this course are those that the discipline of political science expects of data-oriented researchers. We encourage you to approach the course keeping in mind that it is fundamental preparation for the rest of your career.

3 Learning objectives

- The student will understanding how to think through and answer research questions in political science.
- The student will have an intuitive understanding of data and how to work with it.

- The student will know how to use the R programming language and how to look for solutions to common coding problems.
- The student will have an understanding of the fundamentals of probability and statistics.
- The student will have an intuition of the statistics behind Ordinary Least Squares (OLS).
- The student will gain conceptual knowledge needed to consume basic social science research.

4 Required Materials

Any readings other than QSS will be posted to Canvas or linked here. You will need to obtain a copy of QSS (it is around $30 on Amazon). Please let me know if anything is preventing you from acquiring the required book so I can be of help.

- **QSS:** Imai, Kosuke. 2017. *Quantitative Social Science: An Introduction.*
- **TEB:** Huntington-Klein, Nick. 2021. *The effect: An introduction to research design and causality.* https://www.theeffectbook.net/index.html

5 Grading Scale

A	[93-100]%
A-	[90-93)%
B+	[87-90)%
B	[83-87)%
B-	[80-83)%
C+	[77-80)%
C	[73-77)%
C-	[70-73)%
D+	[67-70)%
D	[63-67)%
D-	[60-63)%
F/I	[0-60)%

See the registrar's explanation of letter grades. There will not be opportunities for extra credit.

6 Grade components

Problem Sets (30%), lowest two dropped

There will be 11 problem sets distributed weekly. Problem sets will include a combination of analytical and computational problems. They will be circulated on Wednesday and will be due by the following Wednesday *when class starts* at 10:59am EST.

Teamwork and collaboration is highly encouraged on assignments (but see Academic Integrity section of syllabus).

Problem sets are required to be submitted via a **compiled** R Markdown document. The submission requirements will be clear on each weekly problem set. Please see the late work policy.

The final problem set is a replication exercise where the student will find the replication archive for a published paper and re-run the analyses needed to replicate at least one main figure or table in the paper. The student will complete this replication in a compiled Rmd file. If the original code is messy, the student will clean it up. If the original code lacked comments, the student will add informative comments to the code. Finally, the student will, in text in the Rmd, comment on the elements of the analysis we've learning in class and what elements we haven't learned and may still be confusing. Students are welcome to find their own paper to replicate, perhaps one they have read in a seminar this semester. Or, I can help find replication archives if the student comes to me at least two weeks before this problem set is due.

Midterm Exam (30%)

Students will complete two exams over the course of the semester. The exams have two components: an in-class component and a take-home component. Collaboration is not allowed on any component of the exam.

The in-class midterm exam will be on Monday, October 9. It will be open book, open note. The take-home component will occur the same week according to the students' individual schedules. We will talk more about the exams as they approach.

Final Exam (30%)

The final exam follows the same format as the midterm exam. The in-class component will be on Thursday, December 14 at 4:15-6:15pm. It will be open book, open note. The take-home component will occur the same week according to the students' individual schedules. We will talk more about the exams as they approach.

Participation (10%)

Students are expected to actively engage in class discussion. The participation grade includes showing up to class, TA and professor office hours, completing the readings, and being an overall good citizen in the course (arriving and ready for class to begin on time, keeping phone put away during class, not checking email, etc.)

Note: I reserve the right to curve any and all grades.

7 Re-Grading Policy

In the case where a student would like to appeal a grade, they must submit a written appeal via email to the TA within 72 hours of the graded homework or exam being redistributed. We will not consider any other forms of re-grading requests (i.e., those made in office hours) or any requests that occur beyond 72 hours.

8 Email Policy, Course Communication, Slack, & Canvas

I encourage you to ask questions on Slack in the group channels. If you email, I will just ask if it is okay to post on Slack instead. I will usually respond to emails/Slack messages within 24 hours, except for weekends and holidays. I ask that you double check that any question sent via email/Slack can not be answered by the syllabus. If you expect your question requires more than a short paragraph response, please come to office hours or make an appointment with me to discuss.

We will post all readings, grades and feedback on Canvas, and you will submit all assignments via Canvas.

I will also post critical course information via Slack. For example, if I push back a problem set due date, I will send a Slack announcement. Therefore, I expect you to check Slack multiple times a week for important alerts about the class.

9 Academic Integrity

I expect that students take academic integrity seriously. Instances of cheating, plagiarism, or other forms of academic dishonesty will be reported. All students are responsible for familiarizing themselves with the Honor Code on the University's website and pledge to observe its provisions in all work.

We will review what does and does not consitute plagarism in class. In particular, for this class, students should keep academic integrity in mind for problems sets and exams.

For problem sets, you **will** be allowed to work in groups. However, each person must turn in their own problem set and their own code. My guiding principal for joint work is that *each key stroke should be your own.* Moreover, students should take great care to attribute others' writing and code to the original source. For example, if you found a solution or explanation to a problem set question on Stack Overflow (this is totally fine!), include a URL in the code explaining what portion came from the online source.

For exams, you **will not** be allowed to work in groups. There will be an in-class portion and a take-home portion of the exam. The in-class portion is open-book, open-note, open. You may also use your laptop and Internet. You may not consult classmates or anyone else during the in-class exam. Likewise, the take-home portion is also open-book, open-note, open-Internet, and you cannot consult classmates or anyone else about solutions.

10 Statement on Generative AI, Large Language Models (LLMs) (e.g., ChatGPT), etc.

(Drawn from a similar statement by Chris Zorn)

Much academic discussion of generative text tools revolves around the use of them to "cheat" in the sense that these tools can create work that deceptively gives the impression that the student knows something they do not. In this course, I am not concerned about "cheating," instead, I intend to adapt this course to the newfound prescense of LLMs in our lives. Why? (1) LLMs are a powerful learning tool, particularly for learning a programming language like R. (2) This course is a foundational element of your graduate school career, and your long-term academic career, which disincentivizes cheating in the conventional sense. In fact, we will devote course time to discuss how you can use LLMs like ChatGPT to aid in your quantitative work, specifically when coding in R.

Therefore, you are allowed to use generative AI tools to assist them in their courswork. In doing so, (1) Students ought to use these tools as a learning aid, and seek to fully comprehend anything the tools help generate/debug for you. Also remember that these tools are capable of making errors, especially for the more complex requrests. (2) Students must go an extra step to note/cite when and how they used the LLM, just as they would cite anything else (see above section on Academic Integrity). Moreover, students must include a "Use of AI" subsection to any problem set answer they use AI to complete, providing or describing the prompt they used, which tool they used, etc.

11 Privacy Practices

This course is a community built on trust. In order to create the most effective learning experience, our interactions, discussions, and course activities must remain private and free from external intrusion. As members of this course community, we have obligations to each other to preserve privacy through the following practices:

- Course materials (videos, assignments, readings, etc.) are for use in this course only. You may not upload them to external sites, share with students outside of this course, or post them for public commentary without my written permission.
- In our discussions, some of us may volunteer sensitive personal information. Do not share others' personal information on sensitive topics outside of our course community. Student work, discussion posts, and all other forms of student information related to this course are private.
- If we must transition to Zoom at some point, I plan to record class meetings. These recordings will be available for review through Canvas. I ask that the only recordings made of our class meetings are the ones I am making on Zoom for educational purposes.

12 Statement on Inclusiveness

I expect that students are committed to and strive to maintain a positive learning environment based on open communication, mutual respect, and non-discrimination. In this class we will not discriminate on the basis of race, gender, age, economic class, disability, veteran status, religion, sexual orientation, color, or national origin. Any suggestions as to how to further such a positive and open environment will be appreciated and given serious consideration.

13 Title IX: Confidentiality and Responsible Employee Statement

Notre Dame faculty are committed to helping create a safe and open learning environment for all students. If you (or someone you know) have experienced any form of sexual misconduct, including sexual assault, dating or domestic violence, or stalking, know that help and support are available.

I am available to discuss concerns. Please know that information shared with me regarding alleged sexual assault, sexual misconduct, dating violence, domestic violence, stalking, or conduct that creates a hostile environment will be reported to the University's Title IX Coordinator or Deputy Title IX Coordinator to investigate as I am a mandatory reporter.

If you wish to speak to a confidential employee who does not have this reporting responsibility, you can contact counseling, medical, or pastoral resources. Please see the Title IX website for more information, including phone numbers and hotlines, about reporting options and resources at Notre Dame and in the community.

14 Statement on Covid-19

I will alert you to any possible changes in course requirements, including course format changes, in response to Notre Dame's decisions about community safety during the semester.

Additionally, I may ask students to wear masks. Please always have one with you for class and office hours if I request masking.

Students will not be penalized for having to self-quarantine or self-isolate given Covid-19. Course materials and assignments will be available for completion in an alternative modality if needed.

15 Mental Health Statement

Diminished mental health, including significant stress, mood changes, excessive worry, or problems with eating and/or sleeping can interfere with optimal academic performance. The source of symptoms might be strictly related to your course work; if so, please speak with me. However, non-academic parts of life, like problems with relationships, family worries, loss, or a personal struggle or crisis, can also contribute to decreased academic performance.

Notre Dame provides mental health services to support the academic success of students. In the event I suspect you need additional support, I will express my concerns and the reasons for them, and remind you of resources that might be helpful to you. It is not my intention to know the details of what might be bothering you, but simply to let you know I am concerned and that help, if needed, is available.

The University Counseling Center (UCC) provides cost-free and confidential mental health services to help you manage personal challenges that threaten your emotional or academic well-being.

Remember, getting help is a smart and courageous thing to do — for yourself and for those who care about you. For more resources please see ucc.nd.edu or care.nd.edu.

The UCC is located on the third floor of Saint Liam Hall
Hours: Monday-Friday 8:30am - 5:00pm
Urgent Crisis Line 24/7: 574-631-7336

16 Accommodations for Disabled Students

Notre Dame supports the rights of enrolled students to a full and equal educational opportunity and, in compliance with federal, state, and local requirements, and is committed to reasonable accommodations for individuals with documented disabilities.

Students for whom accommodations may be necessary must be registered with, and provide their instructors official notification, through Sara Bea Accessibility Services. I work with students and Sara Bea Accessibility Services to ensure that students with documented disabilities have the resources that they need to be successful.

Please speak with me as soon as possible regarding accommodations. Students who are not registered should contact the Office of Disability Services as soon as possible since accommodation typically needs to be arranged well in advance.

17 Religious and Cultural Observance Accommodations

Student with a conflict between an academic requirement and a religious or cultural observance should notify me within the first three weeks of class of the specific dates in order to schedule a make-up activity. I strongly encourage you to honor your religious holidays and cultural practices! However, if I do not hear from you within the first three weeks of class, I will assume you plan to attend all class meetings and can participate in all activities.

18 Syllabus Change Policy

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice.

19 Schedule

Week 0: 8/23 – Introductions

- QSS Ch. 1
- TEB Ch. 1-2

Week 1: 8/28, 8/30 – Sampling and measurement

- QSS 3.4
- TEB 3.1-3.2
- Problem Set 1 due

Week 2: 9/4, 9/6 – Descriptive statistics, probability theory

- QSS 2.6, 3.1-3.3, 6.1-6.2
- TEB 3.3-3.4
- Problem Set 2 due

Week 3: 9/11, 9/13 – Sampling distributions

- QSS 6.3, 6.4, 1.3.4
- TEB 3.5
- Problem Set 3 due

Week 4: 9/18, 9/20 – Confidence intervals describing a population mean

- QSS Ch. 7.1
- Problem Set 4 due

Week 5: 9/25, 9/27 – Hypothesis testing

- QSS Ch. 7.2
- Problem Set 5 due

Week 6: 10/2, 10/4 – Hypothesis testing and exam review

- Problem Set 6 Due

Week 7: 10/9, 10/11 – Midterm exam week

- In-class Midterm Exam on Monday
- *No class on Wednesday*
- Two-hour, take-home component distributed and completed Mon 10/9-Wed 10/11 according to students' individual schedules

Fall Break

Week 8: 10/23, 10/25 – Experiments and causality

- QSS Ch. 2.4-2.5
- Gerber and Green Chapters 1 and 2 (on Canvas)
- *No Problem Set due*
- *No TA office hours this week*

Week 9: 10/30, 11/1 – Two sample t-tests and randomization inference (if time)

- QSS 7.2
- Gerber and Green Ch. 3.4 (on Canvas) (if time)
- Problem Set 7 Due

Week 10: 11/6, 11/8 – Bivariate regression

- QSS Ch. 4.1-4.2
- TEB Ch. 4, Ch. 13.1
- Problem Set 8 Due

Week 11: 11/13, 11/15 – Dummy variables, multivariate regression, and related topics

- QSS Ch. 4.3, 7.5, 2.5
- TEB Ch. 4, 13.2,, 18
- Problem Set 9 Due

Week 12: 11/20 – Open (No class 11/22, University holiday)

- *No Problem Set due*

Week 13: 11/27, 11/29 – Text as data

- Text as data applications guest lecture from Adriana 11/29, reading TBD
- QSS Ch. 5.1, Ch. 3.7
- Problem Set 10 Due

Week 14: 12/4, 12/6 – Wrap up & exam review

- Problem Set 11 Due – Replication exercise

Week 15: 12/11, 12/13 – No class, "reading days"

Week 16: 12/13, 4:15pm - 6:15pm – Final Exam

- In-class final exam on Thursday, 12/14 at 4:15pm - 6:15pm
- Two-hour, take-home component distributed and completed Mon 12/11 - Thurs 12/14 according to students' individual schedules