

Syllabus

ECO 4421: Econometrics (Probability and Statistics for Economists)

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Course Time and Location

Section 0409: T/R 13h55 — 15h50 (Periods 7 & 8). Location: MAT 119

Class will typically end 10 minutes before the end of the period. However, please keep your schedule open in case we need to use the full time for a particular day.

Office Hours

Eli Nir (TA): to be determined
Professor Kostyshak: T/R 15h40–16h40 in MAT 119 (same room where we have class)
Please email in advance if planning to arrive to OH after 15h50.

Course Description

ECO 4421 introduces students to the theoretical concepts in probability and statistics that form the core of econometrics. The emphasis is on understanding the theoretical concepts that are used by economists to estimate economic relationships and to evaluate policy. The first part of the course focuses on basic probability and statistics. In the last month of the course we apply the theoretical concepts to practical problems that are important in economics. We will discuss an application in development economics (the causal effect of providing fertilizer to farmers in developing countries), an application in labor economics (the causal effect of education on wage), and an application in education economics (the causal effect of class size on test scores). We focus on disentangling causation from correlation, but also discuss other uses of statistics in economics, such as prediction.

The course has the following objectives:

1. Learn fundamental theoretical concepts in probability.
2. Learn the practical *intuition* of general statistical concepts, including standard errors, hypothesis testing, and confidence intervals.
3. Learn to disentangle causation from correlation.

4. Learn the basics of the R statistical programming language.
5. Learn the dangers of relying on assumptions that do not typically hold in economics (e.g., correlation with the error term).
6. Learn to use simulation in R to get hands-on practice with theoretical concepts (such as the Law of Large Numbers), and to explore the consequences of incorrect assumptions.
7. Learn the basics of working with data, being aware of practical issues such as violations of missing-at-random.
8. Understand selection bias and how to interpret results accordingly.
9. Understand the benefit of randomized controlled trials.

Prerequisites

The prerequisites for this course are: ECO 2013 & ECO 2023 & ECO 3101.

This course will introduce probability and statistics *from the beginning*. Econometrics is probability and statistics for economists, so if you've already taken a rigorous probability and statistics course, you might be bored in this class and you might consider taking a different class (e.g., in the statistics department). Although many students have taken a "statistics" class before, the most common background of students in ECO 4421 is a statistics class that used formulas without really understanding them. In this class, we will develop a strong theoretical understanding of what a standard error is and what a confidence interval is, not just how to calculate them from a formula.

If you look through the Stock & Watson textbook chapters 2 and 3 on probability and statistics, and you already understand that material, you might consider taking a different class.

This class will be divided roughly into three parts:

Part 1: Probability and learning R.

Part 2: Statistics.

Part 3: Causality and working with data.

Textbook and Readings

The textbook for this course is Stock & Watson's *Introduction to Econometrics* published by Pearson. You may use the third edition, the "updated" third edition, or the fourth edition.

Please keep in mind the following two points:

1. You will be responsible for material from class that is not covered in the textbook.
2. You will be responsible for material from the textbook that is not covered in class.

In other words, it is required to understand the readings and to understand the lectures.

Optional Textbook

A separate textbook, which is not required, but covers much of the same material, is J. M. Wooldridge, *Introductory Econometrics: A Modern Approach* (sixth edition), South-Western Publishing. If a topic is confusing in lecture, and it is not cleared up by Stock & Watson, consider reading the corresponding section in Wooldridge.

Software and Programming

Some of the assignments in the course will involve simulation or empirical analysis and will require the use of a statistical software. R is the statistical software for this course. You will likely find RStudio to be a more user-friendly way of using R. You are not required to have any knowledge of R or other programming experience, but you must be willing to learn. R and RStudio are already installed on many computers around campus (e.g., Marston Science Library), as well as on UF apps: <https://info.apps.ufl.edu/published-applications/>. You can also 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/>. To download RStudio, go to: <https://www.rstudio.com/products/rstudio/download/> and download the free “RStudio Desktop Open Source License” version.

You are encouraged to work with other students on the problem sets involving R, but each student must write up his or her answers separately.

Assignments (= “Problem Sets”)

There will be six or seven problem sets. Please follow the following minimal guidelines for the assignments:

1. Write legibly or use software that can write math.
 - (a) I recommend LyX (or LaTeX in general). LyX is free (open source) and can produce professional quality documents containing math, using the powerful LaTeX typesetting engines. LyX is free and available for Windows, Mac, and Linux: <https://www.lyx.org/Download>
2. Staple your problem sets if needed (otherwise -3 points). I do not bring a stapler. This is your responsibility.
3. Turn your problem sets in at the very beginning of class. It is not fair to others if you turn them in later.
4. For problem sets involving a computer, it is up to you to take the necessary precautions to find a way to turn the problem set in on time. If your computer crashes, or the internet stops working for you and you cannot turn it in on Canvas before the deadline, these are not valid excuses. Turn the problem set in early to avoid these problems, or have a backup system and plan: for example, go to the library to get internet access; and use backup software to protect against the possibility of your computer crashing. In summary, I will not accept the virtual analog of “my dog ate my homework” as a valid excuse.

5. If you have questions regarding the problem set, please either go to the TA's OH, or send emails to the TA. The TA is responsible for grading the problem sets, so to be sure about what the criteria is, ask him.

Exams

There will be three exams. The location and times of all exams are the same as our normal class location and time. The tentative dates for the three exams are as follows:

Exam 1: Thursday, 23 January
Exam 2: Thursday, 27 February
Exam 3: Tuesday, 21 April

If you have an excused conflict (e.g., a religious holiday) with any ECO4421 class this semester, or if you have two other exams on one of the exam dates listed above, please email me by the end of the first week of class.

Other Important Dates

Grades

Your final grade will be calculated as follows:

Exam 1	15%
Exam 2	25%
Exam 3	30%
Participation	5%
Assignments	25%
Total	100%

A high participation grade can be obtained by asking and answering questions in class.
Your final 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/1718/regulations/info/attendance.aspx>.

Student Responsibility

Enrollment in this course constitutes acknowledgement 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

1. **Summation Operator**
2. **Probability**
Stock and Watson, Chapter 2
Wooldridge, Appendix B
3. **Introduction to R**
4. **Review of Statistical Inference**
Stock and Watson, Chapter 3
Wooldridge, Appendix C
5. **Simple Regression**
Stock and Watson, Chapter 4
Wooldridge, Chapter 2
6. **Regression: Hypothesis Tests and Confidence Intervals**
Stock and Watson, Chapter 5
Wooldridge, Chapter 4
7. **Linear Regression with Multiple Regressors**
Stock and Watson, Chapter 6
Wooldridge, Chapter 3
8. **Inference with Multiple Regressors**
Stock and Watson, Chapter 7
Wooldridge, Chapter 4

9. **Dummy Variables and Interaction Terms**

Stock and Watson, Chapter 8

Wooldridge, Chapter 7

Changelog

Here I will list any important changes made to the syllabus.

- v1 (2020-12-22): the initial syllabus.