This course covers empirical strategies for applied microeconometric research. The agenda includes regression and matching, instrumental variables, differences-in-differences, regression discontinuity designs, and standard errors.

All 14.381 participants are expected to:

- Miss no more than two classes
- Take an out-of-class final during MIT exam week
- Complete 3 problem sets with a grade of at least 7/10
- Answer questions when called upon in class

MIT Economics Ph.D. (MEP) students seeking credit for the econometrics core also complete a structured empirical project. 14.381 is open to MIT graduate students and full-time RAs, and to MIT undergraduates who have completed 14.32 with distinction. Others looking for an introductory econometrics experience are encouraged to consider 14.32. Unsure whether 381 or 32 is right for you? Try the 381 qualifying exam; 381-ready students should ace the test (this also serves as an ungraded review problem set).

**Grading:** 3 problem sets (10 points each); out-of-class final (60 points); attendance (10 points); empirical project (10 points)

The atmosphere is informal, but we ask you to put electronic devices away when class is in session.

We use the following texts:


Articles are posted on LMOD at [14.381 Class home](#).

**READINGS**

Articles, handbook chapters are available through LMOD. Books are also on reserve. An (M) flags studies done as part of an MIT thesis.

**I. RCT AND REGRESSION RECAP**

MM Chapter 1 and MHE 1-2 introduce our experimentalist perspective on applied econometrics. MM Chapter 2 covers regression basics. MHE Chapter 3 presents more advanced material related to regression and matching.

*MM, Chapters 1-2; MHE, Chapters 1-2 and 3.1-3.2*


**Bad control and measurement error**

*MM*, 6.1-6.2; Appendix to Chapter 6


**Limited dependent variables and marginal effects**

*MHE*, Section 3.4.2

**II. Conditional Independence Assumptions**

**Matching vs regression**

*MHE*, Section 3.3.1


The propensity score

*MHE*, Sections 3.3.2-3.3.3


New ways to use the CIA


III. INSTRUMENTAL VARIABLES

2SLS with constant effects; the Wald estimator, grouped data

*MM*, Chapter 3; *MHE*, Section 4.1


Two-Sample IV and related estimators

*MHE*, Section 4.3


**2SLS details**

2SLS mistakes: *MHE*, Section 4.6.1

The bias of 2SLS: *MHE*, Section 4.6.4


**IV with heterogeneous potential outcomes**

*MHE*, Section 4.4


**Models with variable, continuous, and multiple treatments**

*MHE*, Section 4.5.3


**External validity**


Spec Tests Come LATEly

MHE, Section 4.2.2


IV. REGRESSION-DISCONTINUITY DESIGNS

Basics, sharp and fuzzy

*M*M, Chapter 4; *MHE*, Chapter 6


Heaping


**Nonpara-metrics**


**Regression kinks**


**Extrapolation**


V. **NON-STANDARD STANDARD ERROR ISSUES**

*Review of large-sample theory*

*MHE*, Section 3.1.3


*Finite-sample and cluster-robust inference*

*MHE*, Chapter 8


Hansen, C., “Asymptotic Properties of a Robust Variance estimator for Panel Data When T is Large”, *Journal of Econometrics* 141(2), 2007, 597-620. (M)


**Permutation inference**


**V. MACHINE LABOR**

Time-permitting/TBD

Mullainathan/Spiess JEP 2017  
BCCH ECMA 2012  
BCH ReStud 2014  
BCFH ECMA 2017  
Chernozhukov, Hansen, and Spindler Annual Review 2015  
Athey, Tibishrani, and Wager AMS 2019