

## **ECON 571 - Advanced Econometrics**

Spring 2023

### Syllabus

#### **Course Time and Location**

Time: Mondays and Wednesdays, 11h15am-12h30pm.

Location: Peabody 3018.

#### **Instructor**

Instructor: Valentin Verdier

email: vverdier@email.unc.edu

Office hours (may change): Gardner Hall 110, Mondays, 2h45pm-3h45pm, and Wednesdays, 2h45pm-3h30pm.

#### **Textbook**

*Introductory Econometrics*, edition 4, 5, 6, or 7, Jeffrey Wooldridge, Thomson SouthWestern 2009, 2012, 2015, 2018, or 2021. This is an excellent textbook that is a useful reference to keep. The newest edition is expensive, but you can buy a used older edition for not too much money. (Used 6th edition in paperback: currently \$13.30 on Amazon.)

#### **Statistical Software**

In this course we will use both statistical software packages STATA and R. R is free and we will go over how to install it properly on your machine at the beginning of the year. Stata can be purchased with a 6 months student license (<https://www.stata.com>). The version: Stata/BE is sufficient for this course, and is priced at \$48). Both R and STATA can also be accessed from library computers and from the virtual lab, but note that you do need reliable access to both throughout the semester, so you may wish to have access to both on your own computer. You can contact the UNC library system or UNC ITS if you have issues with

accessing Stata or R. Issues with access to Stata or R will not be accepted as an excuse for not turning in a problem set or other assignment.

## **Course Objectives**

The objective of this course is to build up skills and knowledge of econometric methods from ECON 470, Introductory Econometrics. We will start with a review of the center piece of ECON 470: linear regression models, and will consider three new directions: (1) Non-linear models, (2) Advanced models of panel data, (3) quasi-experimental methods in econometrics (matching/inverse propensity score weighting/regression adjustment, Difference in differences, and regression discontinuity design) and their connections to the models discussed in parts 1 and 2.

At the end of the semester, students should expect to have further developed their ability to articulate the suitability of various econometric approaches to particular empirical questions and their ability to learn quickly about new methods not explicitly covered in the course. In addition, students should expect to have expanded their understanding of the implementation of econometric methods in STATA and R.

Much like ECON 470, this course will be centered around methodological questions, and not empirical applications. Of course, we need empirical examples to contextualize and interpret the new models that we will be discussing, but this will not be a course with extensive empirical investigations. Instead, most of our time and effort will be spent on understanding the theory underlying the new topics we will discuss. In addition, we will also deepen our ability to implement econometric methods. This will mainly be done in a running assignment throughout the semester that will ask students to exactly replicate outputs obtained using Stata with outputs obtained using R. This will require that students “open the black box” that is Stata, to understand the inner workings of each command and replicate these commands in R.

Hopefully this description makes it clear that this is a course that must be taken with a continuous effort throughout the semester to assimilate new material throughout the semester.

Understanding the concepts taught here will require a lot of practice. This is a technical course, and the key to success is to keep up with the material covered in lecture throughout the semester and to practice as much as possible using the problem sets and the additional exercises posted on Sakai. If you feel like you are lost and not understanding particular concepts, I promise that you are not the only one! Ask for clarifications and help during lecture or during office hours, and the course will become easier and easier as you work through these hurdles.

### **Course Requirements**

There will be around five problem sets. There will also be two midterm exams and a final exam. All exams will be in-class and closed book. Dates for the exams will be announced during lecture as they will depend on how much time is spent on each part of the material. The final exam will take place during the time slot allocated by the registrar's office. Students will also hand in write-ups and present on a running assignment that will have students build an “instruction manual” on replicating results from STATA in R. Detailed instructions will be provided throughout the semester.

The grades will be weighted as following:

10% Problem set

22.5% First midterm

22.5% Second midterm

15% Stata vs. R assignment

30% Final

The final grade will be determined by the following table:

Final Grade	From	To
4.0	93.00%	100%
3.7	90.00%	92.99%
3.3	84.92%	89.99%
3.0	81.67%	84.91%
2.7	78.42%	81.66%
2.3	74.08%	78.41%
2.0	70.83%	74.07%
1.7	67.58%	70.82%
1.3	63.25%	67.57%
1.0	60.00%	63.24%
0.0	0.00%	59.99%

### Prerequisites

ECON 400, 410, and ECON 470 or 570; a grade of C or better in ECON 400 and 410 is required.

### Additional notes

This course will abide by university academic policies, which are listed below. In addition, university-level student support and resources apply to this course as well.

Here I also wanted to stress that, if you have any question about this course, you can feel free to contact me! It is easier to troubleshoot issues earlier in the semester than later if possible. If you are unsure about your standing in the course, have questions about course content/assignment/organization, or would like to discuss accomodations you may need, please let me know about it and I would be happy to discuss these with you.

## Course outline and reading list

### Introduction

#### **Part 0: Review of linear regression models (around 2 weeks)**

Lecture notes and chapters 2-4.

#### **Part 1: Non-linear models (around 4 weeks)**

##### **Maximum likelihood estimation**

Lecture notes and chapter 17.

##### **Binary choice models**

Lecture notes

#### **Part 2: Advanced panel data models (around 4 weeks)**

##### **Review of fixed effects models**

Lecture notes, chapters 13 and 14 and chapter 17.

##### **Random coefficient models**

Lecture notes

##### **Dynamic models of panel data**

Lecture notes

#### **Part 3: Quasi-experimental methods (if time permits)**

##### **Regression adjustment/matching/inverse propensity score weighting**

Lecture notes

##### **Difference-in-differences**

Lecture notes

##### **Regression discontinuity design**

Lecture notes

## **Academic policies**

### **Attendance:**

University policy: No right or privilege exists that permits a student to be absent from any class meetings, except for these University Approved Absences:

- Authorized University activities
- Disability/religious observance/pregnancy, as required by law and approved by Accessibility Resources and Service and/or the Equal Opportunity and Compliance Office (EOC)
- Significant health condition and/or personal/family emergency as approved by the Office of the Dean of Students, Gender Violence Service Coordinators, and/or the Equal Opportunity and Compliance Office (EOC). Additional information is available at the University Approved Absence Office.

Class Policy: As you will see, attendance in lecture for this course is very important for the students' ability to do well. Please let me know if you cannot attend lecture. If this is a repeated issue, we may have to discuss your ability to complete the course to your degree of satisfaction. The class policy as it relates to assignments and exams is listed below.

**Conduct:** Please respect your fellow students by behaving professionally. This includes arriving on time, not leaving class unnecessarily, and not distracting others.

**Course delivery:** This course will be meeting in person.

**Honor code:** All students are expected to follow the guidelines of the UNC honor code. In particular, students are expected to refrain from "lying, cheating, or stealing" in the academic context. If you are unsure about which actions violate that honor code, please see me or consult honor.unc.edu.

**Late assignments:** Assignment due dates are firm. I know that things like personal emergencies or computer problems may prevent you from submitting an assignment, which is why I drop the lowest assignment score before computing your assignment average. Exceptions to this policy will generally only be made if you accumulate a significant number of University

Approved Absences.

**Missed exams:** If you miss a midterm exam and you have a University Approved Absence, I will replace the grade on that exam with the average of your other exam grades. For the final exam, the university policy is that you may only take the exam outside the scheduled time if you have an official final exam excuse, and requests involving religious observance or a scheduling conflict must be made no later than the final day of classes. Exams missed without an official excuse or an approval from the instructor will generally receive a grade of zero.

**Syllabus changes:** I reserve the right to make changes to the syllabus, including assignment due dates and exam dates. These changes will be announced as early as possible.

### **Academic resources and student support**

**Accessibility Resources and Services:** The University of North Carolina at Chapel Hill facilitates the implementation of reasonable accommodations, including resources and services, for students with disabilities, chronic medical conditions, a temporary disability or pregnancy complications resulting in barriers to fully accessing University courses, programs and activities. Accommodations are determined through the Office of Accessibility Resources and Service (ARS) for individuals with documented qualifying disabilities in accordance with applicable state and federal laws. See the ARS Website (<https://ars.unc.edu/>) for contact information or email [ars@unc.edu](mailto:ars@unc.edu).

**Counseling and Psychological Services:** CAPS is strongly committed to addressing the mental health needs of a diverse student body through timely access to consultation and connection to clinically appropriate services, whether for short or long-term needs. Go to their website(<https://caps.unc.edu/>) or visit their facilities on the third floor of the Campus Health Services building for a walk-in evaluation to learn more.

**Title IX resources:** Any student who is impacted by discrimination, harassment, interpersonal (relationship) violence, sexual violence, sexual exploitation, or stalking is encouraged to seek resources on campus or in the community. Reports can be made online to the EOC. Please contact the University's Title IX Coordinator (Elizabeth Hall, interim, [titleixcoordinat](mailto:titleixcoordinat)

tor@unc.edu), Report and Response Coordinators in the Equal Opportunity and Compliance Office (reportandresponse@unc.edu), Counseling and Psychological Services (confidential), or the Gender Violence Services Coordinators (gvsc@unc.edu; confidential) to discuss your specific needs. Additional resources are available at safe.unc.edu.

This course meets the "Research and Discovery" objective of the IDEAs in action curriculum. Student immerse themselves in a research project and experience the reflection and revision involved in producing and disseminating original scholarship or creative works.

#### Questions for Students

1. How do I establish my point of view, take intellectual risks, and begin producing original scholarship or creative works?
2. How do I narrow my topic, critique current scholarship, and gather evidence in systematic and responsible ways?
3. How do I evaluate my findings and communicate my conclusions?

#### Learning Outcomes

1. Frame a topic, develop an original research question or creative goal, and establish a point of view, creative approach, or hypothesis.
2. Obtain a procedural understanding of how conclusions can be reached in a field and gather appropriate evidence.
3. Evaluate the quality of the arguments and/or evidence in support of the emerging product.
4. Communicate findings in a clear and compelling ways.
5. Critique and identify the limits of the conclusions of the project and generate ideas for future work