ECO 375: Introduction to Econometrics
Winter 2021
DePaul University - Department of Economics

Time: Monday 1:30-3:00pm (and one asynchronous session) Brian J. Phelan, Ph.D.
Room: Zoom bphelan2@depaul.edu
Office Hours: Wednesday 2:00-3:00 (or by appointment) DePaul Center, Room 6209

Textbook:

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. However, students should strongly consider purchasing a 6 (12) month license of Stata IC, which costs $48 ($94). It is available at: https://www.stata.com/order/new/edu/profplus/student-pricing/.

Course Description:

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. 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 and economic policy. However, 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 in the computer lab 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 in Week 1, but then continue to use it as a resource.

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

Assessment of Students:

Problem Sets (4):	20%
Midterm 1:	25%
Midterm 2:	20%
Final Project:	25%
Class Participation:	10%

Assignments:

Problem Sets: Four 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 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. Problem set answers should be turned in at (or emailed to me by) the beginning of class on the day they are due. I will accept late problem sets, but they will be marked down 5 percent for each day they are late (up to 3 days). Problem sets not be accepted more than 3 days after the due date as I will post the answers to D2L at that point.

Midterms: There will be two midterms for this course. The first one will be time limited and due during week 6. It will count for 25% of your final grade. I expect that it will cover Topics 1-5. The second one will be a take-home midterm and due at the beginning of week 10 and will count for 20% of your final grade. I expect that it will cover Topics 6-9. While the second midterm will not technically be cumulative, understanding the material in the first part of the class is essential to understanding the material in the second part of class.

Final Project: 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 3/17/21 at 8pm. More information about the project will be given later in the quarter but the gist of the assignment is that I will provide you with several 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.

Important Dates:

Problem Set #1 Due:	01/13/21
Problem Set #2 Due:	01/25/21
Problem Set #3 Due:	02/08/21
Midterm #1:	02/10/21
Problem Set #4 Due:	02/24/21
Midterm #2:	03/08/21
Final Project Due:	03/17/21

Syllabus: ECO 304

I. **Introduction and Statistics Review (Week 1)**
> Readings: Detailed notes posted to D2L
>> Math and Probability Appendix in Bailey

II. **Moving from Correlation to Causation (Week 2)**
> Readings: Bailey, Chapter 1-2
> Applications: The effectiveness of Supplemental Instruction at DePaul.
>> Do police lower crime?

III. **The Bivariate Regression Model: Estimation, Interpretation, and Inference (Week 3-4)**
> Readings: Bailey, Chapter 3-4
>> Detailed notes posted to D2L
> Applications: Does greater healthcare spending improve health outcomes?
>> How does education affect earnings?
> Additional Concepts: True model vs. Estimated model
>> Omitted Variable Bias

IV. **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

V. **Dummy Variables, Interaction Terms, and Nonlinearities (Week 6)**

Readings: Bailey, Chapter 6-7

Applications: How large is the gender wage gap?

How much regional variation is there in economic growth?

Additional Concepts: Intercept vs. Slope effects

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: Determining Coronavirus deaths from excess deaths

Inventory management of perishable foods at Supermarkets

VIII. **Business Application of Regression Analysis (Week 9-10)**

Readings: TBD

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

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

Is it profitable to raise prices? Estimating your price elasticity of demand.

Additional Expectations:

Academic Integrity: Work done for this course must adhere to the University Academic Integrity Policy, which you can review in the *Student Handbook* or by visiting Academic Integrity at DePaul University (http://academicintegrity.depaul.edu).

Respect: The classroom is a place for learning. This is best achieved by asking questions, thinking out loud, and even making mistakes. Please treat all of your classmates with respect - we will all struggle at some point or another. If anyone has concerns about the behavior of other people in the class, come see me right away.

Timeliness: All assignments are due as posted in this syllabus. If you foresee a problem with a due date (or midterm date), see me in advance and I may grant you an extension. All unapproved late submissions will be marked down.