ECO 4421: Econometrics
(Probability and Statistics for Economists)

Instructor: Xi Zhang   **Spring 2023**

Email: cathyzx@ufl.edu

Office: MAT 324

Course Time and Location

Mon/Wed   11:45AM – 1:40PM (Periods 5 & 6)   MAT 103

Office Hours

Mon: 4:00PM – 5:00PM in person
Thursday: 4:00PM – 5:00PM on ZOOM

Course Description

ECO 4421 introduces students to the **theoretical concepts of probability and statistics** that form the core of econometrics. The course emphasizes on understanding theoretical concepts and techniques that are used by economist to estimate economic relationships and evaluate economic policy. The first part of the course will focus on probability and statistics. In the last month of the course we will apply the theoretical concepts to practical problems in economics. We will discuss three different applications; (i) an application in education economics (the causal effect of class size on student performance), (ii) an application in labor economics (the causal effect of education on wage), and (iii) an application in development economics (the causal effect of providing fertilizers to farmers in developing countries).

The course has the following objectives:

1. Learn the fundamental concepts of probability and statistics.

2. Learn the intuition of general statistical concepts; standard errors, hypothesis testing, and confidence intervals.

3. Learn to disentangle causation from correlation.

4. Learn the basic of the R statistical programming language.

5. Learn the basics of working with data.

6. Understand the benefit of randomized controlled trials.

This course will be divided (unevenly) into three parts:
Part 1: R and probability.
Part 2: Statistics.
Part 3: OLS and causality.

Prerequisites

The prerequisites for this course are: ECO 2013 & ECO 2023 & ECO 3101.
This course will introduce probability and statistics from the beginning, but students are expected to be familiar with basic concepts of probability and statistics, like integration. To refresh yourself, feel free to read through Appendix A, B, C in the Wooldridge textbook. If you are not familiar with the material, you should take the time out of class to review the materials in detail.

Textbook and Readings

The lectures are self-contained and the required reading is to study each lecture before the next since each lecture builds on the previous one.
It is more important to study the lecture notes, but if you find something confusing in the lecture notes, you might find some of the material from the lecture notes covered in the two optional textbooks below:

1. Stock & Watson, *Introduction to Econometrics* (4th edition), published by Pearson.

2. Wooldridge, *Introductory Econometrics: A Modern Approach* (7th edition), published by Cengage Learning.

Software and Programming

Several of the problem sets will involve simulations and empirical analysis and will require the use of a statistical software. R is the statistical software for this course. I highly recommend that you use RStudio (https://rstudio.com) as it is more user-friendly way of using R. You are *not required* to have any prior knowledge of R or other programming experience, but you must be willing to learn. R & RStudio are installed in many computers on campus (e.g., Marston Science Library). You can easily install R on your personal computer. R is free (open source) and available for Windows, Mac, and Linux. To download R, go to https://www.r-project.org/. You are encouraged to work with other students on the problems sets, but each student must write her/his own answers.

Assignments

There will be several problem sets in this class. Please follow the following minimal guidelines:

1. Write legibly.

   - For the students that intend to pursue graduate school, I recommend LaTeX. LaTeXis free (open source) and it is a high-quality typesetting system; features designed for the production of technical and scientific documentation, and it is available for Windows, Mac, and Linux: https://www.latex-project.org/get/

2. Please stable your problem sets if needed.

3. Turn in problem sets at the beginning of class. It is not fair to others if you return them in later.

4. Show your work. Even if you get the correct answer, you will often be penalized many points if you don't show your work for how you arrived at an answer.

5. You are encouraged to work with other students on the problem sets, but each student must write up their answer separately. The should not be any part of your problem set that is the same or just a rewording of what someone else wrote.

6. For problem sets requiring a computer, it is up to you to take the necessary precautions to find a way to turn the problem set in on time. It is your responsibility to turn in the problem sets on time even if your computer crashes or your internet stops (these are not valid excuses). Have always a backup plan, for example use the library computers to get access to the internet and always backup your work to protect against any unforeseen circumstances. To be clear, I won't accept any excuse for late submission or no submission at all.

Exams

There will be three exams. The exams will be held in the same location where we meet for class. The tentative dates for the exams are as follows:

- **Exam 1: Monday, February 8th**

- **Exam 2: Monday, March 6th**

- **Exam 3: Monday, April 24th**

If you have a conflict with an exam date (e.g., a religious holiday), please e-mail me by the end of the first week of classes.

Grades

Your final grade will be calculated as follows:

Exam 1	15%
Exam 2	25%
Exam 3	30%
Assignments	30%
Total	100%

You letter grade will be determined as follows:

93-100	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
67-69	D+
60-66	D
0-59	E

Attendance Policy and Behavior

Irregular attendance or inattentiveness will most likely result in a substantial reduction in course performance. Econometrics requires participation and attention. Please shut off or put away lap- tops, tablets, ipods, phones and other electronic devices or toys during class, unless asked otherwise. Also notify me if you will be absent from class. I adhere to the UF attendance policy, described in detail at https://catalog.ufl.edu/ugrad/1617/regulations/info/attendance.aspx.

There will be no class and no office hours in the following date:

- January 16th Monday (Martin Luther King Day)

- March 13th Monday (Spring Break)

- March 15th Wednesday (Spring Break)

Student Responsibility

Enrollment in this course constitutes acknowledgment of the following:

1. I understand that the University of Florida expects its students to be honest in all of their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action, up to and including expulsion from the University.

2. I will adhere to university copyright policies as found at http://guides.uflib.ufl.edu/copyright/.

3. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

Course Outline

All course schedule and assignment schedule are listed below: (Please be advised that the schedule is tentative and subject to change while we proceed.)

Week 1	Syllabus
	Math Review: Summation Operator
	Assignment 1
Week 2-3	Introduction to R
	Assignment 2
Week 4-5	Probability with one random variable
	Stock and Watson, Chapter 2 / Wooldridge, Appendix B
	Assignment 3
Week 6	Exam 1 and review
Week 7-8	Probability with multiple random variables
	Stock and Watson, Chapter 2 / Wooldridge, Appendix B
	Assignment 4
Week 9	Exam 2 and review
Week 10	No Class
Week 11-12	Statistical Inference
	Stock and Watson, Chapter 3 / Wooldridge, Appendix C
	Assignment 5
Week 13-14	Simple Regression
	Stock and Watson, Chapter 4 / Wooldridge, Chapter 2
	Assignment 6
Week 15	Simple Regression: Hypothesis Tests and Confidence Intervals
	Stock and Watson, Chapter 5 / Wooldridge, Chapter 6
Week 16	Exam 3 and review