Econometrics (Econ 308)

Department of Economics
William & Mary

Instructor: Andra Hiriscau

Fall, 2021

Office Hours: Tu-Th 1:00 pm- 2:00 pm
Office: Chancellors 460
or by appointment

Class Hours: Tu-Th 11:00 am- 12:20 pm
Classroom: Chancellors 113
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Course Description and Purpose

This course is an undergraduate-level introduction to econometrics. 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.

For some of you, this may be the only course you take in the subject. It provides a solid foundation for economic analysis and thinking that can last throughout your education and subsequent professional careers. For others, this class may provide a foundation for many years of research in economics, business or related fields. Therefore, the goal of this course is for students to learn a set of statistical tools and research designs that are useful in conducting empirical research on diverse topics.

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 be reflective of 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 of their favorite topic.

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 certain topics in more detail.

Course Materials

The **reference** text for the course will be Introductory Econometrics: A Modern Approach. 7^{th}edition, by Jeffrey M. Wooldridge. The e-book can be rented for a reasonable price. Older editions are equally suitable for this class. A great book for intuition is Introduction to Econometrics by Stock James and Watson Mark. In addition to these textbooks, we will use the following materials, which are available for *free*:
Slides: They will be posted on Blackboard and will follow the material in the textbook.
Additional Reading: Causal Inference. Scott Cunningham, 2021.
Stata Reference: Basic Econometrics with Stata. Carl Moody 2005.

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, please contact me immediately. The grade will be calculated using the following proportions:

- **25%** of your grade will be determined by in-class midterm exam 1
- **25%** of your grade will be determined by in-class midterm exam 2
- **25%** of your grade will be determined by the **cumulative** final exam
- **15%** of your grade will be determined by homework assignments
- **10%** of your grade will be determined by the project

If your score for the final exam is higher than your score for the midterm, then I will replace your lowest 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 twice a week for 1 hour and 20 minutes (per meeting).
- All course materials will be posted on Blackboard. Make sure you check it often. I will post lecture slides, assignments, answer keys and announcements on the page.

Topics

Week	Date	Topic	Reading	Assigment
Week 1	2-Sep	First day of class. Review probabilities and statistics	Appendix: A, B, C Causal Inference: 2.1, 2.2, 2.7, 2.8, 2.9, 2.10	
Week 2	7-Sep	Review probabilities and statistics Introduction to Econometrics	Causal Inference: 2.1, 2.2, 2.7, 2.8, 2.9, 2.10 Chapter 1	
	9-Sep	The Simple Regression Model: Overview	Chapter 2: 2.1	
Week 3	14-Sep	Deriving the Ordinary Least Squares (OLS) Estimators	Chapter 2: 2.2	
	16-Sep	Properties of OLS on Any Sample of Data	Cahpter 2: 2.3	
Week 4	21-Sep	Units of Measurement and Functional Form	Chapter 2: 2.4	Assigment 1- Due
	23-Sep	Expected value and Variance of the OLS Estimator	Chapter 2: 2.5	**Project: Team**
Week 5	28-Sep	The Multiple Regression Model	Chapter 3: 3.1, 3.2, 3.3, 4.6	
	30-Sep	Tests of Single Hypotheses and Confidence Intervals	Chapter 3: 3.4 Chapter 4: 4.1, 4.2, 4.3, 4.4	
Week 6	5-Oct	Testing Hypotheses about a Single Linear Combination of Parameters	Chapter 4: 4.4	Assigment 2- Due
	7-Oct	Testing Multiple Linear Restrictions: The F Test	Chapter 4: 4.5 Chapter 9: 9.1	**Project: Topic- Due**
Week 7	12-Oct	**Review Midterm 1**		Assigment 3- Due
	14-Oct	**Midterm 1**		
Week 8	19-Oct			Fall Break
	21-Oct	Multiple Regression Analysis: Further Issues	Chapter 6: 6.1, 6.2	
Week 9	26-Oct	Multiple Regression Analysis with Qualitative Information	Chapter 7: 7.1, 7.2, 7.3	
	28-Oct	Qualitative Information: Interaction Terms and the Chow Test	Chapter 7: 7.4	
Week 10	2-Nov	Heteroskedasticity: Consequences and Testing	Chapter 8: 8.1, 8.2, 8.3	Assigment 4- Due
	4-Nov	Heteroskedasticity: Corrective Measures for Heteroskedasticity	Chapter 8: 8.4	
Week 11	9-Nov	Panel Data Models	Chapter 13	**Project: Data- Due**
	11-Nov	Panel Data Models: Fixed Effects and Random Effects. Hausman Test	Chapter 14: 14.1, 14.2	
Week 12	16-Nov	**Review Midterm 2**		Assigment 5- Due
	18-Nov	**Midterm 2**		
Week 13	23-Nov	Two-Stage Least Squares	Chapter 15: 15.1, 15.2, 15.3, 15.5	
	25-Nov			Thanksgiving Break
Week 14	30-Nov	Two-Stage Least Squares	Chapter 16: 16.1, 16.2, 16.3	
	2-Dec	Draft Final Paper- Peer Feedback		**Project: Draft- Due**
Week 15	7-Dec	Logit and Probit Models	Chapter 17: 17.1	
	9-Dec	Logit and Probit Models	Chapter 17: 17.1	Assigment 6- Due

Homework

- Homework will be distributed through Blackboard at least one week before the due date. Deadlines are mentioned under the Topics section and it will be update on the Blackboard.
- There will be 6 homework assignments, and the lowest homework grade will be dropped. If you miss an assignment, it will count as your lowest assignment grade and be dropped.

- I encourage you to consult with your classmates, but each student needs to submit their own homework. All computer exercises need to be accompanied by a *do file* and *log file*. Check details about DO and LOG files (you need to download the PDF to access the links).
- You will submit your homework on Blackboard as a PDF file before the class on the due date. The PDF file should be accompanied by a DO and a LOG file. (You need to submit **3 documents** for each homework)
- I will post the solutions for each assignment after the due date, so late work will not be accepted unless agreed upon with the instructor before the due date.
- 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 STATA software.

Exams

- There are three 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 midterm exams are not cumulative.
- The cumulative final exam covers all topics in the course but will emphasize the covered material more recently.
- Exams will focus on interpreting empirical results from tables and calculating certain statistics.
- Make-up exams: There will be no make-up exams unless you have a university-sanctioned schedule conflict. If you have a schedule conflict, please notify me at least two weeks before the exam. If you miss a midterm exam, the final exam will count twice and replace the missed exam grade. If you miss a second exam due to a **documented emergency**, then we will deal with those situations on an individual basis.

Project

In this class, you will have the opportunity to write an empirical analysis paper on your favorite topic. This is a group project. You can register your *team* in the excel spreadsheet (available here). Details about the project can be found here: Project Details.

Software

This course will rely heavily on Stata software during classes, homework and project. Stata is designed as a general-purpose statistical package and has a powerful built-in graphing capability. William & Mary has licenses for 40 concurrent PACLab computers. Stata may be accessed from any PACLab computer or on or off campus by using ssh to stat.wm.edu and logging in with your W&M Username and Password. William & Mary is part of the Grad Plan which offers discounts for the Stata (Annual or Multiyear license). A six-month Stata license can be purchased for $48 from Stata website.

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.
- Download data posted on Blackboard, and have Stata running on your computer during the class (or sit next to someone who does).

Policies

Office Hours

My office hours are on Tuesday and Thursday from 1:00 pm- 2:00 pm. You can schedule office hours using Calendly. Ensure you mention whether you would like to meet in my office or via Zoom, and try scheduling them at least 12 hours in advance. You will use my **Personal Meeting ID (923 687 8319)** to join the scheduled office hours. Office hours represent an opportunity to discuss any special needs or challenges you face. (You can find more information about office hours: Hidden Rules of Office Hours)

Writing Center

Writing Resource Center, located on the first floor of Swem Library, is a free service for W&M students, assisting you in all writing process stages. In addition, consultants can provide constructive feedback on your final project for this class regarding your writing. The WRC's goal is to help you become a better writer and communicator. To make an appointment visit Writing Center Webpage.

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 a 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."

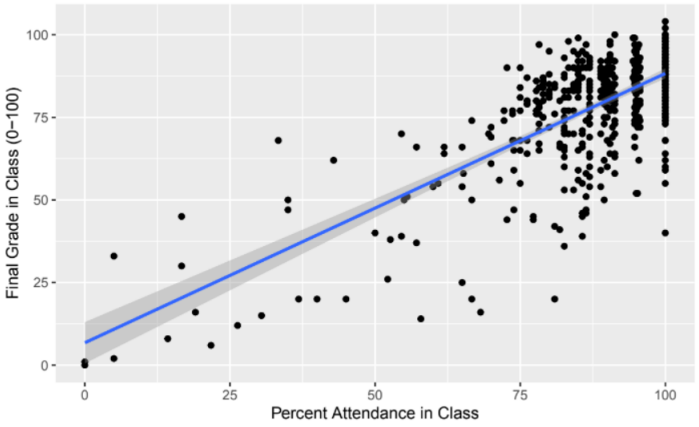

Figure 1: A Scatter Plot of the Relationship between Class Attendance and Final Grade

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.

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

August 31	Add/drop period begins at 1:00 p.m.
September 10	Last day to add/drop
October 1	Deadline to apply for graduation in 2022
December 13-17, 20-21	Final exams
January 3, 2022	Fall final grades due by 9 a.m.