

Syllabus
Introduction to Econometrics
Econ-UA 266, NYU Economics
Summer 2018

Instructor : Ercan Karadas
Term : May 21 - July 1
Lectures : MTWTh 9:00 - 10:35 PM, Room: SILV 414
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1 Course Description

This course introduces some of the basic statistical methods used to analyze economic data. In doing so, we might be interested in quantifying the relationship between certain variables. For instance, in order to quantify how consumption expenditure is related to income or how wage of an individual is related to his or her education, we need these methods. We might also be interested in testing whether a theoretical relationship is supported by data. Consider Okun's law, which relates the output growth to the unemployment rate. This is just a theoretical stipulation unless some econometric methods are used to find out whether it is supported by data. These methods are useful for those who want to become quantitative business and economic analysts, or pursue a graduate degree in a economics/finance related subject, and also, for those who are interested in knowing how economics is applied to real-world problems.

The course begins with an introduction to statistics and probability. In this section, you will learn how to make inferences about certain characteristics of an entire population using a sampled dataset. Then we will begin studying the fundamental method of applied econometrics: the linear regression model. This method allows us to quantify the effect of changing one variable on another one through some parameters. The course focuses on estimation and interpretation of parameters, evaluation of goodness of fit, as well as, hypothesis testing under certain assumptions. These issues will be studied first within the most straightforward case called "simple regression" in which the behavior of a dependent variable is explained by a single explanatory variable. For example, the dependent variable might be the consumption expenditures of households and the explanatory variable household income.

Then, we will turn our attention to "multiple regression" in which we consider cases in which the dependent variable is influenced by more than one explanatory variable. For example, consumption expenditures depend on not only households' income but also the value of their assets. In both single and multiple regression we will be working under some simplifying assumptions. But at the end of the section we will relax some of these assumptions. Most importantly we will focus on problems such as heteroscedasticity and autocorrelation. We will also see how we can use "instrumental variables" to obtain more reliable results in certain cases where some of these assumptions are violated.

In the last part of the course, we will briefly study some more specific models that have been devised to deal with particular data types: binary data models, time series models and panel data models.

Prerequisites: Mathematics for Economists II (MATH-UA 212) and either Statistics (ECON-UA 18) or Analytical Statistics (ECON-UA 20)

2 Course Materials

- [SW] *Introduction to Econometrics* by Stock, J.H., and M.W. Watson (2015), 3rd Edition Updated, Pearson Education (You can also use previous editions). **(Required)**
- [LS] *Lecture Slides* Computer-projected overhead lecture slides accompanying SW will be posted on NYU Classes. **(Required)**
- [W] *Introductory Econometrics* by J.M. Wooldridge (2016), 6th Edition, Cengage Learning (You can also use previous editions). **(Supplementary)**
- [GP] *Basic Econometrics* by D.N. Gujarati and D.C. Porter (2008), 5th Edition, McGraw-Hill Education (You can also use previous editions). **(Supplementary)**

The ultimate resource will be my lecture slides [LS] which will follow [SW] very closely most of the time, but in some cases I will add more details or rearrange the material in the book. [SW] is nicely organized and easy to read. However, no book is a perfect fit for everyone, and there are many other books you can look at for reference. [W] and [GP] are just two good examples. Both of them provide complementary and slightly more mathematical treatment.

Students are expected to have completed the readings ahead of class to facilitate class participation and discussion. You need to take this seriously to be able to make the most out of this class as we will cover a lot of advanced material in just six weeks.

Class Website: The class website is on NYU Classes. Please, be sure to visit the course web page regularly, as all materials for the class, occasional messages and any changes in the schedule will be posted there.

3 Computer software

The course will make heavy use of the statistical software R. No prior knowledge of this software package is assumed. This package will be introduced in the first week. R is installed on all NYU computers and you can also access to R from Virtual Computer Lab, but it is better if you have R installed on your computer. It is available for all major computing platforms: Windows, Mac OSX, and Linux.

It is essential to have a good command of the computer software R to complete this course successfully. Be familiar with R as soon as possible (if you are reading this syllabus before the first lecture, start now!). Knowledge of statistical package(s) will not only help your homeworks this semester but also your future job search or higher education in graduate or professional schools. Below provided some links to get you started with R.

3.1 Installation

Step 1 If you do not already have R, Download and install the R binaries for your operating system, accepting all the defaults:

<http://cran.r-project.org/>

Step 2 Go ahead and download Rstudio now too, again, accepting all defaults from the following URL:

<http://www.rstudio.com/products/rstudio/download/>

3.2 Some Online Resources for R

1. **Basics.** A free interactive course covering the basics of R:

<https://www.codeschool.com/courses/try-r>

Another one:

<https://www.datacamp.com/courses/free-introduction-to-r>

2. **Basics + Stats.**

<http://www.cookbook-r.com/>

and

<https://www.statmethods.net/index.html>

3. **Econometrics.** This book, *Using R for Introductory Econometrics*, accompanies Wooldridge's *Introductory Econometrics* by replicating the examples in R. You can read the book online and download all data sets and R files.

<http://www.urfie.net/>

4 Grading

Your course grade will be based on problem sets, two midterms and a final exam.

4.1 Problem Sets

There will be approximately 5 problem sets during the semester. Problem sets will be a combination of theoretical exercises and computational/simulation exercises which you will do in the programming language R. Completion of the problem sets is extremely important because it is an essential element in learning the course content and preparing for the exams. Further, I strongly encourage to use the problem sets as a device for learning R. R is increasingly used in economics, finance and data science in both the academic and private sectors. Putting in a small amount of effort to learn R should serve you well in the future.

You are expected to submit your problem set on time, meaning at the beginning of class on due date. You are welcome to discuss the problem sets in small groups but you must write up the solutions independently. Any problem sets turned in on time with a serious attempt to answer all questions will receive 100%. Any problem sets turned in late will receive a maximum score of 50%.

Your lowest score on the problem sets will not be counted in determining your final grade. In this way, students who are not able to complete a problem set for a legitimate reason will not be adversely affected.

4.2 Exams

There will be two midterms and a final exam. The exams will emphasize problem-solving ability. The exam content will be cumulative, but with an emphasis on the most recent material. All material discussed in the course is examinable unless stated otherwise. No make-up exams will be given. The usual university policies on academic honesty apply. No electronic devices other than calculators may be used during the exams.

4.3 Course Grade

Your total score will be the weighted average of your scores from problem sets, midterms and final:

Assessment	Weight
Problem Sets	20%
Midterm 1	25%
Midterm 2	25%
Final	30%
Total	100%

Once your total score is determined, your letter grade from the course will be determined by the following curve that is recommended by The Economics Department policy:

Letter	Percentile
A&A-	29%
B+&B&B-	40%
C	22%
D&F	9%

Grades are based solely on your total score. No extra work or additional credit can be assigned to improve your grade.

5 Miscellaneous Course Policies

- **Attendance**

Class attendance and participation are expected and required. If you anticipate to be unable to attend either the Class you need to notify me ASAP. Use of laptops and cellphone during class is strictly prohibited.

- **Missed Exams**

If you miss a midterm due to a medical emergency (for which you must provide a doctors note within one week of the exam) I will appropriately re-weight your scores from the remaining exams.

There is no make-up for the final exam.

- **Academic Integrity**

Academic dishonesty in assignments, examinations, or other academic performance is prohibited and considered a violation of the student conduct. All students are responsible for knowing and adhering to the academic integrity policy of the NYU-CAS available at:

<https://cas.nyu.edu/content/nyu-as/cas/academic-integrity.html>

- **Some Tips and Warnings**

1. If you are having problems, please seek out help early. If you are unable to make my scheduled office hours, please email me noting your availability and we will set up an alternative time to meet.
2. Some students slack off. Econometrics is a very demanding course even though I try to keep the coverage to minimal. The only way to learn it is to keep going over it, work through the problems in the book and problem sets, and think about what you are doing at each step.
3. The course will progress by building on previous parts so let me urge you to read as much of the material as possible early on in the course. You will find this will help you develop a perspective on the course material and lead to a better understanding of econometrics.
4. Do not wait until after I have lectured on something to read the material work on it yourself. Come to class prepared! It is essential that you master every part of the material. I will integrate the material as we go along, but you will be ahead of the game if you make extended efforts to learn and integrate it yourself.
5. The emphasis in this class is on developing your ability to apply analytical techniques and on your understanding of fundamental concepts. Exams will emphasize this. They will assume you have a complete understanding of the lectures, text and study guide, and will ask you to apply what you have learned to new circumstances.

6 Outline of the Course Content (Tentative)

Lec #	Topics	Readings
1&2	Introduction and Review of probability and statistics	SW 1-2-3
3&4	Linear Regression with One Variable	SW 4
5	The Theory of Linear Regression with One Variable	SW 17
6&7	Hypothesis Tests and Confidence Intervals	SW 5
8	Midterm 1	
9&10	Linear Regression with Multiple Variables	SW 6
11&12	Hypothesis Tests and Confidence Intervals in Multiple Variables	SW 7
13	Nonlinear regression	SW 8
14	Assessing Studies Based on Multiple Regression	SW 9
15	Midterm 2	
16	Instrumental variables regression	SW 12
17&18	Regression with a Binary Dependent Variable	SW 11
19&20	Regression with Panel Data	SW 10
21	Final Exam	