

EKT 816: Econometrics

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Class Hours: Wednesday 16.00 - 19.00

Class Room: Tukkieurf 1-37

Course Description

This is a graduate course in econometrics. Our goal is to learn some basic techniques that economists use to establish causal claims. An immediate payoff is that you will be able to read and evaluate empirical research. You may also find these methods useful in your own work.

Prerequisites

You need a working knowledge of calculus and linear algebra. Previous exposure to statistics will be very helpful.

Advice

You may find it helpful to pattern your notes on the applied readings after a referee report; Berk, Harvey, and Hirshleifer (2017) and Berk, Harvey, and Hirshleifer (2015) is a useful guide to the requirements of this important type of professional communication. For the methodological or theoretical parts of the course, work through the arguments or proofs to try to convince yourself of why they are true (or find exactly why you disagree).

As with EKN-812 (or indeed any graduate course), forming study groups often has high payoffs, so I encourage you to work together.

Required Texts

There are two required texts:

- Angrist and Pischke (2008)
- Wickham and Grolemond (2017)

Wickham and Grolemond (2017) is available free online, so you shouldn't buy it. You may also find it useful to refer to these texts:

- Stachurski (2016)

- Wooldridge (2010)
- Deaton (1997)
- Cameron and Trivedi (2005)
- Paarsch and Golyaev (2016)

Of these, Deaton (1997) is available for free in PDF format from [the World Bank's website](#), and Stachurski has posted many lecture slides and other supporting materials to his [website](#). Although we will not refer explicitly to Paarsch and Golyaev (2016) often, it will be useful for the computational parts of the course (and indeed for those parts of your own research that require computation).

Assessment

There will be 6 problem sets, a take-home exam, and a midterm (also take-home).

Class Schedule

Please read at least the prescribed readings before class, even if you find it hard to follow everything; it makes for a more productive discussion if you have figured out the easy stuff first.

Week 01, 02/04 - 02/08: Probability and Statistics Review; Introduction to R

Distributions, expectations, quantiles. Laws of large numbers and the central limit theorem. Estimation: mean square error vs bias.

Required Readings

- Wickham and Golemund (2017), Ch. 3-6; 8; 26-30

Practicals: Basic data manipulation in the tidyverse. R Markdown. github setup and workflow.

Week 02, 02/11 - 02/15: Probability and Statistics Review (continued)

Sufficient and ancillary statistics. Consistency and precision in estimation. Weighting and sample design. Identification. Hypothesis testing: size vs power.

Required Readings

- Wickham and Golemund (2017), Ch. 17-21

Practicals: Pipes, iteration. Monte Carlo simulations.

Week 03, 02/18 - 02/22: Counterfactuals and Causal Inference

Potential outcomes notation. Randomization delivers the ATE; brief aside on SUTVA, peer effects and general equilibrium. Examples of causal claims. Internal and external validity, and the value of understanding mechanisms.

Required Readings: *Experimental and Quasi-Experimental Approaches to Policy Evaluation*

- Angrist and Pischke (2008), Ch. 1-2
- Angrist and Pischke (2010)
- Imbens and Wooldridge (2009)
- Heckman and Smith (1995)
- Heckman (2010)

Required Readings: Social Experiments in Practice

- Card, DellaVigna, and Malmendier (2011)
- Aron-Dine, Einav, and Finkelstein (2012)
- Muralidharan and Niehaus (2017)

Optional Readings: “Structural” and “Design-Based” Approaches to Econometrics

- Angrist and Krueger (1999); DiNardo and Lee (2011)
- Heckman (2008); Heckman and Vytlacil (2007a)
- Goldberger (1972)
- Acemoglu (2010)
- Keane (2010b); Keane (2010a)
- Sims (2010)
- Chetty (2009); Weyl (2019)

Optional Readings: Partial Identification; Prediction vs. Causation

- Manski (1995)
- Mullainathan and Spiess (2017)

Week 04, 02/25 - 03/01: Linear Regression

Derivation of the OLS formula; Frisch-Waugh-Lovell theorem. Implications for interpreting regression output. Conditional expectations and best linear predictors. Typical violations of conditional independence: simultaneity, measurement error, self-selection. Applications: growth accounting and labor market discrimination.

Required Readings: Regression Mechanics

- Angrist and Pischke (2008), Ch. 3

Required Readings: Data Quality

- Bound, Brown, and Mathiowetz (2001)
- Meyer, Mok, and Sullivan (2015)
- Griliches (1986)

Optional Readings: Statistical Decompositions

- Fortin, Lemieux, and Firpo (2011)

Optional Readings: Labor Market Discrimination

- Neal and Johnson (1996)
- Altonji and Blank (1999)

Optional Readings: Growth Accounting

- Topel (1999)
- Barro (1999)
- Hulten (2010)
- Bazzi and Clemens (2013)

Week 05, 03/04 - 03/08: Matching and Inverse Probability Weighting

Basic similarities between matching and regression: matching methods aim for unweighted averages of treatment-control differences, while regression weights by the variance of $P(D = 1|X)$. Applications to the evaluation of job training programs.

Required Readings: Connections between Regression and Matching

- Angrist and Pischke (2008), Ch. 3.5-3.8

Required Readings: The LaLonde Controversy

- Kline (2011); see also the slides on Kline's website.
- Dehejia and Wahba (1999); Dehejia and Wahba (2002)
- Smith and Todd (2005); Dehejia (2005)

Optional Readings: Matching Methods

- Imbens (2015)
- Solon, Haider, and Wooldridge (2015)

Optional Readings: Evaluation of Job Training Programs

- LaLonde (1986); LaLonde (1995)
- Heckman, LaLonde, and Smith (1999)

Week 06, 03/11 - 03/15: Instrumental Variables with Homogenous Treatment Effects

Just-identified IV; 2SLS and GMM. Identification and (asymptotic) inference. Applications to the effects of Catholic schooling, the effects of childbearing on labor supply, and the returns to education.

Required Readings: 2SLS and Linear Probability Models

- Angrist and Pischke (2008), Ch. 4.1-4.3
- Angrist (2001)

Required Readings: Basic Applications of IV

- Angrist (1990)
- Angrist and Evans (1998)

Required Readings: The Effects of Catholic Schooling on Student Performance

- Neal (1997)
- Altonji, Elder, and Taber (2005)
- Oster (2017)

Optional Readings: Supply and Demand in the Fulton Fish Market

- Angrist, Graddy, and Imbens (2000)
- Graddy (2006)

Optional Readings: Mincerian Regressions and the “Return to Schooling”

- Heckman, Lochner, and Todd (2006)
- Card (1999); Card (2001)

Week 07, 03/18 - 03/22: Weak Instruments; GMM; Selection Models (Part I)

2SLS bias; misleading inference with weak instruments. LIML. Outcome and selection equations in the “Generalized Roy Model”. Varieties of treatment effects.

Required Readings: Weak Instruments

- Angrist and Pischke (2008), Ch. 4.6
- Bound, Jaeger, and Baker (1995)
- Stock (2010)
- Andrews, Stock, and Sun (2018)

Required Readings: Models of Self-Selection

- Heckman (1990)
- Eisenhauer, Heckman, and Vytlačil (2015)
- Heckman and Honore (1990)

Week 08, 03/25 - 03/29: Autumn Break

No class; I will post a take-home midterm before the break.

Week 09, 04/01 - 04/05: Selection Models (Part II); Marginal Treatment Effects and LATE

What does IV estimate under essential heterogeneity? Deriving the IV weights. Violations of “monotonicity”.

Required Readings: IV With Heterogeneous Treatment Effects

- Angrist and Pischke (2008), Ch. 4.4-4.5

Required Readings: Making Explicit the Implicit Economics of the LATE

- Heckman, Urzua, and Vytlačil (2006)
- Heckman and Vytlačil (2007b)

Required Readings: The Relationship Between IV and Selection Models

- Kline and Walters (2019)
- Das, Newey, and Vella (2003)

Optional Readings: Interpreting the LATE

- Deaton (2010)
- Imbens (2010)

Optional Readings: Applications to Criminal Justice; “Neighborhood Effects” of Public Housing

- Chyn (2018)
- Mueller-Smith (2015)
- Arnold, Dobbie, and Yang (2018)

Week 10, 04/08 - 04/12: Applications; MTEs and LATE in Practice

Semiparametric approaches to control function estimation. Partial equivalence to IV. Richer treatment spaces: ordered and unordered selection. Applications.

Required Readings: Computing Control Function Estimates

- Cornelissen et al. (2016)
- Wooldridge (2015)

Optional Readings: Applications to Human Capital Investment

- Bazzi (2017)
- Lull (2018)
- Cornelissen et al. (2018)
- Carneiro, Heckman, and Vytlacil (2011)

Week 11, 04/15 - 04/19: Synthetic Panels and Diff-in-Diff

An additively separable model for Y_0 and the parallel trends assumption. Pitfalls: heterogeneous trends and serially correlated shocks. Placebo tests and placebo outcomes (DDD); clustering and bootstrapping standard errors.

Required Readings: Interpreting DD

- Angrist and Pischke (2008), Ch. 5
- Goodman-Bacon (2018)
- Garthwaite, Gross, and Notowidigdo (2014)
- Muralidharan and Prakash (2017)

Required Readings: Clustering

- Angrist and Pischke (2008), Ch. 8
- Cameron and Miller (2015)
- Abadie et al. (2017)

Required Readings: “16 and Pregnant” Controversy

- Kearney and Levine (2015)
- Jaeger and Joyce (2018)
- Kahn-Lang and Lang (2018)

Optional Readings: Miscellaneous Applications

- Hornbeck (2010); Hornbeck and Naidu (2014)
- Malkova (2018)
- Duflo (2001)
- Cunningham and Shah (2018)

Week 12, 04/22 - 04/26: Individual-Level Panel Data (Part I)

The incidental parameters problem (again). Complications: lagged dependent variables and serial correlation. Applications to the effects of job loss on workers and life-cycle labor supply.

Required Readings: The Effects of Job Loss

- Ashenfelter and Card (1985)
- MaCurdy (1981)
- Jacobson, LaLonde, and Sullivan (1993)
- Griliches and Hausman (1986)

Optional Readings: Dynamic Labor Supply; Rent Control

- Diamond, McQuade, and Qian (2018)
- MaCurdy (2007)
- Topel (1991)
- Acemoglu and Pischke (1999)

Week 13, 04/29 - 05/03: Individual-Level Panel Data, Part II - Mover Designs

Wide-panel vs long-panel asymptotics. Multiple unordered treatments in the selection equation. Applications to medical spending and worker-firm matching.

Required Readings: Interpreting Mover Designs

- Finkelstein, Gentzkow, and Williams (2016)
- Finkelstein, Gentzkow, and Williams (2018)
- Hull (2018)
- Heckman and Pinto (2018)

Optional Readings: Matched Worker-Firm Data

- Abowd, Kramarz, and Margolis (1999)
- Borovičková and Shimer (2017)
- Song et al. (2018)

Week 14, 05/06 - 05/10: Individual-Level Panel Data, Part III - Event Studies

“Dynamic treatment effects” and long-panel asymptotics. Applications to local differences in retail prices and human capital accumulation over the life-cycle.

Required Readings: Interpreting Event Studies and the Effects of Childbearing on Women’s Earnings

- Kleven, Landais, and Sogaard (2018)
- Abraham and Sun (2018)
- Borusyak and Jaravel (2016)
- Schulhofer-Wohl (2018)

Optional Readings: Using International Migration to Estimate the Returns to Human Capital

- Lagakos et al. (2018a)
- Lagakos et al. (2018b)

- Hendricks (2002)
- Hendricks and Schoellman (2018)

Optional Readings: Effects of Entry and Exit in Retail; Persistent Tastes for Food in India

- Allcott et al. (2018)
- Atkin (2016)
- Atkin, Faber, and Gonzalez-Navarro (2018)

Week 15, 05/13 - 05/17: Discussion of Applied Papers

Student discussion of applied papers.

Week 16, 05/20 - 05/24: Discussion of Applied Papers

Student discussion of applied papers.

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