Professor Eric Auerbach
Office Hours: KGH 3385 MW 3:30-4:30PM
eric.auerbach@northwestern.edu

Econ 381-1
Econometrics
Winter 2023
MW 11-12:20 PM
University Hall 102

Course Information: This course is the first in a two quarter introductory sequence in econometric theory. Its focus is on the linear regression model with an emphasis on both theory and applications. The main prerequisites are introductory probability and statistics at the level of Math 385 and linear algebra at the level of Math 240. No text is required, but students may find *Introductory Econometrics: A Modern Approach*, 7th edition, Cengage Learning, 2019 by Jeffrey Wooldridge or *Introduction to Econometrics*, 4th edition, Pearson, 2019 by James Stock and Mark Watson to be helpful resources.

Grades will depend on four problem sets, a midterm exam, and a final exam. Problem sets must be submitted by their due dates. Problem sets submitted afterwards will not be accepted. You may form teams to work on each problem set. Each team should submit only one problem set. Additional submissions will not be graded.

Pedro Melgare (e: pedromelgare2027@u.northwestern.edu) is the teaching assistant for this course. He will hold a discussion section on Fridays, 11-12:20PM and announce his office hours in section.

The midterm will be in class and is tentatively scheduled for Wednesday, February 7th. The final is also in-class and is tentatively scheduled for Wednesday, March 6th. Both exams will be 11-12:20PM in Room 102 of University Hall. The approximate final grade will be the average of the average problem set grade, midterm exam grade, and final exam grade. It may be curved as per department policy.

Missed Exams and Academic Integrity: Any student who misses the midterm or final without a good reason will receive no credit for the exam. Medical reasons require written confirmation from the Student Health service or a doctor. Non-medical reasons require written excuse from the WCAS Office of Studies. A makeup for the midterm will be permitted only if there is a good reason for missing the exam. Suspicion of academic dishonesty will be immediately referred to the Dean's office. Students in this course are required to comply with the policies found in the booklet *Academic Integrity at Northwestern University: A Basic Guide*.

AccessibleNU: Any student with a documented disability needing accommodations is asked to register with the AccessibleNU office, and provide an accommodation notification from Accessible NU within the first two weeks of class. All information will remain confidential. Northwestern University is committed to providing the most accessible learning environment as possible for students with disabilities. Should you anticipate or experience disability-related barriers in the academic setting, please contact AccessibleNU to move forward with the university's established accommodation process (e: accessiblenu@northwestern.edu; p: 847-467-5530). If you already have established accommodations with AccessibleNU, please let me know as soon as possible, preferably within the first two weeks of the term, so we can work together to implement your disability accommodations. Disability information, including academic accommodations, is confidential under the Family Educational Rights and Privacy Act.

COVID-19: This class or portions of this class may be held in person. Students, faculty, and staff must comply with University expectations regarding appropriate classroom behavior, including those outlined below and in the *COVID-19 Code of Conduct*. With respect to classroom procedures, this includes policies regarding masking and social distancing evolve as the public health situation changes. Students are responsible for understanding and complying with current masking, testing, Symptom Tracking, and social distancing requirements. In some classes, masking and/or social distancing may be required as a result of an Americans with Disabilities Act (ADA) accommodation for the instructor or a student in the class even when not generally required on campus. In such cases, the instructor will notify the class. No food is allowed inside classrooms. Drinks are permitted, but please keep your face covering on and use a straw. Faculty may assign seats in some classes to help facilitate contact tracing in the event that a student tests positive for COVID-19. Students must sit in their assigned seats.

If a student fails to comply with the COVID-19 Code of Conduct or other university expectations related to COVID-19, the instructor may ask the student to leave the class. The instructor is asked to report the incident to the Office of Community Standards for additional follow-up. To protect the health of our community, Northwestern University requires unvaccinated students who are in on-campus programs to be tested for COVID-19 twice per week. Students who fail to comply with current or future COVID-19 testing protocols will be referred to the Office of Community standards to face disciplinary action, including escalation up to restriction from campus and suspension.

Inclusivity and Wellness: This course strives to be an inclusive learning community, respecting those of differing backgrounds and beliefs. As a community, we aim to be respectful to all students in this class, regardless of race, ethnicity, socioeconomic status, religion, gender identity or sexual orientation. Northwestern University is committed to supporting the wellness of our students. Student Affairs has multiple resources to support student wellness and mental health. If you are feeling distressed or overwhelmed, please reach out for help. Students can access confidential resources through the *Counseling and Psychological Services (CAPS)*, *Religious and Spiritual Life (RSL)* and the *Center for Awareness, Response and Education (CARE)*.

Course Outline: The following is an approximate outline for the course. The relevant section of the lecture notes for each topic is in parentheses.

1. Introduction to econometrics and economic data

2. The simple linear regression model (Section 1)

    a. Model and assumptions (Section 1.1)

    b. Deriving the OLS estimators (Section 1.2)

    c. Properties of the OLS estimators (Section 1.3)

    d. Measuring goodness-of-fit, prediction, and statistical inference (Section 1.4)

3. The multiple linear regression model (Section 2)

    a. Model and assumptions (Section 2.1)

    b. Deriving the OLS estimators (Section 2.2)

    c. Properties of the OLS estimators (Section 2.3)

    d. Categorical variables, interactions, quadratic and higher-order terms (Section 2.4)

    e. Statistical inference (Section 2.5)

4. Specification Error (Section 3.1)

    a. Inclusion of an irrelevant variable (Section 3.1.1)

    b. Exclusion of a relevant variable (Section 3.1.2)

5. Multicollinearity (Section 3.2)

6. Heteroskedasticity (Section 3.3)

    a. Robust Inference (Section 3.3.3)

    b. Weighted Least Squares (Section 3.3.4)

    b. Testing for Heteroskedasticity (Section 3.3.5)