Econometrics (Econ 308)

Department of Economics
William & Mary

Instructor: Andra Hiriscau

Summer, 2022

Office: Chancellors 460   Class Hours: M-Tu-W-Th 12:20 pm- 2:10 pm
Office Hours: Tu-W 11:00 am- 12:10 pm   Classroom: Chancellors 113
or by appointment   E-mail: ahiriscau@wm.edu

Course Description and Purpose

This course is an undergraduate-level introduction to econometrics. In the first part of the course, you will study and apply regression analysis to various data sets to understand the core concepts of estimating economic parameters, predicting economic outcomes, and statistical inference. The second part of the course will focus on causal inference, which sets economists apart from statisticians or data scientists. The ability to draw causal conclusions from data is a skill that graduate schools and potential employers highly value.

Learning Outcomes and Objectives

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

1. Discuss the basic assumptions of the classical linear regression model and identify and correct (if possible) any violations of these assumptions.

2. Understand why correlations, particularly in observational data, are unlikely to reflect a causal relationship.

3. Estimate and inference linear regression models.

4. Explain heteroskedasticity, multicollinearity, omitted variable bias, and endogeneity.

5. Write an empirical econometric analysis.

6. Present journal articles.

Prerequisites

The course catalog outlines ECON 101, ECON 102, ECON 307 as prerequisites. Students may use BUAD 231, MATH 106, MATH 351, or SOCL 353 in place of ECON 307 as a prerequisite for ECON 308, but these courses do not count as credit hours toward the Economics major. Having a solid background in statistics will be helpful. We will discuss specific topics in more detail.

Course Materials

The **reference** text for the course will be Introductory Econometrics: A Modern Approach. 7th edition, by Jeffrey M. Wooldridge. The e-book can be rented for a reasonable price. **Older editions are equally suitable for this class.** I will post slides, on Blackboard, which follow the material in the textbook.

In addition to this textbook and slides, we will use the following materials, which are available for *free*:

- Mixtape: Causal Inference by Scott Cunningham

- The Effect: An Introduction to Research Design and Causality by Nick Huntington-Klein

- R for Data Science by Hadley Wickham Garrett Grolemund.

Software

This course will rely on R Studio Software during classes. We will be working out examples using the software. Moreover, you will be using it for your homework assignments and project. R Studio is a free and open-source software for data science, scientific research, and technical communication. Instructions and videos on installing R Studio and using R Markdown are posted on the Blackboard.

Grading Policy

All of your grades will be posted on Blackboard, allowing me to keep you informed on your progress in the course. If you think you have any questions or concerns about your grade, be sure to get in touch with me immediately. Your grade will be calculated using the following proportions:

- **25%** of your grade will be determined by in-class midterm exam

- **35%** of your grade will be determined by the **cumulative** final exam

- **15%** of your grade will be determined by homework assignments

- **15%** of your grade will be determined by the Journal Article Presentation

- **10%** of your grade will be determined by the Group Project

If your score for the final exam is higher than your score for the midterm, then I will replace your midterm exam score with the final score.

Table 1: Sample Grading Scheme

Grade	Range	Grade	Range	Grade	Range
A	93%- 100%	B-	80%- 82.99%	D+	67%- 69.99%
A-	90%- 92.99%	C+	77%- 79.99%	D	63%- 66.99%
B+	87%- 89.99%	C	73%- 76.99%	D-	60%- 62.99%
B	83%- 86.99%	C-	70%- 72.99%	F	less than 59.99%

Course Structure

Class Structure

- The class is meeting face-to-face four times a week for 110 minutes. A 10 minutes break is scheduled after the first 50 minutes of class.

- All course materials will be posted on Blackboard. Make sure you check it often. I will post lecture slides, videos, assignments, answer keys and announcements on the page.

Topics

- Introduction

- Introduction to R and Markdown

- Review of probability and expected values

- Simple linear regression

- Multiple linear regression:

    - Estimation
    - Inference
    - Further Issues

- Heteroskedasticity

- Panel Data; Differences-in-Diferences

- Instrumental variables estimation and two stage least square

- Regression Discontinuity

Note: A detailed schedule with the required and recommended readings will be posted on the Blackboard.

Homework

- Homework will be distributed through Blackboard at least one week before the due date. Deadlines will be updated on the Blackboard.

- There will be 3 homework assignments.

- You need to use R Markdown to write your code and results.

- We will be using Gradescope this term, which allows me to provide fast and accurate feedback on your work. Homework will be submitted through Gradescope (on Blackboard, access the Homework tab). As soon as grades are posted, you will be notified immediately so you can log in and see your feedback. You may also submit regrade requests if you feel I have made a mistake.

- After you have the PDF of your work, you will need to submit it through Gradescope. This video explains how to submit the PDF.

- Homework assignments will consist of two types of problems. The first type will involve mathematical derivation, and the second type will involve more data analysis using the R software.

- I encourage you to consult with your classmates, but each student needs to submit their homework individually.

Exams

- There are two exams in total. You are required to take all the exams at the scheduled time. All exams are hard-copied exams taken in class.

- The cumulative final exam covers all topics in the course but will emphasize the material which was covered in the later part of the course.

- In addition to multiple choice questions, the exams will focus on interpreting empirical results from tables and calculating certain statistics.

- I will provide samples of midterms and final exams.

- Make-up exams: There will be no make-up exams unless you have a university-sanctioned schedule conflict. Please notify me at least two weeks before the exam if you have a schedule conflict.

Group Project

In this class, you will have the opportunity to analyze, in R, the correlation between family income and educational attainment in a country of your choice. Data are available at IPUMS International. I will provide you the following RMarkdown file, where you will write your code, report the results and summarize your findings. The due date for the project is midnight, August 7th.

Group work can be highly beneficial for learning since students learn from each other and get superior motivation. Moreover, group work creates skills essential for students' future careers: teamwork is a typical work environment. I recommend that students form groups of two-three people to work together on problem sets and the project. You can register your group *team* in the excel spreadsheet (available here).

Students are free to change the group, split the group, or start working alone at any time (after giving others a notice a week before the next deadline). Please view group work as your resource and learning opportunity, not a must.

Group members may have different grades on this project. The instructor's score counts 70% of your project's grade (grading rubric). In addition, your team members will grade your work on this project (20% of grade) and you will self-evaluate your work (10%) using the following grading forms.

Journal Article Presentation

I will post research papers on different topics: education, labor, crime economics, gender economics, etc. Each group needs to choose one paper and present it. If your group wants to present a paper that uses differences-in-differences, instrumental variables, or regression discontinuity as an estimation strategy other than the ones I listed, please email me with the paper so I can approve it. We will cover Chapter 19 -Carrying Out an Empirical Project- after the midterm exam, and I will provide more details about what I am looking for in this presentation.

You will use RMarkdown to create the slides, and the final presentation is on the last day of class, **August** 4th, during class time. The presentation should not be longer than 30 minutes, including the time for questions from the audience. The grade is based on the instructor's score (80%) and your colleagues' score (20%). The presentation will be graded according to the following: grading rubric.

Tips on being successful in this course

- Before each class: skim the notes from the previous meeting, and after each class: read the book section assigned.

- Ask questions. If you do not seek my help, it is difficult for me to help you.

- Make sure you complete the homework since they are the best practice for the exams.

- Have R running on your computer during the class (or sit next to someone who does).

- Close your email and Internet entertainment and disable all other electronic distractions during class.

Policies

Office Hours

My office hours are on Tuesday and Wednesday from 11:00 am- 12:10 pm. You can schedule office hours using Calendly. Try scheduling them at least 12 hours in advance. Office hours represent an opportunity to discuss any special needs or challenges you face.

Academic Integrity and Honesty

Students are required to comply with the William & Mary College policy on academic integrity found in the The Honor Code. Cheating in exams, homework or any other assignment will not be tolerated. Students found cheating on an exam will be given a score of 0 and will not be replaced with the final exam grade. In addition, they will be reported to the relevant authorities of the university.

Attendance Policy

You are expected to attend class in person unless you have an emergency or the need to isolate or quarantine due to COVID-19. If possible, notify me in advance of the absence or inability to participate. As for any in-person course, attendance and participation are crucial for a complete understanding of course material. I understand that the current crisis of COVID-19 could impact the conditions necessary for you to succeed. My commitment is to be there for you and help you meet the learning objectives of this course. Should you have any concerns about your ability to participate in class, please do not hesitate to reach out. Make sure to adhere to all of the health safety protocols issued by the university. Updates are posted at COVID-19 Response Team Updates. "Please remember to visit Report COVID if you test positive for COVID-19 or are identified as close contact, even if you are vaccinated. Completing the short form puts you in touch with a case manager to help navigate work or study and initiates contact tracing."
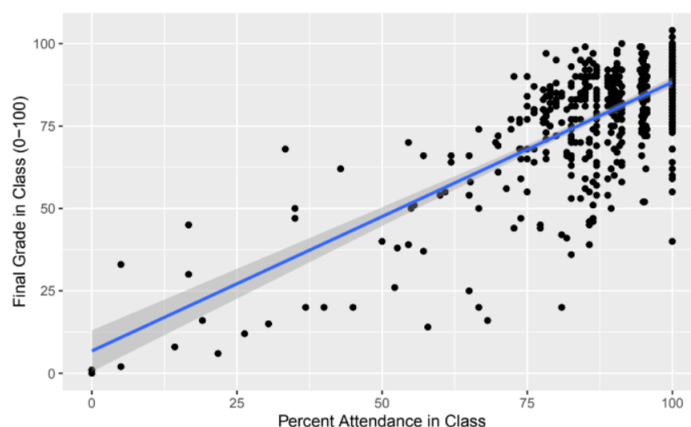

Figure 1: A Scatter Plot of the Relationship between Class Attendance and Final Grade

Accommodations for Disabilities

William & Mary accommodates students with disabilities in accordance with federal laws and university policy. Any student who feels they may need an accommodation based on the impact of a learning, psychiatric, physical, or chronic health diagnosis should contact Student Accessibility Services staff at 757-221-2512 or sas@wm.edu to determine if accommodations are warranted and to obtain an official letter of accommodation. For more information, please see Student Accessibility Services.

Important Dates

July 8th	Last day to add/drop
July 22nd	Last day to withdraw