



## **Statistics 520: Applied Econometrics I**

**Fall 2021**

**Professor:** Paul Shaman

**Email:** shaman@wharton.upenn.edu

**Class hours and location:** TuTh 3:30–5, virtual with Zoom

All classes will be synchronous.

Class will be presented for the full 90 minutes. The last ten minutes can be devoted to discussion and questions, as need arises. Videotapes of all classes will be available on Canvas.

**Office hours:** MTuTh, 8:15–9:30 pm, and by appointment, all virtual with Zoom

**Teaching Assistant:** Abhinav Chakraborty, abch@wharton.upenn.edu

### **Course web site**

Statistics 520 is using Canvas. You can gain access by going to <https://canvas.upenn.edu/>. All notes, homework assignments and data sets for the course will be distributed and managed via the website.

### **Materials**

Class notes. These will be available on Canvas. I will post notes in advance of the lectures. Each posting will provide material for one or more lectures.

*Econometric Analysis of Cross Section and Panel Data*, 2<sup>nd</sup> ed., by Jeffrey M. Wooldridge, MIT Press, 2010 . This is the main course text. I expect to cover Chapters 1–7.

*Mostly Harmless Econometrics, An Empiricist's Companion*, by Joshua D. Angrist and Jörn-Steffen Pischke, Princeton University Press, 2009. I highly recommend you read this book carefully. It is written in a refreshing and entertaining style. However, don't be fooled—it assumes a good deal of statistical understanding and is quite sophisticated and challenging . I expect to cover much of the material in Chapters 1–5 and 8. Quantile regression will be treated in Statistics 521.

*Mastering 'Metrics, The Path from Cause to Effect*, by Joshua D. Angrist and Jörn-Steffen Pischke, Princeton University Press, 2015. This is a second book by Angrist and Pischke, written in the same engaging style as *Mostly Harmless*. The topics covered are the same as in *Mostly Harmless*, except that quantile regression and nonstandard standard error issues are not presented. Much of the value of this book is in the examples presented. *Mastering 'Metrics* is extremely lucid and a must read. I expect to cover much of the material in Chapters 1–3 and 5.

*Applied Econometrics with R*, by Christian Kleiber and Achim Zeileis, Springer, 2008. This is a good reference for R basics and examples of the use of R. I have also posted on Canvas six documents which give R information and instruction.

(Optional) *Econometrics*, by Fumio Hayashi, Princeton University Press, 2000. There are many introductory graduate level econometrics texts. One particularly good one is by Hayashi. His treatment differs substantially from that of Wooldridge. His presentation tends to be more mathematical, and it addresses concepts and topics from time series as it proceeds (we will consider only a few issues from time series). Moreover, Hayashi introduces generalized method of moments (GMM) estimation early in his presentation, noting that ordinary least squares and two-stage least squares are special cases. If your interests are mathematical, I encourage you to do some reading in Hayashi. It is instructive and very helpful to see an alternative presentation of econometrics.

## **Software**

The R package will be used in lectures and for homework. R is free software and is available at [www.r-project.org](http://www.r-project.org).

## **Course overview**

The aims of this course are to study basic econometric techniques. The emphasis will be upon the understanding and use of econometric methodology, and the written communication of the results of data analysis. Topics we will cover include conditional expectation, linear projection, potential outcomes, ordinary least squares estimation, instrumental variables estimation, systems of equations, panel data models, difference-in-differences methodology, and some issues in time series analysis. We will explore mathematical and statistical foundations, as well as the application of statistical methodology. We will employ linear algebra extensively throughout, and will discuss and apply results from probability and theoretical statistics.

## **Course requirements**

There will be five homework assignments. These will include theoretical exercises and the analysis of data and interpretation of the findings, and the presentation of well-organized and clearly written reports. The homework is designed to teach and to give experience in the use of econometric methodology. You are encouraged to consult with each other in doing the homework, and also to contact me and/or the teaching assistant

for help. ***You must submit your own proofs, calculations, and YOUR OWN WRITEUP. SHARING FILES IS NOT PERMITTED.*** Homework must be submitted by the due date specified for the assignment. ***All assignments will be submitted via Canvas.***

There will be a final project. This will involve replicating the analysis presented in an empirical paper, and possibly presenting further analyses of the data set used in the paper. As an alternative, you may use a data set of your own choosing and carry out an original analysis, using your own research. A major goal of this exercise is organization and presentation of a carefully written report. Prior to starting the project, you will submit a brief (not more than one page) project proposal for my review. ***This proposal is required.***

There are no examinations. The course grade will be calculated as 80 per cent homework and 20 per cent final project.

### **Fall 2021 University Calendar**

The first class is Tuesday, 31 August.

No classes 6 September—Labor Day.

The course selection period ends Tuesday, 14 September.

The drop period ends Monday, 11 October.

Fall break, 14–17 October.

Grade type change deadline Friday, 29 October.

The withdrawal deadline is Monday, 8 November.

Thursday, Friday class schedule on Tuesday, Wednesday, 23–24 November.

Thanksgiving break 25–28 November.

Classes end Friday, 10 December.

Reading days 11–14 December.

Final exams 15–22 December.

**Class dates (all class presentations are synchronous)**

There are 28 classes (Tuesday, Thursday schedule)

Week of	Meeting days
8/30	8/31, 9/2
9/6	7, 9
9/13	14, 16
9/20	21, 23
9/27	28, 30
10/4	5, 7
10/11	12
10/18	19, 21
10/25	26, 28
11/1	2, 4
11/8	9, 11
11/15	16, 18
11/22	23
11/29	11/30, 12/2
12/6	7, 9