

Course Syllabus
Econ 322: Econometrics

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Please note that this syllabus is subject to change during the semester. Announcements in class, via email, or on Sakai supersede anything written here.

Course Information

Course Title: Econometrics
Code: 01:220:322:B1
Session Dates: 05/30/2017–07/07/2017
Meeting Times: Mon, Tue, Wed, Thu 10:30am–12:25pm
Location: Scott Hall 202 (College Avenue Campus)
Official Course Website: <http://sakai.rutgers.edu>
MyEconLab Website: <https://www.pearsonmylabandmastering.com/northamerica/myeconlab/>

Contact Information

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Office Hours: Thurs, 1–3pm, New Jersey Hall 3rd floor library (College Ave Campus)
To meet outside these hours, please email for an appointment.

Course Description

Econometrics is the use of statistical techniques and empirical methods to describe causal relationships of economic interest. It provides a systematic way to use data to quantify human behavior in a scientific manner. After briefly reviewing key concepts in probability and statistics, this course will introduce students to simple and multivariate regression, with a focus on linear models estimated by ordinary least squares (OLS)—the workhorse of empirical analysis in economics. Students will learn to conduct hypothesis tests, form confidence intervals, and assess models for statistical and economic significance. Building on these foundations, we will then explore more advanced topics, including nonlinearities, limited dependent variables, panel data techniques, and instrumental variables.

Course Objectives and Learning Goals

As you work through this course, it's useful to keep in mind two key points:

1. **Econometrics is more than statistics.** As economists, we are not only interested in *describing* data; we also want to *explain* why. In other words, we care, above all, about *causality*.
2. **Econometrics is not limited to economics.** The tools you develop in this class—including both data analysis *and* thinking about empirical inquiry in a mature manner—can be extremely useful in many settings, including business, government, other social and physical sciences, and, indeed, in the ways you assess evidence in making decisions in your day-to-day lives.

Introductory econometrics also serves as a transition point in your academic careers, by beginning to fill the gap between being “a student of economics” and being “a practicing economist.” In this course, you will gain an overview of what econometrics is about, and develop some “intuition” about how things work. The emphasis will be on understanding the tools of econometrics and applying them in practice. Students who successfully complete Econ 322 should be comfortable with basic statistics and probability. They should be able to use statistical software to estimate econometric models and be able to report their results in a non-technical and literate manner. (Tip: This is a really great skill to be able to list on a resume!) In particular, Econ 322 alums should be able to estimate and interpret linear regression models and be able to distinguish between economic and statistical importance. They should be able to critique reported regression results in applied academic papers and interpret the results for someone who is not trained as an economist.

Prerequisites

Students should have passed the following courses (or their equivalents) with grades of C or better: Intro to Microeconomics (220:102), Intro to Macroeconomics (220:103), Calculus I (640:135), and Intro to Statistics (960:211 or 960:285). It will be assumed that all students have a good command of the material taught in these courses. It is strongly suggested that you review this material at the beginning of this course.

Important Note

This is a required course for the economics major: a minimum grade of C is required in Econ 322 for majors. Please be proactive in contacting me early in the semester if you think you are struggling!

Textbook (Required)

James Stock and Mark Watson, *Introduction to Econometrics, 3rd Edition, Updated*, with MyEconLab.

You have several options for purchasing the book and access to MyEconLab:

1. Hardcopy text + MyEconLab access (ISBN-13: 9780133595420)
2. Looseleaf text + MyEconLab access (ISBN-13: 9780133848915)

3. eText + MyEconLab access (ISBN-13: 9780133487701 or 9780133487671)
4. Buy a used copy of text and purchase MyEconLab access separately (ISBN-13: 9780133487688)

The text is on order at the bookstore. You may also purchase from Pearson directly, or elsewhere online (doesn't hurt to browse around for the cheapest price).

Software

This class will use Stata. Stata is data and statistical analysis software very popular among economists, especially those doing applied microeconomics. If you are already familiar with another statistical software package (like R, SAS, SPSS, or Eviews) and wish to use that for your homework assignments you are welcome to. However, note that I will not be able to offer you help with using software other than Stata. You have several options for accessing Stata:

1. Purchase: Stata offers several student purchase options, which are pretty reasonable: <https://www.stata.com/order/new/edu/gradplans/student-pricing/>
 - Best option for this class only: Small Stata, 6-month license (\$38). Small Stata only handles 1,200 observations. Most class assignments will not require more than this (but most work in the real world does).
 - If you think you may want to use Stata beyond this class—for writing a thesis, for grad school, for professional work, or anything else—it would make sense for you to buy a perpetual license for one of the larger versions. We can discuss if you have questions.
2. Access in computer labs: All computer labs on campus have Stata installed on them.
3. Access via apps.rutgers.edu. But this can be pretty slow.

We will do a few Stata demonstrations in class, but there are many great online resources for learning the software, including:

- The Stata manual itself is often the best help (if a little dense): <http://www.stata.com/bookstore/users-guide/>
- Stock and Watson have their own intro. It is in some ways too basic, but it may be a good intro: http://wps.aw.com/aw_stock_ie_3/178/45691/11696965.cw/
- German Rodriguez at Princeton has a great introduction at a slightly more advanced level: <http://data.princeton.edu/stata/>
- UCLA's guide has long been a go-to spot for learning Stata: <http://www.ats.ucla.edu/stat/stata/>
- Princeton's Data and Statistical Services also has a set of good Stata tutorials: <http://www.princeton.edu/~otorres/Stata/>
- The same goes for the University of Wisconsin Social Science Computing Cooperative: <http://www.ssc.wisc.edu/sscc/pubs/sfs/home.htm>
- When in doubt, just Google it.

Course Assessment

Assessment	Weight
Class Attendance and Participation	10%
Homework Assignments (MyEconLab)	10%
Empirical Projects	20%
Midterm 1	15%
Midterm 2	15%
Final Exam	30%

Notes on Assessments

1. We will have regular **homework assignments** during the semester. These will be textbook exercises submitted via Pearson's MyEconLab. I will be sending you instructions for how to register for our course's MyEconLab site. The purpose of these assignments is to provide incentive for you to practice the material, as oftentimes there is a gap between learning by reading and learning by doing.
2. We will also have two larger **empirical projects**, where you will have the chance to do "real" applied econometrics using Stata. These will provide an opportunity for you to learn the software and develop skills that will be valuable beyond this course. You will submit your do file, log, and a brief write-up to a Dropbox on our course's Sakai site. (There will also be a smaller introductory assignment to familiarize you with the basics of Stata.)
3. **You are expected to do your homework assignments on your own.** Students caught submitting identical, or nearly identical, assignments will receive a zero grade for that assignment.
4. You may work together on the empirical projects, as you may find it helpful to collaborate in learning Stata. **However, each student must do their own write-up of results (in your own words) and submit their own files.** If you choose to collaborate, your submission must also include a list of who you worked with.
5. **Late assignments and projects** will receive scores of zero. There will be ample time allocated for the assignments so that there is no excuse for a late assignment. Plan ahead.
6. **All exams are cumulative and closed-book.** You will be responsible for all material covered in lectures, the textbook, and assignments. If you do not attend an exam, you will receive a zero grade for that exam. Students who cannot attend an exam can, under certain circumstances, make alternative arrangements if they provide me with documentary evidence regarding the reason they missed the exam. I do not give extra-credit assignments.
7. **Academic dishonesty as a very serious offense.** Any student caught cheating will receive an F for this course and will be reported to the appropriate university authority. There will be no warnings. The following are some of the actions which are regarded as academic misconduct:
 - Taking unauthorized materials into an examination.
 - Submitting work for assessment knowing it to be the work of another person.
 - Improperly obtaining prior knowledge of an examination paper and using that knowledge in the examination.
 - Failing to acknowledge the source of material in an assignment.

Grading Policy

The following table indicates the scores necessary to achieve each grade.

Grade	Score Interval
A	[85,100]
B+	[75,85)
B	[68,75)
C+	[60,68)
C	[55,60)
D	[50,55)
F	[0,50)

Course Outline

This is an overview of the topics we will cover and the associated textbook readings. I reserve the right to add, subtract, or change topics at any time. Dates are subject to change based on the pace of the course.

1. Introduction (Chapter 1)

- Brief introduction to course
- What is econometrics and why study it?
- Observation vs. experiment
- Types and sources of data
- Econometric models

2. Review of Probability and Statistics (Chapters 2,3)

- Key concepts from probability theory
- Random variables
- Discrete vs. continuous random variables
- Probability distributions and densities
- Expected value and moments of a random variable: mean and variance
- Populations vs. samples
- Joint, conditional, and marginal distributions
- Covariance, correlation, and statistical independence
- Some important distributions: Normal, Chi-Squared, Student t, and F
- Sampling distribution of sample average
- Large-sample approximations: law of large numbers, central limit theorem
- Estimation and inference
- Hypothesis tests
- Confidence intervals

3. The Simple Linear Regression Model (Chapters 4,5,17*)

- Regression and conditional expectation
- The simple linear regression model
- Ordinary least squares estimation
- OLS assumptions
- Desirable estimator properties: unbiasedness, consistency, efficiency
- Inference: hypothesis tests and confidence intervals
- Prediction
- Regression diagnostics: goodness of fit, explanatory power
- Statistical vs. economic significance

Midterm 1: Monday, 6/12/17

4. The General Linear Regression Model (Chapters 6,7,18*)

- Multivariate linear regression: extensions of OLS
- Marginal effects and coefficient interpretation
- Presenting regression results
- Single and joint hypothesis tests
- Prediction
- Diagnostics
- Omitted variables bias
- Matrix representation

5. Nonlinearities (Chapter 8)

- Binary regressions
- Polynomials
- Logarithms
- Interactions
- Model specification and choice of functional form

6. Assessing Regression Models (Chapter 9)

- Internal validity
- External validity

7. Limited Dependent Variables (Chapter 11)

- Linear probability model
- Probit and logit regression
- Marginal effects and coefficient interpretation
- Hypothesis tests and confidence intervals
- Model comparisons and measures of fit

- Maximum likelihood estimation

Midterm 2: Monday, 6/26/17

8. Panel Data (Chapter 10)

- Intro to panel data
- Fixed effects regression
- Entity fixed effects and time fixed effects

9. Instrumental Variables (Chapter 12)

- The endogeneity problem
- IV in simple bivariate linear regression
- Instrument validity: relevance and exogeneity
- IV in the general linear regression model
- Estimation via two-stage least squares
- Interpretation of results
- Assessing IV models
- Finding good instruments

10. Intro to Time Series Econometrics (Chapters 14–16) (Time Permitting)

- Intro to time-series data
- Serial correlation
- Autoregressions and distributed lag models
- Stationarity vs. Nonstationarity
- Dynamic causal effects
- HAC standard errors

Final Exam: Thursday, 7/6/17

**The material in these chapters is more advanced. You are encouraged to read them and we will be discussing some of the results in class. However, they will not be the focus of our assignments or exams.*

Important Dates

Date	Event
Thursday, 6/1/17	Drop/Add period ends
Monday, 6/5/17	Withdrawal deadline (“W” grade, 50% refund)
Monday, 6/12/17	Midterm 1
Monday, 6/26/17	Midterm 2
Friday, 6/30/17	Withdrawal deadline (“W” grade, no refund)
Tuesday, 7/4/17	Fourth of July, no class
Thursday, 7/6/17	Final Exam

Some Thoughts and Advice

As you work through this course, here are a few tips to keep in mind.

- **Econometrics isn't easy. It takes work.** Sometimes you'll need to re-read the text or notes several times before you start to "get it."
- **Have a diverse learning diet.** The best chance of success comes when you study the subject from multiple angles. Read the text before class. Come to class. Take notes and ask questions. Read the text and notes again. Do practice problems. Repeat.
- **The best way to learn is by doing.** Practice. Put effort into homeworks and empirical projects. Try to prove results to yourself. Do extra exercises in the book. Developing intuition is important, but so is being able to put those ideas into action.
- **Summer courses pose unique challenges.** We are on an accelerated timeline. The good news is that the material will stay fresher in your mind day-to-day. The bad news is that you're going to have to put in regular effort outside the classroom on most days. If you want to benefit from this course, it'll be a busy month, but it will be worth it. Plus, it's summer, so there's always an excuse for an ice-cream break.