# EC 224
# Econometric Analysis
## TTh 2–3:15 pm, CAS 227

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|---|---|---|
| **Instructor**: | Plinio Dias Bicalho | **TA**: TBD |
| **E-mail**: | pliniob@bu.edu | TBD |
| **Office Location**: | B10 (Econ Dept.) | B21 (Econ Dept.) |
| **Office Hours**: | Tue 3:15 pm (sign up here) | TBD |

**Course Summary** The course can be roughly divided into three parts. The first part is more analytical and proof-oriented. We will go over the foundations of regression analysis and its fundamental theorems. The second part is more practical. We will cover different tools related to least squares regression and how they can help us investigate causal relationships. Finally, if time permits, we will move toward natural experiments and more sophisticated tools for investigating causality.

**Course Description:** This course aims to familiarize students with basic empirical strategies frequently used in econometrics. Topics covered (tentatively) include linear regression with multiple regressors, bootstrapping, nonlinear regression, regression with limited dependent variables, instrumental variable regression, interaction effects in regression, panel regression, difference-in-differences designs, and regression discontinuity designs. R will be our primary tool to apply theory to economic data. After completing this course, students are expected to be able to run regression analyses in R and understand the relevant econometric theory.

**Prerequisite(s):** Familiarity with linear algebra (e.g., matrix multiplication, matrix transpose, matrix inverse) and introductory statistics (e.g., properties of covariance, normal distribution) is assumed.

**Text(s):** Lecture notes will be the primary source. For further references, see James Stock and Mark Watson, *Introduction to Econometrics* (4th edition), and Angrist and Pischke, *Mostly Harmless Econometrics* (any edition).

**Grade Distribution:**

Your grade will be the maximum of the following options:

| Option 1 | | Option 2 | |
|---|---|---|---|
| Problem Sets | 10% | Problem Sets | 10% |
| Midterm 1 | 25% | Best Midterm | 25% |
| Midterm 2 | 25% | Final Exam | 65% |
| Final Exam | 40% | | |

Any extra credit opportunities will be announced in class, made available to all students equally, and awarded at my discretion.

**Academic Conduct** Students should carefully read and understand the CAS Academic Conduct Code:
https://www.bu.edu/academics/cas/policies/academic-conduct/

Any suspected academic misconduct will be reported to the Dean's Office.

**Software:** Students may purchase Stata/BE. The 6-month version costs $48 and can be purchased here: https://www.stata.com/order/new/edu/profplus/student-pricing/.

I highly recommend downloading R and RStudio, both freely available at https://posit.co/download/rstudio-desktop/.

**Exam Regrade Policy:** Regrade requests must follow a formal process. Past misuse of informal regrading has necessitated this policy, which is aligned with BU guidelines on academic integrity.
To submit a regrade request for a midterm question, students must:

1. Write me an e-mail including:

    - Your name and student ID
    - The question you wish to have regraded
    - A justification based on the answer key discussed in section
    - The sentence: *"I acknowledge that if my regrade request is unsuccessful, one point may be deducted from my overall score."*

2. Drop off your exam after class or during office hours

3. If awarded, the grade will be updated on Blackboard. If denied and deemed excessively unmerited, **one point will be deducted** for each denied question.

4. Exams are graded on a curve; regrade abuse to "climb the curve" will not be tolerated.

**Important Notes:**

- Exams will be scanned (entirely or partially).

- Any mismatch between a submitted exam and our records will result in an F and a report to the Dean's Office.

- Discussion sections review complete answer keys.

- Regrade requests not following the guidelines will not be considered.

- Exams will be available for pick-up within three weeks.

- The regrade policy does not apply to the final exam.

- After the final, office hours will be scheduled within one week. Final regrades require a full exam re-evaluation.

| Week | (Tentative) Content |
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| Week 1 | • Introduction/recap |
| Week 2 | • Linear Regression models and OLS<br>• OLS properties<br>• Discussion session: Programming session |
| Week 3 | • OLS properties<br>• OLS hypothesis testing<br>• Discussion session: Derivation OLS estimator and exercises |
| Week 4 | • OLS hypothesis testing<br>• Bootstrapping<br>• Discussion session: OLS standard errors |
| Week 5 | • Review midterm 1<br>• **Midterm 1**<br>• Discussion session: Review of Midterm 1 (answer key) |
| Week 6 | • Non-linear Regression models and limited dependent variables<br>• Non-linear Regression models and limited dependent variables<br>• Discussion session: Probit, Logit, LPM, and polynomial regression |
| Week 7 | • Omitted Variable Bias, Measurement Error, Selection Bias<br>• Omitted Variable Bias, Measurement Error, Selection Bias<br>• Discussion session: Omitted variable bias |
| Week 8 | • Panel Regression and Interaction Terms<br>• Panel Regression and Interaction Terms<br>• Discussion session: No discussion (spring break) |
| Week 9 | • Causality and Experimental Economics<br>• Causality and Experimental Economics<br>• Discussion session: Fixed effect, interaction terms, and their implementations |
| Week 10 | • Instrumental Variables<br>• Instrumental Variables<br>• Discussion session: IV and its implementation |
| Week 11 | • Review Midterm 2<br>• **Midterm 2**<br>• Discussion session: Review of Midterm 2 (answer key) |
| Week 12 | • Instrumental Variables<br>• Difference in Difference<br>• Discussion session: DID and its implementation |
| Week 13 | • Difference in Difference<br>• Regression Discontinuity Design<br>• Discussion session: RDD and its implementation |
| Week 14 | • Regression Discontinuity Design<br>• Regression Discontinuity Design<br>• Discussion session: Review for the Final |
| Week 15 | • Review and Structural approach to Economics |