

## **Econometrics**

Queens College – Spring 2017

Econometrics is where theory meets data. Based on statistics and probability theory, econometrics is the branch of economics that uses economic data to test theoretical relationships and estimate their size. In short, it's a course in data analysis.

As an economist working in a professional environment, you will spend 90 percent of your time preparing data and only 10 percent of your time conducting data analysis. But in the classroom, we will spend 90 percent of our time discussing data analysis and only 10 percent of our time preparing data.

Assume that good data preparation and good data analysis are equally important for us to obtain meaningful results. Even if they are equally important, we should still spend most of our class time discussing econometrics because the purpose of our data preparation is econometric analysis.

You will have to learn data preparation outside of the classroom, but I will help you learn the same way that I learned: by imitating other people. How does a child learn to speak? By imitating others. So I'm going to ask you to imitate me. I'm going to show you how I retrieve data, how I prepare it for analysis and how I analyze it. Then I'm going to ask you to imitate my work, by performing a similar statistical analysis with a different data set.

### **textbooks**

The following textbooks are required:

- J.H. Stock and M.W. Watson (2010). *Introduction to Econometrics*. ISBN: 978-0-1380-0900-7
- P. Kennedy (2008). *A Guide to Econometrics*. ISBN: 978-1-4051-8257-7

The following textbooks are optional:

- M.H. DeGroot and M.J. Schervish (2011). *Probability and Statistics*. ISBN: 978-0-3215-0046-5
- D.W. Pearce (1992), editor. *The MIT Dictionary of Modern Economics*. ISBN: 0-262-66078-4

Kennedy's *Guide* emphasizes the intuition behind the econometric models. It explains the Gauss-Markov assumptions, the properties of time-series and the importance of having exogenous regressors. Stock and Watson's textbook explains econometric techniques.

Kennedy's *Guide* and Stock and Watson's textbook will be the primary textbooks for this course. The DeGroot-Schervish textbook is a good reference on statistics and probability theory, while Pearce's *MIT Dictionary* will help you learn the language of economics and econometrics.

### **software**

Please install R, wxMaxima and Gretl on your computer. I will use wxMaxima to show you the mathematical foundations of econometrics. For statistical analysis, I will provide examples written in the R language, but Gretl is a better tool for you to start with. Gretl's "drop-down menus" make it easy to learn econometrics.

### **course requirements**

The best way to learn econometrics is to do it, but to do it properly, you need to know the theory. Solving the problems in the problem set will help you learn the theory. Performing an econometric analysis will help you learn how to conduct a statistical analysis. And studying for the two exams will ensure that you learn the major themes of econometrics.

- (20 percent) midterm exam
- (50 percent) econometric analysis
- (20 percent) final exam
- (10 percent) class participation

## course outline

### Background – statistics and probability

- Stock and Watson, chaps. 1, 2, and 3

### Lecture 1 – ordinary least squares

- Stock and Watson, chaps. 4 and 5
- problem #1

### Lecture 2 – maximum likelihood

- Kennedy, chaps. 1, 2 and 3
- problem #2

### Lecture 3 – hypothesis testing

- Kennedy, chap. 4
- problems #3 and #4

### Lecture 4 – violations of the Gauss-Markov assumptions

- Kennedy, chaps. 5, 6 and 7

### Lecture 5 – panel data

- Stock and Watson, chap. 8
- Kennedy, chap. 18

### Lecture 6 – heteroskedascity

- Kennedy, chap. 8

### Lecture 7 – probability models

- Stock and Watson, chaps. 9
- Kennedy, chap. 16

### Lecture 8 – time-series

- Stock and Watson, chaps. 12, 13 and 14
- Kennedy, chap. 19