Econometrics
Fall 2015 Syllabus
SA. 340.710

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Course Description

NOTE: The syllabus might (probably will) change during class. The most up-to-date syllabus can always be found on my website (nathanielhiggins.com).

This course will provide an introduction to modern econometric techniques, with an emphasis on techniques used in micro-level analysis. There will be little emphasis placed on the theoretical derivation of estimators. Students will learn programming, data management, and to implement the estimators we discuss using the software package R.

Prerequisites

A Statistics course (SA. 340.709 *Statistical Methods for Business & Economics* or equivalent).

Time and Place

Class

- Class will meet each Monday from 6p to 8p in Rome 102
- TA session in the Stata lab on Thursdays from 4:45-5:45p
- TA office hours are Tuesdays from 6-8p

Office Hours

- I am always available immediately following the lecture, i.e. from 8-9p on Mondays
- I can also be reached by email to schedule individual meetings

TA contact info

- The TA is Robert Tenorio (rtenori2@jhu.edu)
- Robert will hold regular office hours and a weekly TA session outside of class

Books and Readings

Required

Introductory Econometrics: A Modern Approach will be the course textbook. I will be using the fifth edition (so all the quoted page numbers will be from the fifth edition). You can use whatever edition you can get hold of, though a more recent edition is better, all else equal. You are responsible for consulting a fifth edition whenever there are discrepancies. That is, having an older edition is fine, but having an older edition is not an excuse for missing material. (The differences that matter will likely be differences in the numbering of problem sets)

Full Citation:

Wooldridge, Jeffrey M. (2013). *Introductory Econometrics: A Modern Approach, 5e.* Mason, OH: South-Western CENGAGE Learning.

Recommended

I *highly* recommend the following be kept as a reference book by any applied econometrician:

Kennedy's *A Guide to Econometrics* is well organized and serves as a great reference. Each subject is treated in three stages: in an unformatted essay style, then in a series of bulleted *General Notes*, and finally in a series of bulleted *Technical Notes*. If you find Wooldridge to be too . . . *textbooky*, then Kennedy might be right up your alley.

Full Citation:

Kennedy, Peter (2008). *A Guide to Econometrics, Sixth Edition.* Malden, MA: Blackwell Publishing.

Dalgaard's *Introductory Statistics with R* is one of many good books about/for the programming language R. There might be better ones, but I have this one and it's good. A worthwhile reference for R.

I will be happy to recommend other books that are particularly useful for special topics, upon request.

Software

Students in this course will be expected to use R to complete in-class work, homework assignments, and individual projects. I encourage students also to use other software packages, especially Stata, but only R will be required.

R is becoming more widely used in the economics community. It is used widely by statisticians and data scientists more generally, and is one of the top programming languages in the world. And R is free. In comparison to Stata and other popular econometrics software packages, you will find that R has a syntax more similar to programming languages such as FORTRAN, C, and MATLAB. There are no funny looping structures like in Stata, or requirements that a single dataset be loaded at one time. R is an object-oriented language, and many objects can be held in the workspace at any given time – matrices, vectors, scalars, and datasets, including categorical, continuous, and character data, can be worked simultaneously. http://www.r-project.org/

If you have never used R before, Rstudio is a popular all-in-one GUI. Download it, install it, and you can be programming in R, analyzing data, and doing econometrics right away. https://www.rstudio.com/

I personally do not work in Rstudio all that much, but it is a great tool.

I work using a regular old distribution of R (the kind that you get if you download directly from http://www.r-project.org/) paired with the text editor Tinn-R.

There are a ton of good resources for learning and using R. I'll put a longer list up on the website, but here I will only list the required resource: Leada (https://www.teamleada.com/). You are required to sign up for and purchase a Team Leada account and the R Bootcamp course (consists of 4 modules). You will be assigned exercises from R Bootcamp for homework.

Assignments and grading

Grading

You will receive numerical grades for each piece of work you turn in. These points will then be summed, scaled, and projected onto a four-point scale. The university's grading system is as follows:

Grading scale

Grade	Interpretation	Numerical
A	Outstanding	4.00
A-	Excellent	3.67
B+	Very good	3.23
B	Good	3.00
B-	Pass	2.67
C+	Low Pass	2.33
C	Minimal Pass	2.0
D	Failure	0.0

Components of grade

As mentioned above, you will receive numerical grades for each piece of work you turn in. There are three types of work you will do during the semester: problem sets (regular homework), a research paper, and a replication project.

1. Problem Sets
    - Students will complete a series of problem sets requiring the use of R.
    - The exact number of problem sets assigned depends on the topics we cover and how quickly we cover them.
    - Experience leads me to estimate that we will complete roughly 6 problem sets.
2. The replication project
    - Students will replicate the results of a published econometric work.
    - See the lecture notes from class #1 for details.
    - The project deliverable will be a document (prepared in Word or LaTeX or similar) that explains the results of the paper back to me, including reference to the necessary code to generate the results of the published paper.
    - The code and data should be handed in as well.
    - If the results of your work are not identical to those of the published paper, tell me why (did the author make a mistake?).
3. A mid-term and a final
4. Weighting for the assignments is displayed in the table below

Weight	Assignment
15%	Problem Sets
25%	Mid-term exam
30%	Final Exam
30%	Replication Project

Lecture schedule

class 1:

- Introduction to econometrics
- An example of what econometrics "buys"
- Introduction to semester-long replication project
- Statistics review
- Introduction to Stata (brief)
- Reading: Appendices A, B, and C
- Homework 1: B.1 - B.5 (except part iii of B.3), B.7 - B.8, B.10, C.1

2:

- Linear regression with NO variables
- Parallelism between no-variable regression and summary statistics you already know
- Linear regression with one variable (univariate regression model)
- Reading: Chapters 1 and 2

3:

- Linear regression with two variables, using maximum likelihood
- Homework: Interim assignment 1 for replication project

4-5:

- Linear regression with multiple variables (multivariate regression)
- Reading: Chapters 1 and 2
- Reading: Chapter 3
- Homework 2: 2.1 - 2.11, C2.1 - C2.3
- Homework 2: C3.1 - C3.8 and posted homework

5:

- Making OLS make sense
- What OLS *really* does — what it means to hold a variable constant
- Reading: 3.2 - 3.3 (re-read)

6:

- Omitted variables
- Introduction to endogeneity
- Inference with OLS
- Variance of OLS estimators and statistical tests of individual parameters
- Confidence intervals
- p-values
- 9.1 - 9.2, 9.4 (9.5 may be helpful too)
- Reading: 4.1 - 4.4
- Homework 3: Posted homework

7:

- Review of basic hypothesis tests
- Hypothesis testing with multiple parameters
- Large-sample properties of OLS
- Reading: 4.5; Chapter 5

8:

- Mid-term exam on 28 October

9:

- Functional form of regressions (how to specify different shapes of a regression function)
- Dummy variables
- Using dummy variables to create different functional forms

- Interactions
- Reading: 6.1 - 6.2; 7.1 - 7.4

10:

- Move the dummy variable to the left-hand side: categorical dependent variables
- Linear probability model
- Probit and logit models (and their marginal effects)
- Maximum likelihood estimation
- Reading: 7.1, 7.5, 17.1

11:

- Applied micro — necessary tools
- More on endogeneity (all the flavors)
- Introduction to instrumental variables and two-stage least-squares
- Reading: 6.3 - 6.4; 9.4 - 9.5

12:

- Panel data
- Fixed effects
- Random effects
- Reading: 14.1 - 14.2 (14.3 will not be emphasized, but is worth reading)

13:

- Basics of time series analysis
- Reading: Chapter 10

14:

- Checking assumptions of the basic model(s)
- Heteroskedasticity
- Wrap-up

- Synthesis of material — what you do and don't know
- Reading: Chapter 8