

Analytics for Economics
ECO 304
Spring 2022

The Class:

Time: Tuesday and Thursday 11:50 AM – 1:20 PM
Place: DePaul Center Room 8204 & Flex

Instructor: Yanchao Yang, Ph.D.
Office: 6223 1 E Jackson Blvd
Office hours: Monday, Wednesday: 1:40 PM – 3:40 PM
(or on any day by appointment)
Email: yyang125@depaul.edu

** Coming to my office during office hours is the best way for me to address your questions. If my office hours don't work for you, then we can make an appointment to meet at a time that better fits your schedule. I also do my best to promptly respond to your emails, but make sure you identify yourself with your full name and course number (**ECO304**) when emailing me. Also, please feel free to call me if you ever need anything.
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Course Materials:

Michael A. Bailey, *Real Econometrics: The Right Tools to Answer Important Questions*, 1st or 2nd Edition, Oxford University Press.

Along with this book, I will post detailed notes and occasionally assign articles to read. The notes and readings will be available in PDF format on D2L.

This course will also use the statistical package, Stata. Stata is available on all computers in all computer labs under "statistics/economics" and can be accessed online using the virtual lab. <https://offices.depaul.edu/information-services/services/Software/Pages/Software-for-the-Virtual-Lab.aspx>
However, students should strongly consider purchasing a 6 (12) month license of Stata BE, which costs \$48 (\$94). It is available at: <https://www.stata.com/order/new/edu/profplus/student-pricing/>.

Course Objectives:

What separates economics from most other social sciences is that our discipline begins with a few basic assumptions and utilizes these as building blocks for models of behavior. Models are only useful if they can be tested and economists have developed a large toolkit of statistical models that are used to test these theories and estimate economic parameters. The workhorse statistical model in the social sciences is the ordinary least squares (OLS) regression. The bulk of the course will be based around teaching you how to use OLS regressions to answer important questions related to economics, economic policy, and business. Indeed, regression analysis is also increasingly used by businesses to evaluate

business decisions and forecast demand. Thus, we will develop a broad understanding of regression and the different ways it is being used. The course will not, however, just be an abstract exercise. For each topic, we'll also incorporate readings that demonstrate the usefulness of the technique and integrate real data to allow you to perform your own empirical analysis. To perform these empirical analyses, we will use Stata, a statistical software package frequently used by economists. Familiarity with this software is not a prerequisite. We'll hold several classes to teach you how to use the software and I will provide sample code to get you started on each of the exercises.

Learning Outcomes:

- Understand and apply the linear regression model to applications in economics and business
- Perform, interpret, present, and write about one's own empirical analyses
- Clean real-world data and further develop data presentation skills
- Develop statistical programming skills using Stata

Prerequisites:

ECO 105, ECO 106, and MAT 137 (or equivalent).

I have put together a 20 page review of the basic statistics that you need for this course. It is available on D2L. This handout goes over most of the important concepts that will be used this semester such as expected values, covariance, correlation, linear combinations of random variables, and hypothesis testing. We will review these concepts over the course of the quarter.

Familiarity with the software package, Stata, is NOT a pre-requisite. It is quite easy to use. Additionally, I will include instruction and lessons about how to use the software

Classroom Etiquette

Please make sure to show up to class on time as I will start each class promptly at **11:50 AM**. If you do have to be late, then please immediately sit down when you arrive so that you don't further disrupt the class. Please bring something to write with, paper, your cell phone and/or computer, and an enthusiastic and eager mind with you to every class. You do not need to bring the textbook with you to class everyday (but please feel free to do so if it helps you learn). You may also find it helpful to bring a simple calculator (one without programming capabilities) with you to class, but it is not required.

It is my goal to foster an interactive and energetic learning environment and so I encourage you to participate and ask questions. However, please do not engage in excessive talking when it is obviously inappropriate as it can distract myself and your fellow students, causing us to miss out on the knowledge and answers that we so desperately seek. Also, please make sure you are not inappropriately using your cell phone or any other communicative device. This means no text messaging during class. If you anticipate an emergency and need to leave class early for any reason, please sit in the back rows so that you may exit quietly. If you are not prepared to meet these requirements, then

please do not attend class as you will devastate the learning potential of your fellow classmates.

Grading:

Assignments	Weight	Grading Scale	
Problem Sets (5)	25.00%		
Midterm	30.00%	A	91.0% - 100.00%
		A-	89.5% - 90.99%
Final Project	30.00%	B+	88.0% - 89.49%
		B	81.0% - 87.99%
Class Participation	15.00%	B-	79.5% -80.99 %
Total	100.00%	C+	78.0% - 79.49%
		C	71.0% - 77.99%
		C-	69.5% - 70.99%
		D+	68.0% - 69.49%
		D	61.0% - 67.99%
		D-	59.5% - 60.99%
		F	< 59.5%

I will post scores and points from classroom assignments on D2L as quickly as possible after class. You will have *one week* from the posting date to appeal or correct that information. After that, no adjustments will be allowed for any reason. It is your responsibility to monitor your grades on a regular basis*.

Assignments:

Problem Sets (100 points):

Five problem sets will be assigned during the quarter. These problem sets are designed to gauge your understanding of the concepts discussed in class and your ability to apply the material. The problem sets will have four types of questions. The first are "pencil-to-paper" where you are asked to calculate an estimate, derive an equation, or discuss the implications of a set of assumptions. The second are "interpretation" questions where you are asked to interpret a set of results. The third are "read and reply" questions related to a course reading. And lastly, the fourth are "estimate and analyze" questions where you will be given a data set and asked to generate and interpret statistical output using Stata.

You are encouraged to work in groups of 2 on the problem sets. I will accept late problem sets, but they will be marked down 5 percent for each day they are late (up to 3 days).

* In the interest of saving time and satisfying student preferences, I anticipate returning exams by allowing students to claim them from a folder at the front of the room. There is a chance that other students may see your exam as they pick up their assignments. If this makes you uncomfortable in any way then please advise me and I will remove your assignments from the folder and we can make a different arrangement for you to pick them up.

Problem sets not be accepted more than 3 days after the due date as I will post the answers to D2L at that point.

Midterm Exams (100 points):

The midterm for this course will be held at the beginning of week 7. It will count for 30% of your final grade. I expect that it will cover Topics 1-5. As of now, it is expected to be an in-class exam. I will allow students to take it remotely, but you will need to take it with your camera on and during class time. You will then have 5 minutes, once the class is finished to post your answers to D2L. The midterm will not require students to work with data, but you will likely be required to interpret regression results (among other things). More details and information will be provided in the week prior to the exam.

Final Project (100 points):

The final assignment for this class will be an empirical project, which will bring together everything you have learned in the class. It is due on 6/7/2022 by the midnight. The gist of the assignment is that I will provide you with a few possible questions to address and data associated with each question. Each student will choose to address one of the possible topics, use the associated data to best answer the question, and then write-up their analysis, findings, and conclusions. As such, the final project must include a statement of your research question, a description of your data, an explanation of your empirical approach, and a description of your results. Grades on the final project will be based on the quality/clarity of the writing, the justification for the empirical model you estimate, the quality/clarity of the empirical tables and figures of your analysis that you present, and the accuracy with which you interpret your statistical models. More information about the project will be provided later in the quarter.

Suggestions for studying:

It is recommended that you read the chapter before we go over it in class. If this is not feasible given your time constraints then you should at least look over the key words and chapter summary (if you don't have a copy of the textbook, the book and class PowerPoint slides are located on our D2L course site for your convenience). It is also important that you come to class and take notes as the material on the tests will come from the lectures (again, coming to class is probably the most important step toward doing well in this course). If time allows, I would also recommend re-writing or typing your notes as soon as you can after class to reinforce your understanding of the material (this was the most valuable tip I received for success in my college classes as a young undergraduate). I have also posted practice questions as a way for you to test yourself and see if you are understanding the material. It is recommended that you do them as we progress through the class. Finally, please see me if you feel lost or have any questions regarding the class. It is my job to make sure that you get the most you can out of this course, so I am always more than happy to meet with you.

Tentative Course Outline

I. Introduction: Moving from Correlation to Causation (Week 1)

Readings: Bailey, Chapter 1-2
Applications: Estimating the price elasticity of demand

Do police lower crime?

II. The Bivariate Regression Model: Estimation, Interpretation, and Inference (Week 2-3)

Readings: Bailey, Chapter 3-4
Detailed notes posted to D2L

Applications: Does greater healthcare spending improve health outcomes? How does college completion affect earnings?

Additional Concepts: True model vs. Estimated model Omitted Variable Bias

III. Multivariate Regression Model: Estimation, Interpretation, and Inference (Week 4-5)

Readings: Bailey, Chapter 5
Detailed notes posted to D2L

Applications: How much does another bathroom increase the sale price of your house? Do smaller class sizes lead to better schooling outcomes?

Additional Concepts: Type I vs. Type II error Unbiasedness

IV. Dummy Variables (Week 5)

Readings: Bailey, Chapter 6
Applications: How large is the gender wage gap? Additional Concepts: Intercept vs. Slope effects

V. Specifying Models (Week 6)

Readings: Bailey, Chapter 7
Applications: What are the returns to education?

How much regional variation is there in economic growth? Additional Concepts: Linear vs. Quadratic Effects

VI. Limited Dependent Variable Regressions (Week 7)

Readings: Bailey, Chapter 12
Applications: Is there racial discrimination in access to public services?

What determines who dies from Covid-19?

VII. Using Regression as a Predictive Tool and Forecasting (Week 8-9)

Readings: Bailey, Chapter 13

Applications: Forecasting Real Estate Prices

Inventory management of perishable foods at Supermarkets

VIII. Business Application of Regression Analysis (Week 10)

Readings: TBD

Applications: Weather and Retail Sales: Should rain affect staffing?

Advertising and sales: Natural experiments from Super Bowl match-ups

Academic Integrity

For all of your papers and assignments, please make sure that your work is original! Please understand that intentionally copying another person's paper or submitting someone else's work as your own is considered cheating and is against the academic integrity policies and procedures here at DePaul. All students involved in such behavior will automatically lose all points for that assignment, and will be subject to any additional penalties as outlined by the administration at the DePaul University

Please don't cheat as there is no reason for it. I will be more than happy to help you with any problems you may have in the class.

Students with Disabilities

Students with disabilities who wish to request special accommodations are encouraged to contact me via email, during office hours, or by appointment, and I will be happy to help you in any way that I can. Please understand that the earlier you contact me, the more I will be able to accommodate you for the course.