

Quantitative Methods II
Public Policy 240B

Course Overview

In this course, we are going to build on the foundations in statistical theory covered in the first semester to explore in detail the statistics associated with estimating relationships between variables. The primary focus of this course is on the use of regression analysis, a statistical technique for quantifying and making inferences about relationships between variables. Regression analysis is increasingly used to evaluate and provide quantitative assessments of existing public policies and programs. For example, these empirical techniques have been employed to assess the effects of head start on the long term socioeconomic outcomes of children, to test whether lenders racial discriminate against African-Americans seeking mortgages, and to assess the effect of the prison incarceration rate on crime. As policy analysts, you will need to understand these research methods, how to apply them, and how to assess the validity of social scientific research based on these empirical techniques.

While the principal objective of the course is to introduce the statistical models used to measure association between random variables (specifically, linear and non-linear regression analysis), an important sub-theme that will be salient in most of our discussions this semester concerns the issue of actually determining causality. In a nutshell, regression analysis uses data samples to estimate the relationship between dependent and explanatory variables. An important point that should always be kept in mind is that for most empirical studies in the social sciences **correlation does not imply causation no matter how fine the correlation is measured**. When analyzing observational or non-experimental data, there are a number of factors that may lead one to conclude that a given variable causally affects another variable, when in fact, there is no effect. For example, the explanatory variable of interest may not have an effect but may be highly correlated with variables that do. Alternatively, the direction of causation may run in the opposite direction of that which is being hypothesized. Throughout the course, we will be highlighting such problems and presenting statistical techniques designed to address these issues.

This course has several goals. The first is to familiarize you with the vocabulary, methods, and results of econometric theory. We will be mainly concerned with using, rather than proving, the theory. Over the course of the semester, we will study how to address the most important issues that arise when doing an econometric study. These issues include (1) endogeneity of regressors due to omitted variables, simultaneity, or selection, (2) functional form, (3) choice of control variables, (4) measurement error in regressors and handling of outliers, (5) efficient estimation in the presence of heteroskedasticity, (6) appropriate estimation of standard errors and test statistics, and (7) presentation of results.

Second, you should strive to become an educated/critical consumer of empirical research. We will read and critique a number of empirical papers and program evaluations. The usual approach will be to discuss 1) the economic, political, and policy issues that motivate the application, 2) the econometric techniques and issues related to the application (e.g., data, specification, estimation techniques), and 3) the results of the empirical analysis and what we can learn from them.

Your work in this course will be multi-faceted. You will be assigned 5 (depending on how quickly we move through the material) “hands on” applied problem sets. These frequently will involve replicating some results from published work. Replicating what others have done is a good way to understand the choices involved in applied work. We will use STATA, the leading computer program for statistical analysis in the social sciences, and by the end of the course you should have acquired a variety of skills that will be useful for doing public policy research. To gain skill as an “educated/critical consumer” you will be required to write a summary and critique of an applied policy research paper. Detailed guidelines on this writing assignment will be given to you early in the semester. There will be three exams.

Meeting Times

Class will meet Mondays and Wednesdays from 8:30 to 10:00 am. In addition, there are discussion sections on Fridays where material presented during the week will be reviewed.

Grades

Grades will be based on 3 exams (25 percent each), 5 problems sets (worth a cumulative 15 percent) and a writing assignment (10 percent). Problem sets will be handed out in class and are due a week later (we will then distribute answer keys). Late problem sets are docked 20 percentage points per day.

The writing assignment (on an assigned paper/topic yet to be determined) will involve writing a short (3 to 5 pages) summary and critique of an applied policy research paper. You are to identify the general premise of the article, the hypothesis being tested, the data used in the study, the econometric methods employed, and the sources of variation/identification that the researcher employs to estimate parameters. Close attention should be paid to how the parameter estimates are/can be interpreted. Lastly, you should briefly discuss how believable you find the estimates.

Readings

The required textbook for this class is *Introductory Econometrics*, Jeffrey M. Wooldridge (Southwestern, 2nd edition, 2002). More than others, this text has lots of examples and is written for students who are or will be doing applied work. The textbook is available at the campus bookstore. There is also a reader for this course. The reader will be available at Vic's Copies, 2843 Hearst Avenue, Berkeley. The reader is a collection of scholarly articles that we will be reading throughout the semester.

STATA

STATA version 8.0 is available in the computer lab. However, you can buy a one-year license to use STATA at home if you wish, through the STATA website (at <http://www.stata.com/order/new/edu/gradplans/gp2-order.html>). The student rate is \$39 for "small" STATA (a scaled-back version) and \$89 for the standard Intercooled STATA. We will distribute a STATA tutorial guide. (If you prefer SPSS or SAS that is fine too).

Office Hours

Johnson's office is on the third floor of the new building, room #347. His office hours for this course are Tuesdays, 3-5. Johnson can also be reached by phone at 643-0169 and Email at: ruckerj@berkeley.edu

Week 1: Introduction

January 19

TOPIC: **Course Intro • Review of Syllabus • Overview of Quantitative Program Evaluation • Inferring Causality: experimental vs. non-experimental data analysis**

READING:

- Wooldridge Ch 1
- Freedman, David. 1999. "From Association to Causation: Some Remarks on the History of Statistics," *Statistical Science*, 14(3), pp. 243—258. [LINK](#)
- Manski, Charles. 1995. "Introduction," in *Identification Problems in the Social Sciences*, Harvard University Press, Chapter 1, pp. 1—9.

Week 2: Review of Statistical Inference & Introduction to Linear Regression Analysis

January 24

TOPIC: **Review of Probability & Distribution (expectation and moments) • Review of Statistical Inference (Point and Interval Estimation—confidence intervals; Hypothesis Testing--testing for differences in means; sampling distributions and inference; approximate asymptotic distribution of the sample mean)**

READING:

- W Appendices A, B
- W Appendix C
- (mathematics, probability, and statistics review for refreshing memories)

* ASSIGNMENT: **Hand out first problem set (due Feb. 2nd)**

January 26

TOPIC: **Introduction to Regression Analysis—Why & How? (Bivariate Regression)**

Week 3: Introduction to Linear Regression Analysis & the Two-Variable Model

January 31

TOPIC: **Introduction to Regression Analysis—Why & How? (Bivariate Regression—Structure of data; Mechanics of OLS, Assumptions required for Unbiasedness, Relationship to Correlation)**

READING:

- W Ch 2

February 2

TOPIC: **The Two Variable Regression Model (cont'd)--Sampling Distribution of Regression Estimates; Residuals, Fitted Values & Goodness of Fit; Hypothesis Tests; Confidence Intervals**

READING:

- W Ch 2

* ASSIGNMENT DUE: **First Problem set due**

Week 4: Multiple Regression Analysis: Estimation

- February 7 TOPIC: **Motivation for Multiple Regression Analysis • Interpretation of Coefficients • Omitted Variable Bias**
READING:
 • W Ch 3
 * ASSIGNMENT: **Hand out second problem set (due Feb. 14th)**
- February 9 TOPIC: **Multiple Regression Analysis—Inference & Hypothesis Tests: t-Test, p-value, confidence intervals**
READING:
 • W Ch 3, Sections 4.1-4.3
 • McCloskey, Deirdre N. and Stephen T. Ziliak. 1996. “The Standard Error of Regressions.” *Journal of Economic Literature*, 34(1), pp. 97—114. [LINK](#)
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Week 5: Multiple Regression Analysis: Inference & Hypothesis Testing

- February 14 TOPIC: **Multiple Regression Analysis—Inference & Hypothesis Testing (cont’d) • Multicollinearity**
READING:
 • W Ch 3, Sections 4.1-4.3
 • W Ch 3 (p.97-100)
READING: Brown, Charles and Mary Corcoran (1997) “Sex-based Differences in School Content and the Male-female Wage Gap” *Journal of Labor Economics*, 15(3): 431-465. [LINK](#)
 * ASSIGNMENT DUE: **Second problem set due**
- February 16 TOPIC: **Model Specification--Dummy Variables, Interaction terms, & Quadratics • Tests of Joint Hypotheses—Goodness of Fit Measures, Tests involving more than 1 regression coefficient**
READING:
 • W Ch 7.1-7.4, 7.6
 • W Sections 4.4-4.6
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Week 6: First Midterm

- February 21 NO CLASS
- February 23 *Review for Midterm*
- February 25 **MIDTERM DURING SECTION**
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Week 7: Application of Multiple Regression Models: Decomposing Group Differences, Specification Choices

February 28

Application#1: The Black/White Wealth Gap

READING: J. Altonji, U. Doraszelski and L. Segal, "Black/White Differences in Wealth" Economic Perspectives Federal Reserve Bank of Chicago, Winter 2000
<http://www.chicagofed.org/publications/economicperspectives/2000/Epart3.pdf>

Application#2: Racial Disparities in Federal Sentencing

READING: Mustard, David B. (2001), "Racial, Ethnic, and Gender Disparities in Sentencing: Evidence from U.S. Federal Courts," *Journal of Law and Economics*, 44(1): 285-314. [LINK](#)

March 2

TOPIC: Model Specification—Functional Form and Variable SelectionREADING:

- W Ch 6.1-6.3 (Also p.685-691)
- Leamer, Edward (1983) "Let's Take the 'Con' Out of Econometrics," *American Economic Review* 73, 31-41. [LINK](#)

ASSIGNMENT: Hand out third problem set (due March 9th)

Week 8: "Real World" Issues—Violation of the Basic Assumptions

March 7

TOPIC: HeteroscedasticityREADING:

- W, Ch 8.1-8.4

March 9

TOPIC: Measurement Error, Missing Data, and Sensitivity of Results to Particular ObservationsREADING:

- W Sections 9.3,9.4
- Hausman, Jerry. 2001. "Mismeasured Variables in Econometric Analysis: Problems from the Right and Problems from the Left." *Journal of Economic Perspectives*, 15(4), pp. 57—68. [LINK](#)

ASSIGNMENT DUE: Third Problem Set Due

Week 9: Study Designs to Distinguish Correlation from Causality—Accounting for Omitted Variable Bias

March 14

TOPIC: Using Proxy Variables for Unobserved Explanatory Variables to address Omitted Variable BiasREADING:

- W Section 9.2

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March 16

TOPIC: Adding Controls to Account for Omitted Variable BiasApplication: Explaining Black-White Wage Differences

READING: Neal, Derek A. and William R. Johnson (1996), "The Role of Premarket Factors in Black-White Wage Differences," *The Journal of Political Economy*, 104(5): 869-95. [LINK](#)

ASSIGNMENT: Hand out fourth problem set (due March 28th)

March 21

NO CLASS: Spring Recess

March 23

NO CLASS: Spring Recess

Week 10: Panel Data Techniques

- March 28 TOPIC: **Introduction to Panel Data Techniques** (Sources of variation/identification, Difference Estimators)
READING:
 • W Ch 13.3-13.5
- March 30 **REVIEW FOR MIDTERM**
ASSIGNMENT DUE: Fourth problem set due.
- April 1 **MIDTERM EXAM DURING SECTION**
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Week 11: Panel Data Applications and Natural Experiments

- April 4 TEXT READING: W Ch 13.3-13.5, 14.3
- Application#1: **The Effects of Teenage Pregnancy on Socioeconomic Outcomes**
READING: Geronimus, A.T. and S. Korenman. 1992. "The Socioeconomic Consequences of Teen Childbearing Reconsidered." *Quarterly Journal of Economics* v. 107, pp. 1187-1214. [LINK](#)
- Application#2: **The Effects of Head Start on Socioeconomic Outcomes**
READING: Eliana Garces & Duncan Thomas & Janet Currie, 2002. "Longer-Term Effects of Head Start," *American Economic Review*, American Economic Association, vol. 92(4), pages 999-1012, September. [LINK](#)
- April 6 TOPIC: **Natural/quasi Experimental Designs: pre-/post-intervention observation with a comparison group (Difference-in-Difference Estimators)**
- TEXT READING: W Ch 13.1-13.2
- Application: **The Effect of the Minimum Wage**
READING: • Card, David and Alan B. Krueger (1994), "Minimum Wages and Employment: A Case Study of the Fast Food Industry." *American Economic Review* 84(4), (1994): 772-793. [LINK](#)
 • Meyer, Bruce. 1995. "Natural and Quasi-experiments in Economics." *Journal of Business and Economic Statistics* v. 12, pp. 151—161.
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Week 12: Experimental Methods continued

- April 11 TOPIC: **Empirical Methods for Program Evaluation**
- Application#1: **The Effects of 1996 welfare reform**
READING: Schoeni, Robert F., and Rebecca Black. 2001. "What has Reform Accomplished? Impacts on Welfare Participation, Employment, Income, Poverty, and Family Structure," NBER working paper #7627. [LINK](#)
- Application#2: **Evaluating the Effect of Tuition and Financial Aid Policies**
READING: Dynarski, Susan (2003) "Does Aid Matter? Measuring the Effect of Student Aid on College Attendance and Completion." *AER*3(1), 279-288. [LINK](#)
- * **ASSIGNMENT:** Hand out writing assignment (due April 18th)
- April 13 TOPIC: **Advantage & Disadvantages of Experiments**
- Application#1: **Effect of Price of Health Care on Health Care Utilization**
READING: Manning, Willard G. et al. (1987). Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment. *American Economic Review*,
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77(3): 251-277. [LINK](#)

Application#2: Neighborhood Effects

READING: U.S. Department of Housing and Urban Development, Office of Policy Development and Research. 2003. *MTO for Fair Housing Demonstration Program: Interim Impacts Evaluation*. [LINK](#) Exec Summary: [LINK](#)

Week 13: Randomized Experiments and Instrumental Variables Approaches

April 18

Application: Labor Market Discrimination

READING:

- Marianne Bertrand and Sendhil Mullainathan. 2004. “Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination.” *American Economic Review* Vol.94(4): [LINK](#)
- Burtless, Gary. 1995. “The Case for Randomized Field Trials in Economic and Policy Research.” *Journal of Economic Perspectives*. 9(2): 63-84.
- Heckman, James J. and Jeffrey A. Smith. 1995. “Assessing the Case for Social Experiments.” *Journal of Economic Perspectives*, 9(2), pp. 85—110.

* **ASSIGNMENT DUE: Writing assignment due**

April 20

TOPIC: Instrumental Variables Approach/ 2 Stage Least Squares for Omitted-Variables Problem

TEXT READING: W Ch 15

Application#1: Effect of Class Size on Achievement

READING: Krueger, A. (1999). Experimental Estimates of Education Production Functions. *Quarterly Journal of Economics*. 114(2), 497-532.

Application#2: Effect of School Vouchers on Achievement

READING: • Howell, W.G., Wolf, P.J., Campbell, D.E., & Peterson, P.E. (2002). School Vouchers and Academic Performance: Results from Three Randomized Field Trials. *Journal of Policy Analysis and Management*, 21(2), 191-217.

• Krueger, A.B., & Zhu, P. (2002). Another Look at the New York City School Voucher Experiment. *National Bureau of Economic Research*, Working Paper #9418. Available at <http://www.nber.org/papers/w9418>

Week 14: Instrumental Variables Continued and Introduction to Binary Dependent Variables

April 25

TOPIC: Endogeneity, Instrumental Variables Approach/ 2 Stage Least Squares for Omitted-Variables Problem

READING:

• W Ch 15

• Angrist, Joshua D. and Alan B. Krueger. 2001. "Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments." *Journal of Economic Perspectives* v. 15, pp. 69-86.

Application: Labor-Supply Consequences of Childbearing

READING: Angrist, Joshua and William Evans. 1998. "Children and their Parents' Labor Supply: Evidence from Exogenous Variation in Family Size," *American Economic Review*, v. 88, pp. 450—477.

April 27

TOPIC: Binary Dependent Variables—Logit and Probit Model

READING: W Sections 7.5, 8.5, 17.1

* **ASSIGNMENT: Hand out fifth problem set (due May 4th)**

Week 15: Models with Categorical Dependent Variables: Binary Dependent Variable

May 2

TOPIC: Binary Dependent Variables—Logit and Probit Model

READING: W Sections 7.5, 8.5, 17.1

Application: Racial discrimination in the markets for mortgage capital and insurance

READING: Munnell, Alicia H.; Tootell, Geoffrey M. B.; Browne, Lynn E.; and James McEneaney (1996), "Mortgage Lending in Boston," *American Economic Review*, 86(1): 25-53.

May 4

REVIEW FOR THE FINAL

* **ASSIGNMENT DUE: Fifth problem set due**

