

ECON 4261: COURSE SYLLABUS

- INSTRUCTOR : Sergi Marín Arànega
 - OFFICE : 3-161 Hanson Hall
 - EMAIL : marin236@umn.edu
 - OFFICE HOURS : 9:00 am - 11:00 am, Thursday
or by appointment

- RECITATION LEADER : Ji-Heum Yeon (section 02)
 - OFFICE : 3-137 Hanson Hall
 - EMAIL : yeonx012@umn.edu
 - OFFICE HOURS : 11:30 am - 12:30 pm, Mon and
2:30 pm - 3:30 pm, Tue or appointment

- RECITATION LEADER : Hasan Tosun (section 03)
 - OFFICE : 3-113 Hanson Hall
 - EMAIL : tosun007@umn.edu
 - OFFICE HOURS : 9:00 am - 11:00 am, Friday
or by appointment

Email Policy

Please include ECON4261 in the subject of your email with a couple of key words describing the content of your email. You can expect an answer within 24 hours.

1 Introduction

Econometrics is a body of theory and methods for analyzing economic data. Econometrics draws primarily from statistics, probability and economic theory to address empirical questions about the economy.

This course is of particular interest both for people seeking to attend graduate school in economics as well as for people interested in going to the job market (either to the public or the private sector). For the first group, econometrics is a fundamental tool in the skill set of economic researchers (or social sciences in general) and a core component of all top graduate programs in the world. For those willing to explore the job market after completing their degree, being able to work with (economic) data and understand which conclusions and implications we can be drawn from it is a highly marketable skill.

The course will start with an introduction to econometrics and some motivating examples that will allow to underline the important distinction between correlation and causation. The next step in the course is to present the Classical Linear Model (CLM) and the estimation workhorse of applied econometrics, the Ordinary Least Squares (OLS) method. In this chapter we are going to understand the intuition behind this estimation technique as well as their mathematical derivation. Also, we are going to highlight some important properties (unbiasedness, consistency and efficiency) of the OLS estimator in the CLM. Next, we are going to study experiments and quasi experiments. Chapter four is devoted to Hypothesis Testing and Confidence Intervals. We are going to review basic concepts of hypothesis testing and derive hypothesis test confidence intervals. In the last pair of chapters we are going to explore what happens when some of the assumptions under the CLM do not hold. The failure of these assumptions is going to make the OLS estimator undesirable but we are going to see how we can overcome these problems using Generalized Least Squares (GLS) and Instrumental Variables (IV) estimators.

In parallel to the theory section of the course and to gain deeper knowledge of the skills learned, you will need to write an original 7-10 pages paper where you answer

an empirical question using data and the methods learned in class.

Please, note that this is a mathematics and statistics intensive course and you should be comfortable with the materials in the enrollment prerequisites (Econ 3101, Math 1271/2, Math 2243, Math 2263, Stat 4/5101/2). If you need to review these materials you will find some references in section 3 of this syllabus.

1.1 Learning goals

After taking this course, a student will be able to read critically and conduct empirical analysis of economic data. In particular, the student will be able to:

- estimate parameters of an economic model and conduct inference;
- read and interpret empirical analysis critically, and in particular, appreciate the difference between correlation and causation;
- appreciate what can and cannot be said from economic data (identification).
- apply the theory to an original empirical project.

2 Course Details

2.1 Times and Location

Lecture is held Tuesdays and Thursdays from 4 pm to 5:15 pm in Hanson Hall 1-104. Your attendance is expected.

2.2 Recitation

Recitations will be held on Thursdays, from 5:30 to 6:20 pm in Hanson Hall 1-111 (section 02 led by Ji-Heum Yeon) and from 5:30 to 6:20 pm in Hanson Hall 1-105 (section 03 led by Hasan Tosun). You MUST attend to the section in which you are registered.

2.3 Homework

There will be four assignments which will involve analytical derivations as well as using a statistical software to conduct estimation and inference and report your results. You will be granted access to Stata by CLA OIT; make sure that by the end of the second week of class you know how to access Stata.

The due dates for the assignments are Tuesday October 1, October 22, November 19 and December 10, 2019. These due dates are subject to change, in which case you will be informed during class or recitation.

All homework assignments will be available online at the class webpage, no hard copies will be provided. We do not require that your assignments be typed (although learning to use something like LaTeX wouldn't be a bad skill to learn), but all assignments must be neatly done. Homework will be collected at the lecture on the due date. No late assignments will be accepted. Only documented special circumstances (e.g. severe illness with doctor's note) are possible exceptions to this. If you cannot attend class on the due date, you must turn it in before the class. You will lose 15 points if you do not staple your homework and 25 points if it is nearly illegible. Also, you will lose 10 points if you do not write your recitation section correctly.

2.4 Exam

There will be a midterm on Tuesday October 29, 2019 during the lecture time. The material for the midterm exam will include everything we will have covered by then (more details will be provided in due time).

The final exam will take place December 17 from 4 to 6 pm in Hanson Hall 3-104. The material for the final exam is cumulative with an emphasis on the material covered after the midterm.

All exams are closed book, closed notes and calculators are not allowed.

2.5 Research Project

The research project is designed so that you have to apply skills and knowledge you are learning in class while answering an empirical question of your interest. To that end and to guarantee that you work constantly on it, it will be composed of 5 assignments: research proposal, data, outline, draft I and final draft. The due dates are September 24, October 15, November 5, November 26 and December 10. respectively.

More information and details will be provided in due time during lecture time.

2.6 Grading

- 4 Homeworks - 25 percent
- Midterm - 20 percent
- Final - 30 percent
- Research Project - 25 percent

Below is the grading scale for the course. We reserve the right to lower these cut-offs points (i.e. increase the letter grades for percentages), but we will not raise the cut-offs (i.e. make it harder to get good grades).

Table 1: Grading Scale

| % Points | 0-59 | 60-67 | 68-69 | 70-71 | 72-77 | 78-79 | 80-81 | 82-87 | 88-89 | 90-91 | 92+ |
|----------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| Grade | F | D | D+ | C- | C | C+ | B- | B | B+ | A- | A |

2.7 Course Material

Material will be posted on the Canvas course website. Please check it regularly. The material for the course will be based on lecture notes (students are expected to take notes during classes). References to ETM, Greene and Hayashi (see the list below) will be given in class for each topic we will cover.

- Greene, W., H., *Econometric Analysis*, 2012, Prentice Hall [Greene].
- Davidson R. and J. G. MacKinnon, *Econometric Theory and Methods*, 2004, Oxford [ETM].
- Hayashi F., *Econometrics*, 2000, Princeton [Hayashi].
- For the computational part of the course, a particularly useful textbook is Baum, C. F. *An Introduction to Modern Econometrics Using Stata*, 2006, Stata Press.
- Angrist, J. and J. Pischke, *Mastering Metrics: The Path from Cause to Effect*, 2015, Princeton [AP].

2.8 Disability Services

Students with disabilities must be registered with Disability Services. Contact <http://ds.umn.edu>. The Department of Economics, in conjunction with Disability Services, will make appropriate accommodations for students with disabilities. Specifically, exams will be administered by Disability Services to meet student needs. Please contact the instructor as soon as possible if you need accommodation.

2.9 Prerequisites

The prerequisites for this course are:

- ECON 3101 Intermediate Micro
- MATH 1271/2 Calculus
- MATH 2243 Linear Algebra
- MATH 2263 Multivariate Calculus
- STAT 4/5101/2 Theory of Statistics
- MATH 4242 Applied Linear Algebra is strongly recommended

- Familiarity with computers.

2.10 Academic Dishonesty

For the purpose of this class, students are allowed (and in fact encouraged) to work together on homework provided the following rules are followed: any collaboration must be acknowledged explicitly, each student must individually type up or write up each homework assignment and any use of material other than class notes must be cited. Identical assignments will receive a zero score. Anyone committing scholastic dishonesty on an exam will receive an F for the assignment or exam and the incident will be referred to the Office for Student Conduct and Academic Integrity. Among other things, this includes looking at the exam of another student, communicating with another student via any means during the exam, and continuing to work on the exam when the exam is complete. There is zero tolerance for cheating on exams.

3 Tentative Schedule and Course Content

Subject to change at the discretion of the instructor. References to sections in the textbooks complements (but do not necessarily substitute) class notes and documents in Canvas.

- Chapter 0: Math and Stats Review.
 - Basic concepts in statistics.
 - Basic concepts in linear algebra.

References: Appendix [Greene] ETM Sections 3.2, 3.3 and 3.5.

- Chapter 1: Introduction to Applied Econometrics.
 - Whats Econometrics?.
 - Motivating Examples

- Structural vs. Reduced Form Approach.

References: Chapter 1 [Greene] and Chapter 1 [AP].

- Chapter 2: The Classical Linear Model (CLM) and Ordinary Least Squares (OLS).

- Introduction to the Classical Linear Model.
- Ordinary Least Squares.
- Other estimation techniques: Method of Moments (MM) and Maximum Likelihood (ML)
- Algebra of OLS.
- Interpretation of Coefficients and Frisch-Waugh-Lovell Theorem.
- The variance of OLS.
- OLS properties in the CLM: unbiased, consistent and efficient.

References: Chapters 2, 3 and 4 [Greene], Chapter 1 [Hayashi] and Chapter 2 [AP]

- Chapter 3: Experiments and QuasiExperiments

- Experiments: Randomized Control Trials.
- QuasiExperiments:
 - Regression Discontinuity.
 - Difference in Difference.

References: TBA

Midterm: Thursday October 29, 2019 during the lecture time.

- Chapter 4: Hypothesis Tests and Confidence Intervals.

- Basic concepts on hypothesis testing.

- Some properties of standard distributions.
- Testing of multiple restrictions: F-test.

References: Chapter 4 (sections 4.1-4.5) and Chapter 5 (sections 5.1-5.2 and 5.5) [ETM], Chapter 5 (sections 5.1, 5.2.1 and 5.4.2) [Greene] and Chapter 1 (section 1.4) [Hayashi]

- Chapter 5: Generalized Least Squares.

- Derivation of the GLS estimator.
- Efficiency under a known form of heteroskedasticity and serial correlation.
- Discussion: Weighted Least Squares.

References: Chapter 7 (sections 7.1-7.2) [ETM], Chapter 9 (sections 9.2.3, 9.3 and 9.6) [Greene], Chapter 1 (section 1.6) [Hayashi].

- Chapter 6: Instrumental Variables.

- Sources of Endogeneity: omitted variable bias, measurement error, reverse causality, simultaneity and selected sample.
- Sample selection and Randomized Trials.
- Derivation of the Instrumental Variables (IV) estimator.
- Discussion about Instrumental Variables and Causality.
- Derivation of the Generalized Instrumental Variables Estimator (GIVE) / Two Stages Least Squares (2SLS).
- Identification.

References: Chapter 8 (sections 8.1-8.3) [ETM], Chapter 8 (sections 8.1-8.3 and 8.5) [Greene], Chapter 3 (sections 3.1-3.2) [Hayashi] and Chapter 1 [AP].

Final Exam: December 17, 2019. 4pm-6pm Hanson Hall 1-104

DEPARTMENT OF ECONOMICS -- PROCEDURES AND POLICIES 2016-2017
4-101 Hanson Hall (612-625-6353)

CLASS ASSIGNMENTS:

Written answers to homework assignments must be typed; Graphs and numerical work need not be typed, but should be legible.

COURSE PREREQUISITES:

Students are expected to have successfully completed all prerequisites prior to taking an Economics course.

DISABLED STUDENTS:

Reasonable accommodations will be provided for all students with documented disabilities (by the OSD). Contact the instructor at the beginning of the semester to work out details. This information will be kept confidential.

STUDENT MENTAL HEALTH AND STRESS MANAGEMENT:

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. Information about confidential mental health services available on campus: <http://www.mentalhealth.umn.edu/>.

DROPPING A CLASS:

Termination of attendance alone is not sufficient to drop a class. You must notify the Registrar's office. Please contact your academic (college) adviser for details on this process and pay attention to University deadlines for add/drop.

INCOMPLETE GRADE:

Low class standing is not a valid reason for an Incomplete grade. An I is given only in exceptional circumstances like family emergencies or hospitalization; arrangements must be worked out between the student and instructor before the final exam. We require written proof of emergencies. Details about I grades and how to make it up -in the Economics Undergraduate Handbook.

MAKE-UP EXAMS:

Make up exams are possible for the final exam only if the student has another exam scheduled at the same time, or has three exams within a 16 hour period. This should be pre-arranged with the instructor at least three weeks before the final exam. Make up final exams may also be possible for documented medical emergencies.

SCHOLASTIC DISHONESTY:

"The College of Liberal Arts defines scholastic dishonesty broadly as any act by a student that misrepresents the student's own academic work or that compromises the academic work of another. Examples include cheating on assignments or exams, plagiarizing (misrepresenting as one's own anything done by another), unauthorized collaboration on assignments or exams, or sabotaging another student's work".

The University Student Conduct Code defines scholastic dishonesty as "Submission of false records of academic achievement; cheating on assignments or examinations; plagiarizing; altering, forging, or misusing a University academic record; taking, acquiring, or using text materials without faculty permission; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement."

Penalties for scholastic dishonesty of any kind in any course will entail an "F" for the particular assignment/exam or the course.

Please check this website for information on Student Academic Misconduct -- <http://www1.umn.edu/oscai/integrity/student/index.html>

STUDENT CONDUCT AND CLASSROOM BEHAVIOR:

Students are expected to contribute to a calm, productive, and learning environment. Information on student classroom behavior issues is at: http://www1.umn.edu/regents/policies/academic/Student_Conduct_Code.html .Check the Student Conduct Code to find out what is expected of you.

STUDY ABROAD IN ECONOMICS:

The Department encourages you to undertake Study Abroad. There are many courses in foreign countries that can satisfy some economics major, minor, or Liberal Education requirements. For more information, please contact our Undergraduate Advisor, Ms. Madhu Bhat, or the University's Learning Abroad Center at <http://www.umabroad.umn.edu/>

UNDERGRADUATE ADVISER:

Contact the Undergraduate Adviser if you wish to sign up for an Economics major or minor or to get information about institutions of higher study. Your APAS form will list your progress toward an Economics degree.

Adviser: Ms. Madhu Bhat (econadv@umn.edu); Sign up for appointments at econ.appointments.umn.edu

Office: 4-100 Hanson Hall , Phone number: 612-625-5893,

UNDERGRADUATE HANDBOOK:

Available on the Internet at: <http://www.econ.umn.edu/> Click on Undergraduate Programs. We are in the process of updating it. Registration policies are listed in the University Course Schedules and College Bulletins.

COMPLAINTS OR CONCERNS ABOUT COURSES:

All course grades are subject to department review.

Please contact your instructor or TA if you have any complaints/concerns about the course. If your concerns are not resolved after talking with your instructor, you can contact: Professor Simran Sahi, Director of Undergraduate Studies.

(Phone): 612-625-6353 and E-mail: ssahi@umn.edu .