
PSCI 205
Data Analysis II

Spring 2021
Tues/Thurs 11:05-12:20, Online

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COURSE DESCRIPTION: This course builds on PSCI 200, Data Analysis I, taking the linear regression model as its starting point. We will explore various statistical techniques for analyzing a world of data that is relevant to political science in particular, and to the social sciences more broadly. In addition to the linear regression model, we will examine models for binary data, durations, counts, censoring and truncation, self-selection, discrete choice, and strategic choice, among others. These models will be applied to topics such as international conflict, civil war onset, parliamentary cabinet survival, international sanctions, campaign contributions, and voting. Students will be taught how to (1) frame research hypotheses, (2) analyze data using the appropriate statistical model, and (3) interpret and present their results. Statistical analysis will be conducted using R.

COURSE MEETING & CREDITS. This course follows the College credit hour policy for four-credit courses. We will meet twice a week (Tues & Thurs) for 1.5 hour sessions. There is no separately designated day for labs. Rather, the normal Tues/Thurs sessions will be a mix of lecture and labs. During the labs, students will receive computer instruction, analyze data, discuss past homework problems, and start on new homework problems. The remaining credit hour is fulfilled through independent reading and completion of the homeworks.

PREREQUISITES: Students should have taken a course (such as PSC 200, ECO 230, STT 211, STT 212, STT 213, or STT 214) that introduces them to probability, hypothesis tests, confidence intervals, and bivariate regression. Students should have a basic familiarity with R. Calculus and matrix algebra are not required. If you need to refresh yourself concerning R and/or introductory statistics, I have uploaded review material to Blackboard.

GRADING: Course grades will be based on a series of homeworks (72%), a final exam (25%), and class participation/attendance (3%).

Unless otherwise noted, homeworks will generally be due at the start of class, one week after they are handed out. Homework assignments will be distributed via Blackboard. Students should submit homework answers via Blackboard as well. Late assignments will be penalized one half-

grade (e.g., B to B-) for each day they are late. Homeworks more than seven days late will receive a grade of zero. Finally, while you are encouraged to study together and to learn the software together, all assignments are to be completed individually. Please see the Course Academic Honesty page on Blackboard for examples of what is allowed and not allowed when completing homeworks and the final exam.

READINGS: There is no perfect text for this course. Instead, I will assign readings from various texts and articles. All texts and articles will be available as pdf's on Blackboard. Texts used for this course will include

- John Verzani. [*SimpleR: Using R for Introductory Statistics*](#). This is an open source pdf that introduces students to using R for statistics. There is little to no math. It focuses on the mechanics of data analysis, hypothesis testing, and linear regression using R. If you feel rusty concerning R, please work through pages 1-24 before the end of the first week of class.
- G. Jay Kerns. *Introduction to Probability and Statistics using R*. 3rd ed. The topics overlap quite a bit with Verzani. However, Kerns is much more mathematical, including the use of calculus. The open source pdf is available as part of R's IPSUR package.
- David M. Diez, Christopher D. Barr, and Mine Cetinkaya-Rundel. [*OpenIntro Statistics*](#). 3rd ed. For some, this will be a more user-friendly version of Kerns, without any calculus or more advanced math.
- Jeffrey M. Wooldridge. *Introductory Econometrics*. 5th ed. More advanced than *OpenIntro Statistics*. Does not demonstrate with R. Does not use calculus or linear algebra, but does provide some proofs.
- Marco R. Steenbergen. 2008. *Discrete Choice Models for Political Analysis*. Advanced Political Methodology Lecture Notes. (pdf on Blackboard)

STATISTICAL SOFTWARE: We will be using R and RStudio for our statistical analysis. R is open source and free. There are versions for Mac OSX, Windows, and Linux. You can download it from <https://cran.r-project.org/>. Additionally, we will be using [RStudio](#) as a graphical interface for R. RStudio is free for students to download. Instructions for downloading R and RStudio are provided on Blackboard under the Prerequisite R Review folder on the Course Home Page.

IMPORTANT DATES:

First lecture: Tues, Feb 2

Study break: Tues, Mar 30

Last lecture: Thurs, May 6

Final exam: TBD, finals week (May 10-15)

COURSE OUTLINE:

1. Course Introduction

2. Introduction to R, RStudio, & RNotebook

Starting R, calculations, variables, classes, vectors, matrices, logical operations, data.frames, loading data sets, descriptive statistics, tables, plots, help, RNotebook

Required (R): Verzani, pp. 1-24. IPSUR, Ch 2.

3. Bivariate Linear Regression: Estimation & Inference

It's a line!, estimating the coefficients, t tests, CI's, r^2

Required (math): *OpenIntro*, Ch 7. Wooldridge, Ch 2.1-2.4. *IPSUR*, Ch 11.1-11.3.3.

Required (R): Verzani, pp 24-31, 77-83.

4. Multiple Regression: Estimation & Inference

Research hypotheses, interpreting coefficients and standard errors, statistical vs substantive significance, nested models, R^2

Required (math): *OpenIntro*, Ch 8.1-8.3. Wooldridge, Ch 3.1-3.2, Ch 4.

Required (R): Verzani, pp 84-89.

Optional: *IPSUR*, Ch 12.1-12.3

5. Additional Linear Regression Topics

5.1 Dummy variables

Required: Wooldridge, Ch 7.1-7.3

5.2 R^2

Required: Wooldridge, Ch 6.3.

5.3 Polynomial & log transformations

Required: Wooldridge, Ch 2, pp 41-44. Ch 6.2 pp 191-198.

5.4 Predictions & Interactions

Required: Wooldridge, Ch 6.2 pp 198-200. Ch 7.4.

5.5 Diagnostics

Required: *OpenIntro* Ch 8.3. *IPSUR*, 11.4-11.5. Wooldridge, Ch 9.5.

6. Maximum Likelihood

Intuition, one parameter, multiple parameters, Normal, Binomial

Required: Gary King. 1998. *Unifying Political Methodology*. Ch 2 & 4.

7. Binary Data

Logit, probit, research hypotheses part II, derivations, nonlinear $E(Y)$, interpretation, implicit interactions, CI's

Required: *OpenIntro*, Ch 8.4. Steenbergen, Ch 2.

8. Count Data

Poisson, negative binomial, hurdle models

Required:

Beaujean & Morgan. 2016. "Tutorial on Using Regression Models with Count Outcomes..."

Zeileis et al. "Regression Models for Count Data in R."

9. Survival Models

Exponential, Weibull, Kaplan Meier, Cox proportional hazard

Required: TBD

10. Censoring and Truncation

Tobit, truncated normal

Required:

Arne Henningsen. "Estimating Censored Regression Models in R using the censReg..."

Sigelman & Zeng. "Analyzing Censored and Sample-Selected Data with Tobit..."

11. Ordered Logit/Probit

Required: Steenbergen, Ch 3.

12. Discrete Choice

Random utility, multinomial logit, conditional logit

Required: Steenbergen, Ch 4-5.

13. Selection Models

Heckman selection model

Required: TBD

14. If Time Permits...

- Writing your own function in R
- Maximum Likelihood Estimation using `maxLik()`

OTHER IMPORTANT ITEMS

Course Organization. The course organization may be adjusted/optimized during the semester according to the pace of learning and the priority of topics. Students are responsible for attending lectures and maintaining an awareness of any changes to the course materials, homework requirements, or exam dates.

Student Disability Accommodation. I am happy to work with any student who requires an accommodation due to a disability. It is important that students first contact the Office of Disability Resources. (I can't do anything until Disability Resources authorizes me to do so.) They will discuss any barriers a student is experiencing, explain the process for establishing academic accommodation, and coordinate with me concerning the accommodation. You can reach the Office of Disability Resources at disability@rochester.edu or (585) 276-5075.

Academic Honesty. Students are expected to be familiar with the University's policies on [academic honesty](#). I have provided additional course-specific academic honesty policies on Blackboard under the Course Academic Honesty tab. If I suspect a student has violated any of these policies, I am required to report the violation. Punchline: don't cheat. If in doubt about what is acceptable behavior concerning completing an exam or homework, just ask me.

During the first week of class, please review both the University policies and the course policies. You must confirm that you have read and accept these policies by completing the Acceptance of Academic Honesty Policy activity at the bottom of the Course Academic Honesty page on Blackboard.

Attending PSCI 205 via Zoom

The online version of class is always a work in progress. However, there are a few things you can do to help it run more smoothly for everyone.

- Find a quiet place to use Zoom. Try to find a spot in your room or home that is quiet, doesn't get interrupted by others, and doesn't have distractions.

- Make sure your audio and video are working. Before you join the class session, take a second to verify that your mic, audio output (e.g., computer speakers or headphones), and video are all working. You can test these by opening the Zoom client settings and clicking on Video and then Audio.
- Calibrate your volume. This will take some work on everyone's part – including mine. I want to hear you, but I also don't want my ears blown out any more than they already are!
- Join the class a few minutes early to get yourself situated.
- MUTE your audio. In general, unless you are asking or answering a question, mute your own audio. Small background noises can cause the audio and spotlight to jump around.
- If possible, attend with your video turned on. It's very helpful for me to have at least visual feedback when I'm teaching. I also find that students who attend with the video on are more engaged during class. That said, no worries if your internet is spotty and you can only attend via audio.
- Use the Chat feature while I'm lecturing. If you have a question or want to speak while I'm lecturing, type it in the chat area. I will do my best to get to it promptly. If, for whatever reason, I appear not to have seen it – or forgot about it – copy and paste it back. If you really, really need to get my attention quickly, unmute your audio and just interrupt me!
- Remember that we can see you. When attending class, please minimize distracting movements. Want to enjoy a cup of coffee or tea? No problem. But maybe hold off on eating that plate of Buffalo wings until after class. And, seriously, we don't need to watch you exercising.

University COVID-19 Statement

[Note: Since this course will be online, much of the following is irrelevant during online lectures. To the extent that you meet with classmates in person or anyone else outside of class, please follow the University's guidelines.]

The University is committed to protecting the health and safety of the entire community – students, faculty and staff. For this reason, it is mandatory that everyone wear a mask in University buildings and observe appropriate social distancing, including classrooms. Masks have been provided to students, faculty and staff and classrooms have been specifically assigned to allow for social distancing to support these requirements. You must wear a mask appropriately (e.g. over nose and mouth) if you are attending class in person, and you must do this for every class session and for the entire duration of each class session. If you fail to do this, you will be politely reminded of the requirement and then asked to leave if you do not comply.

If you do not want to wear a mask, you may consider taking the course remotely (online). This may require you to complete a set of online requirements different from the in-person requirements, although these will be equivalent in their learning objectives.

Students who refuse to adhere to requirement for mask wearing or social distancing the course will be in violation of the COVID-19 Community Commitment and will be referred to the Student Conduct system through a COVID-19 Concern Report. Such referrals will lead to student conduct hearings and may result in disciplinary action.

Students who feel unable to wear a mask may contact the Office of Disability Resources to explore options for accommodations. Students requiring accommodations may be asked to participate in the course through synchronous or asynchronous learning as part of this accommodation.

Updated: 2/1/21