

## Econ 2310: Econometric Methods and Models

<b>Instructor:</b>	Xu Cheng	Email: <i>xucheng@upenn.edu</i>
<b>Recitation Instructors:</b>	Lucienne Brunner	Email: <i>brunnerl@sas.upenn.edu</i>
	Hyoung Kang	Email: <i>artef75@sas.upenn.edu</i>
	Joseph Huang	Email: <i>jhuangsa@sas.upenn.edu</i>

**Course Description:** This course is designed to introduce you to econometric techniques and their applications in economic analysis and decision making. The main objective of the course is to train you in (i) handling economic data; (ii) quantitative analysis of economic models with probabilistic tools; (iii) econometric techniques, their application as well as their statistical and practical interpretation; (iv) implementing these techniques on a computer.

The course focuses on practical and conceptual issues involved in substantive applications of econometric techniques. Estimation and inference procedures are formally analyzed for simple econometric models and illustrated by empirical case studies using real-life data. The course covers linear regression models, simultaneous-equations models, discrete choice models, time series models, and panel data models. Estimation and inference is conducted using least squares, instrumental variable, and likelihood based techniques.

**Prerequisites:** ECON 101 and ECON 103; MATH 104 and MATH 114 or MATH 115.

**Class:** Tuesdays and Thursday 3:30-5:00 PM.

**Office Hours:** see canvas homepage

**Course Text:** The required textbook for this course is Stock, James and Mark Watson (2019, 4th Edition): *“Introduction to Econometrics”* Moreover, I will post some slides. You will be responsible for all the material covered in the lectures and the recitation sessions. However, you will not be responsible for additional material contained in the textbook that is not covered in lectures and recitations.

**Courseware:** We will be using an online discussion forum called PIAZZA for this course, which you can access directly from CANVAS. PIAZZA is the best place to ask any question you have about course material or logistics. By asking your question and getting an answer on PIAZZA, you create a positive externality: other students benefit from your questions and you benefit from theirs. The instructor and TAs will actively moderate PIAZZA both to answer questions and approve (or correct) answers written by your fellow-students. As an incentive you will receive credit bonus toward your final grade (see below).

### Course Requirements and Grading:

- **Individual Homework[15%]:** We assign 3 problem sets in total. Turn pdf version on Canvas by 12pm on the due date. No excuses for missed assignments/deadlines will be accepted. No makeup for missed problem sets.
- **Exam1 [25%]:** *Thursday, 9/29:* Exam 1 covers Lectures 1-8.
- **Exam2 [25%]:** *Thursday, 11/03:* Exams 2 covers Lectures 9-16.
- **Exam3 [25%]:** *Tuesday, 12/06:* Exams 3 covers Lectures 14-21. Note that Lectures 14-16 are covered by both Exam 2 and Exam 3.
- **Group Project[5%]:** There is one group project on big data covered in lectures 22 and 23. You can form your own group of size 2 or 3.
- **Participation: PIAZZA [5%]:** You will earn participation credit based on the frequency and quality of your contributions to the PIAZZA discussion board. Contributions include questions, answers, and follow-ups. Details of the rules will be posted on PIAZZA.

### Important Administrative Policies for all Courses:

**Academic Conduct:** I expect complete adherence to Penn's code of academic conduct. I will treat any violation, such as cheating in any form, with severity.

**Classroom Conduct:** I expect classroom conduct to be respectful of others. For example, late arrivals, early departures, and conversations are disruptive to all and are not appreciated.

**Excusal From Exams Due to Severe Illnesses or Conflicts:** You must EMAIL me at least one hour BEFORE the start time of the exam, giving details of the situation and requesting to be excused. You must also produce official documentation, as per University rules. At my discretion I will then: (1) Accept the request and require that the exam portion of your final grade be based solely on your other exam grades, or (2) Accept the request and require that you take a makeup exam, typically different from the original exam, at a time, date and location to be determined by me in accordance with University rules. You will then be expected to make all arrangements necessary to ensure that you appear at the set time, date, and location, and failure to so will result in a grade of 0, as there is no "makeup makeup exam." During the period between the originally-scheduled exam and the makeup exam, neither I nor the TA's will be available to discuss any material of potential relevance to the exam, or (3) Decline the request and assign a grade of 0 if you do not take the exam. Note well: (a) I grant requests for excusal due to conflicts only in very special situations, as you are expected to make all arrangements necessary to ensure that you appear at the set time, date, and location. In particular, conflicting activities such as early/late travel departures/returns, interviews, and non-emergency family events are *\*NOT\** valid grounds for excusal, and (b) Makeup exams for finals are generally given at the beginning of the semester following the course. Seniors who miss a spring-semester final may therefore be required to postpone graduation.

**Problem Set and Exam Grading Reviews:** You must first review the PS or exam with the TA "in charge" of the PS or exam. If you are not satisfied with the TA's explanation, you may submit a formal regrade request by email to the TA in charge of the PS or exam. The regrade request (1) must clearly state the specific item in dispute and contain a clear and persuasive explanation of the reason for your regrade request, and (2) must be submitted within one week (seven days) from the initial release of the PS grade online or the return of the exam (e.g., if the PS or exam is returned at the end of class at 2:45pm on a Thursday, then the emailed regrade request must be time-stamped earlier than 2:45 on the following Thursday). If and only if the TA accepts your re-grade request, s/he will then regrade the ENTIRE PS or exam, not just the item in question. Note that under the reasonable assumption of symmetric grading errors, the expected point change from a re-grade is zero, even if you get additional points for the item in question. Moreover, to the extent that a regrade does produce a point change, it's as likely to be down as up. Finally, we randomly photocopy some PS's and exams before returning them, so we will likely catch any regrade-

related cheating.

**Course Outline and Schedule:** see canvas site for a large excel version.

Econ 2310 Fall 2022 (subject to adjustment)						
week	lecture	Day	Date	Topic	Readings	Due and Remark on Exam
1	1	T	08/30	Introduction and Review	SW1-3	
	2	TH	09/01	Linear Regression with OLS	SW4.1-4.3	
2	3	T	09/06	Assumption and Properties of OLS	SW4.4, 4.5	
		TH	09/08	NO CLASS		
3	4	T	09/13	Test and CI for Linear Regression	SW5.1-5.2	PS 1 Assigned
	5	TH	09/15	Binary Regressor; Heteroskedasticity, Omitted Variable Bias	SW5.3, 5.4, 6.1	
4	6	T	09/20	Assumption and Estimation with Multiple Regression	SW6.1-6.5	PS 1 Due
	7	TH	09/22	Test/CI with Multiple Regression	SW7.1-7.6	
5	8	T	09/27	Nonlinear Regressions	SW8.1-8.4	
		TH	09/29	Exam 1		Exam 1 covers Lecture 1-8 (8 Lectures)
6	9	T	10/04	Internal and External Validity	SW9.1-9.4	
		TH	10/06	Fall Break		
7	10	T	10/11	Panel Data and Fixed Effects	SW10.1-10.3	
	11	TH	10/13	Panel Data and Fixed Effects	SW10.4-10.6	PS 2 Assigned
8	12	T	10/18	Binary Dependent Variable, Probit, Logit	SW11.1-11.2	
	13	TH	10/20	Binary Dependent Variable, Probit, Logit	SW11.3-11.4	PS 2 Due
9	14	T	10/25	Instrumental Variable	SW12.1	
	15	TH	10/27	Instrumental Variable	SW12.2-12.4	
10	16	T	11/01	Instrumental Variable	SW12.5	
		TH	11/03	Exam 2		Exam 2 covers Lecture 9-16 (8 Lectures)
11	17	T	11/08	Experiments and Quasi-Experiments	SW13.1-13.2	
	18	TH	11/10	Experiments and Quasi-Experiments	SW13.3-13.4	PS 3 Assigned
12	19	T	11/15	Time Series Forecasting	SW15.1-15.3	
	20	TH	11/17	Time Series Forecasting	SW15.4	PS 3 Due
13	21	T	11/22	Nonstationary Time Series	SW15.7	
		TH	11/24	Thanksgiving		
14	22	T	11/29	Big Data	SW 14.1-14.3	Group Project on Big Data Assigned
	23	TH	12/1	Big Data	SW14.4-14.5	
15		T	12/6	Exam 3		Exam 3 covers Lecture 14-21 (8 Lectures)
	24	TH	12/8	Big Data and Overview of Econometrics Topics	SW14.6-14.7	Group Project Due

**Statistical Software:** We will use the statistical package *R* via a front-end called RStudio throughout the course. Both programs are free and open source. See the last page of this document for instructions on how to configure your computer to run *R* and RStudio.

## *R* Resources

**Installing R and RStudio:** First, download and install *R* from <http://cran.r-project.org/>. Second, download and install RStudio by visiting <http://rstudio.org/download/desktop> and clicking the link listed under “Recommended for Your System.”

**References:** While not required, these references may be useful if you need some extra help learning *R*, or want to go beyond the material covered in the course.

- Contributed Documentation by Comprehensive R Archive Network (CRAN) <http://cran.r-project.org/other-docs.html> Comprehensive list of freely available reference material for *R*.
- *R Twotutorials* by Anthony Damico <http://www.twotutorials.com/>  
Ninety energetic, two-minute video tutorials on statistical programming with *R*.
- Google Developers R Programming Video Lectures  
<http://www.r-bloggers.com/google-developers-r-programming-video-lectures/>  
R Programming video tutorials from beginning to advanced.
- *Econometrics in R* by Grant Farnsworth  
<http://cran.r-project.org/doc/contrib/Farnsworth-EconometricsInR.pdf>
- *Resources to help you learn R* by UCLA Academic Technology Services  
<http://www.ats.ucla.edu/stat/R/> A wealth of information about *R*, conveniently arranged in one place. The R Starter Kit is particularly helpful.
- *R in a Nutshell* by Joseph Adler  
<http://proquestcombo.safaribooksonline.com/book/programming/r/9781449377502>  
Electronic version of the book of the same name published by O’Reilly (Accessible on the UPenn Network). Provides a comprehensive reference guide to *R*.

- R-bloggers <http://www.r-bloggers.com> A blog aggregator for R news and tutorials, with lots of applications.