

# PPHA 41400: Applied Regression Analysis

## Winter 2025

<b>Instructor</b>	Sheng-Hao Lo ( <a href="mailto:shenghaolo@uchicago.edu">shenghaolo@uchicago.edu</a> ) Office Hour: Wednesday 10:30am-12:00pm, Zoom
<b>Class Meetings</b>	M/W 3:00pm-4:20pm, Keller 0023
<b>Teaching Assistant</b>	Pepi Pandiloski ( <a href="mailto:predragpandiloski@gmail.com">predragpandiloski@gmail.com</a> )
<b>TA Sessions and Office Hours</b>	TBD

### Course Overview:

This course focuses on the theory and application of econometrics, offering both practical experience in econometric analysis. It is designed to equip students with the skills necessary to effectively consume and produce empirical research in public policy, economics, and related disciplines. The course applies concepts to real-world scenarios, primarily through economic applications. In the first half, we will review key properties of linear regression and delve into various econometric models for causal inference. The second half transitions to model building, selection, and cross-validation techniques for prediction, followed by a comprehensive introduction to time series models and forecasting. Students will engage in hands-on data analysis, working with real-world datasets from diverse fields such as labor economics, finance, environmental studies, education, etc. The coursework includes practical experience in R to reinforce these concepts through applied modeling techniques.

### Prerequisites:

Students must have completed PPHA 31102 Statistics for Data Analysis II or equivalent. It is recommended (but not required) that students have completed PPHA 34600 Program Evaluation.

### Course Structure:

We will meet in person twice per week. All lectures will be in person unless notified. (An exception: In observance of MLK Day, we will *not* meet in person on January 20. Instead, we will meet in person on Friday, January 24.) Attendance is required unless some unforeseen problem prevents it, as the bulk of your learning will come from lectures, slides, and in-class discussions of each lecture's material.

Weekly TA sessions complement lectures and are led by our teaching assistant. Each session is divided into two parts: the first half focuses on reviewing the week's content to deepen understanding, while the second half is reserved for office hours. Attendance is not mandatory but is strongly recommended for all students to enhance their grasp of the material.

## **Textbooks:**

There are no required textbooks for this course; however, the following are recommended:

- *Introductory Econometrics: A Modern Approach* (7<sup>th</sup> Ed.) by Jeffrey M. Wooldridge. Earlier editions are fine, but I will indicate readings only for the 7<sup>th</sup> edition—you are responsible for cross-walking the chapters to a different edition.
- *Introduction to Econometrics* (4<sup>th</sup> Ed.) by James H. Stock and Mark W. Watson. Similarly, earlier editions are fine, but I will indicate readings only for the 4<sup>th</sup> edition—you are responsible for cross-walking the chapters to a different edition.
- *Mastering Metrics* by Joshua D. Angrist and Jorn-Steffen Pischke.
- *Forecasting: Principles and Practice* (OTexts 2014) by Rob Hyndman and George Athanasopoulos. This is available online [here](#).

## **Communications:**

Communication from instructor to students will happen primarily through the posting of materials on Canvas, including postings to Announcements and the Piazza discussion board. Please note that you are responsible for reading all Canvas Announcements related to the course.

Based on our past experience, emailing your instructor directly is an ineffective way to have either a logistical or a pedagogical issue resolved. Therefore, we suggest and request that communication from students take the following forms:

- Questions regarding scheduling and other course logistics should be directed to the TA: Pepi Pandiloski ([predragpandiloski@gmail.com](mailto:predragpandiloski@gmail.com)).
- Questions regarding course material may be posted to **Piazza**, a forum that is monitored by the teaching assistant and instructor. Please note that, while we strive to respond expeditiously to student questions posted on Piazza, you should not expect to always receive prompt replies, especially if your question is posted on the weekend or after normal business hours. So, for example, please do not expect to receive a quick response at 9:00pm on a Friday evening.

## **Office Hours:**

Each week, you are encouraged to attend your instructor's office hours. To attend instructor office hours, a student or small group of students (we encourage you to attend office hours in a small group!) can reserve an available time slot to meet with the instructor. More information, including time slots for scheduled office hours, is available on the course Canvas site. In addition, the TA will hold regularly scheduled sessions (along with office hours) that you are encouraged to attend. These sessions are useful for asking questions about the course material, homework assignments, and troubleshooting R code. Additional information about TA office hours is also available on Canvas.

## Grading:

The composition of your overall course grade is calculated as follows:

Problem Sets 1-5	60%
Midterm + Final Exam	40%

- **Problem Sets:** There will be 5 Problem Sets in this course. You are encouraged to form your own study group to share approaches (not answers), but **you must write up your own set of answers individually and indicate on the first page who you worked with.** Your work should only reflect your knowledge and your effort. That means, for instance, that your write-up to an assignment should always and entirely be written in your own words. If your write-up contains the same language as others' write-ups in the class, that is considered a violation of the collaboration policy and hence results in zero credit. If you are ever unsure about what is permissible, proper attribution, and other academic (dis)honesty issues, please ask the teaching staff!

Problem Sets 1-5 are due on the due time and **late problem sets will not be accepted.** Below are the due dates for each problem set (**subject to change**):

- Problem set 1: Thursday, January 16
- Problem set 2: Thursday, January 30
- Problem set 3: Thursday, February 13
- Problem set 4: Thursday, February 20
- Problem set 5: Thursday, February 27

The problem set with your highest score will be worth 18% of your overall grade, the problem set with your lowest score will be worth 6% of your overall grade, and each of the remaining three problem sets will be worth 12% of your overall grade. This weighting scheme is designed to minimize the consequences of a single bad assignment and ensure that your best work is rewarded.

We will be using **Gradescope** to manage assignments and grading. You can find the Gradescope shortcut on the left side of your Canvas menu. You must follow all submission instructions, which are provided on Canvas with each assignment. Homework assignments are due at 11:45pm on the due date. We will provide a 14-minute grace period in which assignments submitted by 11:59pm on the due date will not be marked as late. After then, no late problem sets will be accepted. **You must submit a PDF version of your assignment at that link, and NOT under "Assignments" on Canvas.** We will NOT consider submissions if they are not uploaded to Gradescope, even if they are submitted in time. In order to include your coding work in the PDF, you can use one of the three options listed below:

1. Save your .R file as a PDF and attach it to your homework PDF with the rest of your assignment.
2. Take screenshots of your .R file and copy them into your homework PDF with the rest of your assignment. Make sure it's legible if you use this option.
3. If you are so inclined, use R Markdown to knit your code & rest of your assignment together into a PDF.

**You must include the outputs of your code, such as any numbers, figures, tables, or graphs, within your homework assignment PDF.** Any problem set without these outputs will receive zero credit on the coding portion.

If you wish to submit a regrade request for an assignment, you must submit a request for a specific question through the Gradescope regrade request system **within 7 days** of the release of grade release. Regrade requests submitted later than 7 days will not be considered. If your regrade request is approved, your grade on Canvas will be changed to reflect the regrade. It may take up to a week for your grade change to be available on Canvas. In all cases, the *entire* problem set will be re-graded, not just the question or specific part that pertains to your grievance. As a result, the re-grade can (and often does) result in a lower overall grade on the assignment or assessment.

- **Examinations:** The exams will be held on the following dates and times:
  - Midterm exam: **Wednesday, February 5**, in class.
  - Final exam: **TBD**. It will cover the content from the second half of the course.

All exams will be held in-person at these times. Students must take the exams in order to receive a letter grade in the class; in other words, students will not be exempted from the exams. We will provide more details on the exams as they approach.

For students who did better on the midterm than the final, the weights will be 25% on the midterm, and 15% on the final. For students who did better on the final than the midterm, the weights will be 25% on the final, and 15% on the midterm.

All requests for accommodations for the midterm or final exam should go through the Harris Student Affairs who will determine if the request is for an acceptable reason. Please email Dean Kate Biddle and cc the TA. In the rare case of a documented emergency where an accommodation is not feasible, we will re-weight other components of your grade.

- **Final letter grade:** I will be grading on a curve that is more generous than the Harris Core curve (i.e. with a higher share of higher grades than the standard curve).

### **Course Outline (subject to change):**

The following outline is meant as a **rough guide**. In terms of lecture material, this is the order of the material, but we expect some content to take longer than one lecture. Corresponded textbook chapters and additional readings will be posted on Canvas.

- Unit 1: Course Introduction and Review of Linear Regression
- Unit 2: Limited Dependent Variables
  - Maximum Likelihood Estimation
- Unit 3: Instrumental Variables Revisited (with more applications)
  - Order condition, Test for endogeneity
  - Simultaneous causality bias and simultaneous equations
- Unit 4: Panel Data Models Revisited (with more applications)
  - Difference-in-difference
  - Synthetic control
- Unit 5: Model Evaluation and Selection for Prediction
  - Big data and Data mining
  - The many-regressor problem
  - Prediction errors
- Unit 6: Introduction to Time-series Regression and Forecasting
  - Serial correlation, Stationarity and Trends
  - Forecast intervals and Prediction errors
  - Autoregressions, ADL Model
  - ARMA & ARIMA models
- Unit 7: More Discussions on Time-series Regression
  - Dynamic causal effects
  - Vector Autoregressions
  - Multi-period forecasts
- Unit 8: Additional Topics (if time permits)

### **Other Course Policies:**

- Recording, Deletion and Copyright
  - As per the Harris School's policies for core courses, we will record the twice-weekly lecture and make that recording available to students enrolled in the course through the course Canvas site. The lecture recording will only include the audio and the screen capture of the computer displaying slides. We, unfortunately, do not have the ability to record video that legibly captures writing on the white board. In addition, while we always hope to provide a recording with clear audio, we make no warranty about the quality of the audio or the auto-generated captions from that audio. In other words, the lecture recordings are not a substitute for

regular lecture attendance. Please keep in mind the following course, school, and university policies regarding the recording of lectures:

- You may not record, share, or disseminate any course sessions, videos, transcripts, audio, or chats.
  - You may not share recordings (or other materials) for the course to those not currently enrolled.
  - Any Zoom cloud recordings will be deleted 90 days after the completion of the recording.
  - The full Recording and Deletion Policies can be found in the [Student Manual under Petitions, Audio & Video Recording on Campus](#).
- All course materials (including, but not limited to, class lectures and discussions, meetings, handouts, exams and web materials) and the intellectual content of the course itself are protected by United States Federal Copyright Law. Students are permitted to make notes solely for their own private educational use. Students and all other persons are expressly forbidden from recording lectures or discussions and from distributing or selling lecture notes and all other course materials without the prior written permission of the instructor. Because the instructor owns the copyright to the classroom presentations and all course materials, any notes taken during those presentations and subsequently sold or distributed to others would constitute an unauthorized derivative work and expose the person or persons involved to individual copyright infringement actions by the instructor.
- Academic Integrity  
All University of Chicago students are expected to uphold the highest standards of academic integrity and honesty. Among other things, this means that students shall not represent another's work as their own, use impermissible materials during exams, or otherwise gain an unfair academic advantage. All students suspected of academic dishonesty will be reported to the Harris Dean of Students for investigation and adjudication. The disciplinary process can result in sanctions up to and including suspension or expulsion from the University. At the instructors' discretion, the student may receive a failing grade for the course regardless of their performance on other elements of the course.

Please note that the collaboration policy is explicitly stated on every homework assignment. Not abiding by this policy is considered academic misconduct and is subject to the sanctions described above. For additional resources on academic integrity at the Harris School and the University of Chicago, see:

1. [University Student Manual](#)
2. [Harris Student Policies](#)
3. [University of Chicago University Policies and Regulations on Academic Honesty & Plagiarism](#)

- Use of Generative Artificial Intelligence
 

Generative AI tools, such as ChatGPT, are incredibly powerful and potentially transformative. Students are permitted to use these tools for assignments in the course as they would any other internet resource. With that in mind, students should remember that:

  - Generative AI tools, like other internet resources, are sometimes inaccurate. Large language models can generate remarkably coherent and correct-sounding text that is profoundly inaccurate. There is some evidence that these models are especially prone to producing inaccurate responses to prompts in the quantitative domain. As a result, compared to traditional internet resources (the sources of which are known), these tools may confuse and mislead rather than provide guidance towards the solution. Students are always fully responsible for the accuracy of their written work for the course.
  - Just as it is not acceptable to copy and paste text into an assignment from a traditional internet resource, it is not acceptable to copy and paste text from generative AI tools. As the collaboration policy states, “Your write-up and code should only reflect your understanding of the material. As such, these should be written in your own words.” These principles and this policy are applicable to the generative AI context as well. To comply with the university policies on academic honesty, you must always provide proper documentation and citation of the generative AI tools that you used. When you are not sure about appropriate usage, please ask for clarification.
  - Over-reliance on these tools may be detrimental to student learning. Of note, students will not have access to these tools for the exams, which constitutes 40% of the overall grade. Students who depend on these tools to complete assignments may score lower than they otherwise would have on the exams.
  
- Americans with Disabilities Act
  - Students with disabilities needing academic accommodation should contact UChicago’s Student Disability Services (SDS). SDS staff will engage with you in an interactive process to identify necessary services and accommodations to ensure equitable access to University programs and services. You also must submit current [disability documentation](#) that meets SDS guidelines to establish eligibility. You can find the necessary forms and instructions for [accommodations related to learning disabilities](#) and [accommodations related to physical disabilities](#). Please see the webpage for contact information (<https://disabilities.uchicago.edu>).
  - Please note that the process for requesting accommodations generally takes several weeks, but Student Disability Services can usually provide provisional accommodations in the interim. Please contact [disabilities@uchicago.edu](mailto:disabilities@uchicago.edu) with the documentation you have.

- If SDS approves accommodations, a determination letter will be shared with the Harris Disability Liaison (Marley Mandelaro) and the Dean of Students. The liaison will work with the student to implement your approved accommodations.
- Mental Health Services
  - Students differ in how much they know about mental health services. Your use of UChicago's Student Health and Counseling Services (SHCS) is free, confidential and not linked to your academic file. There are no gains from suffering in silence, so please do not hesitate to make use of the services provided by SHCS if you need them. Please see SHCS' mental health webpage for services and contact information (<https://wellness.uchicago.edu/mental-health/>). And if you are having serious mental, physical, or other problems, immediately contact the urgent medical care line at (773) 834-WELL.
- Diversity and Inclusion
  - UChicago welcomes, values, and respects students from a wide range of backgrounds and experiences, and we believe that rigorous inquiry and effective public policy problem-solving requires the expression and understanding of diverse viewpoints, experiences, and traditions.
  - UChicago is committed to diversity and rigorous inquiry that arises from multiple perspectives, and encourages thought-provoking discourse that involves not only speaking freely about all issues but also listening carefully and respectfully to the views of others. I concur with this commitment and view the diversity that students bring to my class as a valuable resource and a benefit to learning. I expect to maintain a productive learning environment based on open communication, mutual respect, and non-discrimination, and strive to present materials in a way that is respectful of diverse student backgrounds. As there can always be a gap between intent and execution, suggestions for promoting a positive and open environment are welcomed. Please feel free to correct me on your preferred name and gender pronouns if necessary.
- Emergencies or Assignment Conflicts, including Religious Exemptions
  - In general, due dates and assessment dates are not subject to change out of fairness to your fellow students. That said, we understand there are rare circumstances that may require exceptions. Please do not email your instructors about these personal situations. Instead, you need to email your academic advisor regarding circumstances that may warrant an exception. Your advisor will then communicate with your instructor to help determine the appropriate accommodation if the situation indeed merits one. Importantly, any such request must be communicated sufficiently in advance of the due date to be considered.