

ECONOMETRICS SYLLABUS

Version 8.25.21

Instructor: Professor Taryn Dinkelman
Location: DeBartolo Hall 317
Times: MON/WED SECTION 01: 9.30-10.45AM
SECTION 02: 11AM-12.15PM
Email: tdinkelm@nd.edu
Office Hours: Mondays 3-5pm Zoom: [https://notredame.zoom.us/j/93753404778?](https://notredame.zoom.us/j/93753404778?pwd=VTArbGJVeVNIL3VXQmVLZFdiKzRIQT09)
pwd=VTArbGJVeVNIL3VXQmVLZFdiKzRIQT09

TAs: Jane DiSibio jdisibio@nd.edu Mondays 5-7pm
DeBartolo Hall 203 and Zoom: TBA
Clark Doman cdoman@nd.edu Wednesdays 3.30-5.30pm
DeBartolo Hall 203 and Zoom: <https://notredame.zoom.us/j/95427796516>
Will Collins wcollin5@nd.edu Wednesdays 1-2pm and Thursdays 2-3pm
O'Shaughnessy 117 (Wed), 217 DeBartartolo (Thurs) and Zoom: TBA
TA office hours will start the week of August 30th

FINAL EXAM: MONDAY DECEMBER 13 2021 7.30PM-9.30PM

OVERVIEW AND COURSE OBJECTIVES

This course exposes you to statistical techniques that economists use for estimating and testing economic relationships. We will emphasize understanding the techniques involved, what implicit and explicit assumptions are required for them to be appropriately used, and what they mean (interpretation) in terms of the economic problem being studied. Topics covered include estimation and hypothesis testing using simple and multivariate regression analysis, and a variety of problems with regression and their potential fixes (e.g. panel data methods, instrumental variable methods).

Successful completion of this course should:

- (1) allow you to read much of the professional empirical literature in economics and
- (2) prepare you for independent research using economic data, particularly for an upper-level class in Economics

Recommended readings (including textbook readings), practice problems, problem sets, quizzes, and a short empirical exercise involving direct use of economic data completed during the course will support you in achieving these two goals.

PREREQUISITES

This course assumes you have a good grasp of the concepts covered in ECON 30330 or a related rigorous course in probability and mathematical statistics. I expect you to know some simple calculus. At the start of this class, I will assume that you are very familiar with the material in Appendices A, B, C (excluding “maximum likelihood”) in our assigned textbook. If you review these appendices and are not comfortable with this material, you should make time outside of class in the first week of the semester to review this material. **It is extremely unlikely that you will pass this course without knowledge of this material.** The first problem set is based on this material, without any supporting lectures.

COURSE MATERIALS AND RESOURCES

1. Lecture slides and readings

Slides will be posted to SAKAI ahead of class. A good way to prepare for class is to skim the slides before coming to class to get a sense of what we will cover and to think about questions ahead of time. I will also post journal articles for in-class examples on SAKAI. These readings will be recommended, not required.

2. Textbook

We will mostly focus on lecture notes that cover (but are not limited to) material in the textbook. You are responsible for the material covered in lecture, including any handouts as well as the relevant textbook chapters. The textbook (below) provides useful additional background and many practice problems, which I encourage you to practice.

Introductory Econometrics: A Modern Approach (7e) by Jeffrey Wooldridge, published by South-Western Publishing, seventh edition. If you purchase the Access Code, I believe this gives you access to student solutions to chapter problems online. This textbook is available at the bookstore. There is a second-hand market for cheaper versions of earlier editions (rent or buy), but I do not recommend editions earlier than the fourth. If you prefer not to buy the physical book, you can buy digital copies of the fifth and sixth editions at www.cengagebrain.com.

3. Statistical analysis software

There will be significant emphasis on the use of the statistical software STATA. STATA is one of the programs of choice for applied micro economists. Based on prior experience with undergraduate research assistants, it is fair to say that knowledge of STATA will greatly enhance your ability to get a research job with any economics professor, and a job after graduation.

I recommend you purchase a 6-month or one-year site license for STATA IC (latest version) through the STATA Grad Purchase plan. Choose STATA plan that is right for your operating system (Windows or MAC platforms).¹

¹ Access to the software is available on campus in two ways. In computer clusters <https://inside.nd.edu/task/all/computerlabs> for a list of computer clusters, and through a virtual lab: <https://oit.nd.edu/services/software/software-downloads/stata/>. However, the university has only a limited

Website for STATA license: <http://www.stata.com/order/new/edu/gradplans/student-pricing/>

As part of the class, you will be required to work in a data analysis program to produce empirical results, and I will ask you to read and interpret econometric output, using the concepts and methods we cover in class. It is worthwhile spending time outside of class getting familiar with generating and understanding standard STATA output. There are many resources to assist you in working with this package, e.g.:

- <http://libguides.library.nd.edu/data-analysis-stata>
- <https://www.youtube.com/user/statacorp>
- Ben Chiewphasa (Email: bchiewph@nd.edu) is the Economics and Data Librarian at Hesburgh Library.

If you have specific questions about working in STATA, one of the class TAs or I can help you. However, to help you, we need to see your code – hence, always work with a do file and a log file (I will explain these objects in our intro to STATA class).

A side note on R: Some economists and social scientists in other disciplines use R for all of their econometric needs. I do not. However, I realize some of you may come in with a little background in R. This semester, for the first time, I will provide the class with a set of optional notes that introduce you to working in R, and provide output (code) for problem sets and projects in R. I will also allow you to produce results for any problem sets, homeworks, and projects, using R, with these two important caveats in mind:

- I am beta testing these notes. I will not be providing any support for R (having no knowledge of it myself at this time), although feedback on their usefulness is welcomed. Some of the TAs may be able to assist with troubleshooting in R.
- **If** you choose to program in R, and produce output for homework and problem sets, you should prepare output in a form that would be included in a regular paper. I will not read R code or output directly from the console

If you know neither STATA nor R, I would recommend you invest in learning STATA this semester.

4. Additional class support

TAs: We are lucky to have three former econometrics students helping us out this term: Jane, Clark, and Will. They will provide additional office hours for this class, and will distribute the times and days when they are available on a weekly basis, via SAKAI announcements. Their office hours will start in the week of August 30 2021.

number of site licenses for concurrent use, so if you have trouble getting into STATA, it may be because there are more than 25 students already using the program. A purchased license will not have this issue.

Peer tutoring through the Economics Department is available on a drop-in basis for question and answer sessions. Services will begin on Monday, August 30th. Please stop by to get individual attention from students who have previously excelled in these courses.

Mondays 6:30-8:30pm - B062 Jenkins Nanovic Halls

Tuesdays 6:30-8:30pm - 207 DeBartolo Hall

Wednesday 6:30-8:30pm - B062 Jenkins Nanovic Halls

5. PIAZZA

Piazza is an online gathering place where students can ask and answer questions about the material, homeworks, etc. Between the TAs and myself, we will try to monitor questions and respond on Piazza at least once a day; we can also pick up general problems that students are running into, this way. As students, you can also respond to questions from your classmates if you know the answers.

COVID HEALTH AND SAFETY PROTOCOLS

In this class, as elsewhere on campus, students must comply with all University health and safety protocols outlined here: <https://covid.nd.edu/>. **In addition, I will require that everyone in our classroom is masked during this semester.** The University has approved this policy on an individual faculty basis, here <https://covid.nd.edu/policies/masks-policy/>. Compliance with these protocols is an expectation for everyone enrolled in this course. If a student refuses to comply with the University's health and safety protocols, and my request to be masked during class time (and if I see you in my office), the student must leave the classroom and will earn an unexcused absence for the class period and any associated assignments/assessments for the day.

Do not come to class if you have any symptoms of illness – get it checked out! If you are following University protocols regarding COVID, I will share a recording of the relevant missed classes with you.

OTHER HOUSEKEEPING NOTES

1. Economics Department Exam policies:

a) **Final exams must be taken at the scheduled times**

- a. Final exams are scheduled well in advance of the beginning of the semester and all quiz dates are on the syllabus. If your travel plans conflict with the scheduled final exam, you should not take this class this semester.
 - b. Exceptions may be made for Notre Dame sponsored events such as varsity sports and other activities related to your Notre Dame education
 - c. On very rare occasions, there may be a conflict with the final exam in another class. If possible, these conflicts will be resolved by taking the final exam for this class during a different final exam period on the same day. Let me know as soon as possible if this is likely to be the case for you – your Advising Dean can help with rescheduling. Note that two exams scheduled on the same day at different times does not constitute a conflict.
 - d. Acute events (e.g. an illness or a death in the family), will be handled on a case-by-case basis
- b) **If for any reason a quiz cannot be taken at the scheduled time, it will not be rescheduled.** There are four quizzes and I will count the best three scores. If more than one quiz is missed, increased weight will be given to the other quizzes and the final exam to make up for the missed quiz.
- c) Any questions regarding the grading of quizzes must be brought to my attention within one week of the exam being returned. **All appeals should be in writing and will involve the reevaluation of the entire quiz**, not just the areas in dispute. While I am always happy to discuss the content of exams, I do not discuss points in real time.

2. Notre Dame Honor Code

It is your responsibility to know and abide by the Honor Code, available here: <https://honorcode.nd.edu/> I will ask you to sign the following statement on all midterms and exams: *"As a member of the Notre Dame community, I acknowledge that it is my responsibility to learn and abide by principles of intellectual honesty and academic integrity, and therefore I will not participate in or tolerate academic dishonesty."*

3. Economics Department Policy for students needing accommodations:

It is the policy and practice of The University of Notre Dame to provide reasonable accommodations for students with properly documented disabilities. Students who have, or think they may have, a disability are invited to contact Sara Bea Disability Services for a confidential discussion in the Sara Bea Center for Students with Disabilities (see <https://sarabeadisabilityservices.nd.edu/> for how to do this). Because the University's Academic Accommodations Processes generally require students to request accommodations well in advance of the dates when they are needed, students who believe they may need an accommodation for this course are encouraged to contact Sara Bea Disability Services at their earliest opportunity.

4. Class attendance:

Attendance is not required, but is recommended. It is the easiest way for you to learn what I think is important in this class. It is your responsibility to keep up with class work (all slides will be available on-line) when you miss class, and to deliver required coursework to me by relevant deadlines.

5. Communication:

Please try to include "*Econometrics*" in the subject line of all of your emails to me. I generally try to respond to email as soon as I can, but do not expect responses after 9pm.

COURSE REQUIREMENTS

Much of what we learn in ECON 30331 is **cumulative** - you need to have a good grasp of the first part of the course to understand everything that follows. Coursework is designed to help you review and keep up with the material we cover in class. There are several assessed pieces of work for this class:

1. **Four quizzes:** of which I will count your best three scores (10% for each quiz, 30% total). These quizzes will likely be run through GradeScope on SAKAI.
2. **Four problem sets:** (5% for each problem set, 20% total) all must be turned in on time, uploaded to SAKAI. These will practice of concepts from class and will prepare you for the quizzes and final. I encourage you to work in small groups (3-5 students) on these problem sets, so you may learn from each other. **Each person must upload their own individual problem sets, on time, on SAKAI, and make a note of which students were in the group.** Problem sets will be awarded points if turned in on time and complete (check plus if complete, check if incomplete, check minus if not turned in). I.e. they will be very lightly graded. It is in your interest to attempt these problem sets without looking at solutions that may be in circulation. After problem sets are complete, I will release solutions on the class website and you should review them carefully to consolidate concepts we cover in lectures.
3. **A final exam:** (20%) this will be open book, open notes. I will provide old exams for practice, along with typed out solutions. Exams will cover materials from class notes and the textbook that are covered in class. I will also assign a few papers from economics journals which apply techniques we learn in class to questions of economic and/or social importance. These readings are for you to see applications of the techniques you are learning. Some exam questions might be based on ideas in those papers (not the details), so familiarity with them will help you think through those questions.
4. **One empirical exercise:** (20%) You will work in groups of three or four on a short empirical exercise that I will set for you. The point of this exercise is to have you practice using the methods from class, give you direct experience working with data, and write up some of your findings in response to guided questions. The work for this exercise will happen in the second half of the semester. Note: If you have not formed a group by mid-September, I will randomly assign you to a group for this work. Each group will turn in one completed exercise on the last day of class. Each group member is expected to contribute equally and this will be reflected in the grading rubric.
5. **Class Participation:** (10%) I will use class polls in *PollEverywhere* to track your participation in class. The specific answers given in the polls will not be graded; you will not score points on whether your answer was correct or not, but rather on whether you responded at all.

FINAL GRADE DISTRIBUTION: According to department norms, the median final grade in this class is typically around a B/B+. Final grades may be curved. A grade below a C- indicates a performance significantly below others in the class and may indicate my serious concern about a student's readiness to apply econometrics to independent research in a senior research project or writing intensive class.

CLASS SCHEDULE AND READINGS

The schedule below indicates the topic and most of the readings for each lecture. If we run out of time, we may not cover all of the readings. While we will cover the topics in the order shown, exact dates may change if we need to postpone material to the following class, or if we need to use additional time to complete a topic. Required readings are starred (*), recommended readings are unstarred and all non-textbook readings are available on SAKAI. I may add links on SAKAI to relevant online resources, and additional papers, for assorted topics.

Week 1 (1 class)

Introduction – What is Econometrics? What is a good research question? What is causality?

*Class notes

*Wooldridge Ch 1, Appendix A, B and C

Angrist, Joshua D. and Jörn-Steffen Pischke. Mostly Harmless Econometrics: An Empiricists' Companion. Princeton University Press, 2009. Chs.1-2

Athey, Susan and Michael Luca. 2019. “Why tech companies hire so many economists”, *Harvard Business Review* <https://hbr.org/2019/02/why-tech-companies-hire-so-many-economists>

Weeks 1 and 2 (3 classes)

Estimation using Simple Linear Regression – the mechanics of OLS and examples

*Class notes

*Wooldridge Ch 2

Bertrand, Marianne and Sendhil Mullainathan. 2004 “Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination”, *American Economic Review*, Vol. 94, No. 4 (Sep.), pp. 991-1013

Week 3

Introduction to STATA (1 class)

*Class notes & handout

Week 3: Wed 8 Sep Quiz 1: covers OLS, in-class

Weeks 4 and 5 (~ 4 classes)

Estimation using Multiple Linear Regression – mechanics and examples

*Class notes

*Wooldridge Ch 3

Case, Anne and Christina Paxson, 2008 “Stature and Status: Height, Ability, and Labor Market Outcomes,” *Journal of Political Economy*, vol. 116(3), pages 499-532, 06.

Multiple Regression Specification choices, dummy variables, application of dummy variables

*Class notes

*Wooldridge ch 6, ch 7

Week 5: Mon 27 Sept Quiz 2: covers MLRM, in-class

Weeks 6 and 7 (3 classes)

Inference in Simple and Multiple Regression

*Class notes

*Wooldridge Ch 4

Asymptotics

*Class notes

*Wooldridge Chapter 5

Weeks 8 and 9 (~3 classes)

Problems in multiple regression and fixes: Heteroskedasticity. Measurement Error. Sample Selection and other issues

*Class notes

*Wooldridge ch 8, 9

Week 9: Wed Oct 27, Quiz 3 – covers Inference and problems in MLRM, in class

Weeks 10 and 11 (4 classes)

Panel data methods for addressing causal questions

*Class notes

*Wooldridge Ch 13, 14

Card, David. 1990. "The Impact of the Mariel Boatlift on the Miami Labor Market", *Industrial and Labor Relations Review*, Vol. 43, No. 2. (Jan.), pp.245-257

Outside of class work for Empirical Project

*Class notes: Carrying out an empirical project

*Wooldridge Ch 19

Week 12: Mon 15 Nov, Quiz 4 – covers panel data methods, in class

Weeks 12, 13, 14

IV and 2SLS methods for addressing causal questions (3 classes)

*Class notes

*Wooldridge Ch 15

Card, David. 1993. "Using geographic variation in college proximity to estimate the returns to education", *NBER Working Paper 4483*

No class Wed Nov 24th, Thanksgiving

Week 14

Regression Discontinuity Designs (1 class)

*Class notes

*Wooldridge Ch 17

Brian A. Jacob and Lars Lefgren, 2004. "Remedial Education and Student Achievement: A Regression-Discontinuity Analysis," *The Review of Economics and Statistics*, MIT Press, vol. 86(1), pages 226-244, February.

Carpenter, Christopher, and Carlos Dobkin. 2009. "The Effect of Alcohol Consumption on Mortality: Regression Discontinuity Evidence from the Minimum Drinking Age." *American Economic Journal: Applied Economics*, 1 (1): 164-82.

Week 15

Review class: Applications/Spillover class

*Class notes

Due Dates for Problem Sets, Group Projects and Scheduled dates for Quizzes

All problem sets and the empirical exercise are due on SAKAI by the end of the day (**midnight**) on the date indicated. Please list names of any group members that you worked with on the problem sets and empirical exercise. Work may be typed up or **clear** photographs of written work may be submitted.

Assignment	Date
Problem set 1	Wed Sept 1
Pre-quiz gradescope check-in	Wed Sept 8 by 8am
Quiz 1	Wed Sept 8, in class
Problem set 2	Wed Sept 22
Quiz 2	Mon Sept 27, in class
Problem set 3	Wed Oct 13
Quiz 3	Wed Oct 27, in class
Problem set 4	Wed Nov 10
Quiz 4	Mon Nov 15, in class
Empirical exercise	Tues Dec 7
Final Exam	Mon Dec 13 7.30-9.30pm

Note: You will need to use your phone to take a photo of your solutions to each quiz using a high quality scanner, and upload to Gradescope. Here are two sets of examples for different phones:

- Examples for iOS: Scannable by Evernote, Genius Scan, CamScanner
- Examples for Android: Genius Scan, CamScanner. (I'll be using CamScanner, it is free)

We will do a test run of this procedure before Quiz 1.