Applied Econometrics II

Instructor:	Minchul Shin
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	Office Hours: See Canvas

Scheduled Class Time and Organization: We will meet twice a week
Mondays and Wednesdays from 8:30am–10:00am, Location: Room F55, Jon M. Huntsman Hall.

Course web site: Statistics 5210 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, 2nd ed., by Jefferey M. Wooldridge, MIT Press, 2010. This is the main course text. I expect to cover topics in Chapters 7, 8 and 10; in part of Chapter 11; in Chapters 12–16; and in part of Chapter 18.

Journal articles. I will use several journal articles for notes and discussion, and for homework assignments.

Optional materials:

(Optional) Useful readings on micro-econometric methods. They are written in a refreshing and entertaining style. However, don't be fooled – it assumes a good deal of statistical understanding and can be quite challenging. These books contain many good examples:

- *Mostly Harmless Econometrics, An Empiricist's Companion* by Joshua D. Angrist and Jorn-Steffen Pischke, Princeton University Press, 2009.

- *Mastering Metrics: The Path from Cause to Effect* by Joshua D. Angrist and Jorn-Steffen Pischke, Princeton University Press, 2014.

- *Causal Inference: The Mixtape* by Scott Cunningham. Online version of the book is freely available from https://mixtape.scunning.com/.

(Optional) Other potentially useful graduate-level econometrics textbooks:

- Econometrics, by Fumio Hayashi, Princeton University Press, 2000.

- Econometrics, by Bruce Hansen, Princeton University Press, 2022.

(Optional) Useful readings for computing with R: I have posted on Canvas six documents which give R information and instruction. The following books are good reference for examples of the use of R for econometric analysis.

- *Introduction to Econometrics with R*, by Christoph Hanck, Martin Arnold, Alexander Gerber, and Martin Schmelzer, 2021. This online book is freely available from <https://www.econometrics-with-r.org/index.html>.

- *Applied Econometrics with R*, by Christian Kleiber and Achim Zeileis, Springer, 2008. Related materials including slides are available freely from <https://www.zeileis.org/teaching/AER/>.

Software: The R package will be used in lectures and for homework. R is free software and is available at <www.r-project.org>. I recommend you to use Rstudio as an IDE. <https://posit.co/products/open-source/rstudio/>.

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 panel data models, system estimation with instrumental variables, random effects and fixed effects models, M-estimation, nonlinear least squares, quantile regression, maximum likelihood, the generalized method of moments, binary and multinomial response models, and regression models for count data. We will examine the mathematical and statistical foundations of the methods, as well as their application. As in Applied Econometrics I, we will employ linear algebra extensively throughout, and we will discuss and apply results from probability and statistical theory.

- Note 1: System-wide OLS; Chapter 7.

- Note 2: System-wide (feasible) GLS; System-wide IV regression; Chapters 7 and 8.

- Note 3: System GMM estimation; Chapter 8.

- Note 4: Unobserved effects panel data models: Random effects and fixed effects; Chapter 10.

- Note 5: More topics on panel data models; GMM approaches, Hausman and Taylor model; sequential exogeneity and dynamic panel models; Chapter 11.

- Note 6: M-estimation and nonlinear regressions; Chapter 12.

- Note 7: Maximum likelihood estimation and logistic regression; Chapter 13 and 15.

- Note 8: Binary response models; Chapter 15.

- Note 9 : Quantile regression; Chapter 12.

Course requirements:

There will be six homework assignments. These will include theoretical exercises and involve 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 for help. ***You must submit your own proofs, calculations, and your own writeup. Files should not be shared.*** Homework must be submitted by the due date specified for the assignment. ***All assignments will be submitted via Canvas.***

There will be a project. This will involve duplicating 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.

Spring 2024 Calendar:

First day of classes, January 18
Course Selection Period ends, January 31
Drop Period ends, February 27
Spring Term Break, March 2 – March 10
Last day to withdraw from a course, April 2
Last day of classes, May 1
Reading Days, May 2 – May 5
Final Examinations, May 6 – May 14 (NOTE: there is no final exam for STAT 5210)
Spring Term ends, May 14

Class dates: There are 28 lectures (Monday, Wednesday schedule).

	Week of		Class dates
W1	22 Jan	L1, L2	1/22, 1/24
W2	29 Jan	L3, L4	1/29, 1/31
W3	5 Feb	L5, L6	2/5, 2/7
W4	12 Feb	L7, L8	2/12, 2/14
W5	19 Feb	L9, L10	2/19, 2/21
W6	26 Feb	L11, L12	2/26, 2/28
W7	4 Mar		Spring Break
W8	11 Mar	L13, L14	3/11, 3/13
W9	18 Mar	L15, L16	3/18, 3/20
W10	25 Mar	L17, L18	3/25, 3/27
W11	1 Apr	L19, L20	4/1, 4/3
W12	8 Apr	L21, L22	4/8, 4/10
W13	15 Apr	L23, L24	4/15, 4/17
W14	22 Apr	L25, L26	4/22, 4/24
W15	29 Apr	L27, L28	4/29, 5/1

(Revised: January 20, 2024)