

Economics 185A
Econometrics with Linear Algebra: Syllabus

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COURSE DESCRIPTION

Econ 185a is an advanced undergraduate course in econometrics. The course is divided into two parts. It covers the statistical theory for the linear regression model, its most important variants, and extensions to nonlinear methods including Generalized Method of Moments (GMM) and Maximum Likelihood Estimation (MLE). Theoretical analysis will be accompanied by the study of empirical economic examples. (Please note that working knowledge of linear algebra is required for the course.)

Relative to Econ 184b, this course is designed to offer a more mathematical presentation of econometrics involving the extensive use of linear algebra. As such, the course provides a complete explanation of the derivations of certain principles and methods of econometrics.

Prerequisite: Econ 80a, Econ 82b and Econ 83a and **Math 15a [Applied linear algebra]**

TEXTBOOK

The main textbook for the course is the following:

J.H. Stock and M.W. Watson, *Introduction to Econometrics*, 2nd edition, Addison-Wesley, 2005.
You need to purchase this book.

ASSIGNMENTS

There will be weekly problem sets. The course statistical software is STATA (and a little bit of MATLAB). The material covered in the course cannot be learned without solving a lot of problems! You will be asked to hand in a subset of the problems so that you can get feedback. The rest of the problems will be discussed in weekly sessions with the teaching fellow.

Students are encouraged to work with others in the class on their problem sets, and you are allowed to work in a group of **up to 3** for the computer exercises. But each student must write up his or her answers independently. Please list the name(s) of those with whom you worked on your assignment. Note that direct copying is not permitted and will be treated as cheating.

GRADING

Problem Sets and in-class quizzes: 30%; Midterm Exam: 25%; Final Exam: 45%. The mid-term will take place in-class on [TBA]. Final exam will be scheduled by the registrar's office on [TBA].

CLASS POLICIES

If you are a student with a *documented disability* on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please see me immediately. Requests for any other adjustments to exam dates or due dates due to factors such as temporary illness or necessary athletic travel must be made as far ahead of the relevant date as possible.

If you have any questions about the material covered in my lectures or in the required reading you should seek help. I strongly encourage questions both during class and office hours. Feel free to schedule a time to discuss the course if you can not make my regular office hours.

TENTATIVE COURSE OUTLINE

SW = Stock and Watson

H = Hayashi

1. Introduction and review
SW: 2, 3
2. Simple linear regression
SW: 4, 5
3. Theory of simple linear regression
SW: 17 and handout
4. Multiple linear regression
SW: 6,7
5. Theory of multiple linear regression
SW: 18 and H
6. Nonlinear regression
SW: 8
7. Binary Choice Model
SW: 11 and handout
8. Panel Data Model
SW: 10
9. Instrumental variable regression
SW: 12, 18
10. Linear GMM (generalized method of moments)
SW: 18 and handout
11. Time Series Analysis
SW: 14,15 and handout

SOME TIPS FOR STUDYING ECONOMETRICS

This short note gives you some tips for smartly doing econometrics. The reason is that each course has its unique feature, each teacher has his/her own style. As a result, you should identify a feasible strategy that maximizes your performance given those features and styles. This note tries to help you by providing some “inside” information.

1. Commitment

This is a heavy and challenging course. We will cover a lot of topics. It is *impossible* to understand so many things in one week or two right before the midterm/final exams. So it is important to have a continuous commitment throughout the semester. Therefore, spend time on it every week.

2. Methodology Issues

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- (a) Coming to the class is time-saving
 - (b) Coming to the tutorial is time-saving
 - (c) Read the lecture notes / textbook in an efficient manner
 - (d) 184B is *not* writing intensive. Learn to be concise and precise.
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For each of the four suggestions, let me explain in more detail below.

(a) Coming to the class is time-saving

You might wonder if you can download everything from the webCT, why bother to come to the class? The answer is: it is time-saving to come to the class. The purpose of the course is to teach you something, not to toss out information and see how much sinks in. First, my task is to highlight the most important part, and explain the most difficult part in the slides. Second, I don't put everything in the slides (actually I might not use slides that much). Finally, it is always fun to have some interaction with your teacher.

(b) Coming to the tutorial is time-saving

Again, it is time-saving. The tutorial examples not only are testable (i.e., they might show up in the exams), but also directly related to your turn-in problem sets.

(c) Assigned reading

There are several suggestions here. First, it is always optimal to read the lecture notes / textbook *before* doing the problem sets. *Study* the material, don't just read it.

Second, my lectures are designed in a way to summarize the textbook material, and as a result, to save your time on textbook reading. To be more specific, the following strategy might be efficient: Read the lecture notes first. If there is something in the notes you don't quite understand, go to the relevant sections in the textbook for further reading.

Third, when preparing for exams, let the lectures guide you as to what is really important.

(d) Econometrics is *not* writing intensive. Learn to provide short but precise answers

This is a distinguishing feature of this course. Econometrics is logic intensive. Many students don't realize this until very late. You are supposed to learn to think problems logically. You are supposed to learn to be precise. So provide concise but hit-the-point answers. Don't write essays in your problem sets and exams – essay-type answers don't help.

(e) And by all means, seek help from the TAs and the instructor if you need it, and before you get hopelessly behind.