

## Advanced Regression

### Instructor Contact Information

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Professor: Chris Herbst

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### Course Description and Objectives

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This course is a method-based, applied treatment of extensions to the basic regression model. The key aims of this course are twofold: to help students become savvy consumers of research and to develop rigorous skills for implementing empirical analyses of public policy and administration issues. Accordingly, this course stresses critical thinking and creativity.

The course is roughly divided into two sections. We begin with a review of descriptive and inferential statistics, followed by a brief presentation of the least squares regression model for continuous dependent variables. The first section ends with a thorough treatment of empirical techniques for analyzing categorical and qualitative dependent variables. In section two, we consider the evaluation of public policies using experimental and observational data. We focus on the advantages and disadvantages associated with these data, paying special attention to ethical issues that arise when conducting social experiments. The remainder of the course examines advanced empirical techniques for evaluating public policy using observational data. In particular, we cover panel data methods, instrumental variables, simultaneous equations, and difference-in-differences.

Course meetings are split between two activities: traditional lectures on various topics and seminar-style discussions of empirical papers. After a new method is introduced, every one to three weeks, students are assigned relevant textbook readings in addition to one or more peer-reviewed papers that apply each method. These papers form the basis of each week's seminar discussion, during which key findings are interpreted, research designs and empirical methods are critiqued, and policy implications are discussed.

Given the course's focus on the application of empirical methods, students receive several opportunities to collect and analyze data. Problem sets are assigned throughout the semester to reinforce key concepts introduced in class. In many ways, however, the cornerstone of the course is the Research Paper and Presentation prepared by each student. It is intended to accomplish several goals. First and foremost, this exercise allows students to investigate a policy question of individual interest or significance. It also provides a channel through which course content is actually applied to a piece of policy analysis. Textbook exposition of quantitative methods is stylized and unrealistic, leaving students inadequately prepared to conceive of and carry out empirical research. The Research Paper is therefore intended to bridge the gap between course readings and the application of research methods.

## Course Materials

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### Required Textbooks

Long, S. & Freese, J. (2005). *Regression Models for Categorical Dependent Variables Using Stata, Second Edition*. Stata Press.

Wooldridge, J. (2006). *Introductory Econometrics: A Modern Approach, Fourth Edition*. South-Western College Publishing.

### Supplemental and Recommended Textbooks

Acock, A. (2005). *A Gentle Introduction to Stata*. Stata Press.

Gujarati, D. (2003). *Basic Econometrics: Fourth Edition*. McGraw-Hill Companies.

Stigler, S. (1990). *The History of Statistics: The Measurement of Uncertainty Before 1900*. Harvard University Press.

Stock, J. & Watson, M. (2006). *Introduction to Econometrics: Second Edition*. Addison Wesley.

### Journal Articles

The discussion of peer-reviewed journal articles forms an important part of the course. References for all assigned papers are found at the end of the syllabus, and may be accessed through on-line retrieval services, such as JSTOR ([www.jstor.org](http://www.jstor.org)), or popular search engines, such as Google Scholar ([www.scholar.google.com/](http://www.scholar.google.com/)). Furthermore, if you are working on a computer with an ASU IP address, you may also access papers through the journal websites.

### Statistical Software

Nearly all of econometric analysis is now computer-driven, aided by statistical software. Students are therefore introduced to Stata (which rhymes with “data”), arguably the most powerful and flexible statistical software in the social sciences. However, students may use other programs, such as SPSS and SAS. All statistical software packages offered by ASU can be found at <https://citrix.asu.edu>. Here, students can access software at remote locations. Students will also have access to the ASU Downtown Computer Center and the Public Affairs Laboratory for assignments. Each computer center has staff on duty, and I will be available to meet with students for individual and group instruction outside of class.

### Evaluation and Grading

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Evaluation in the course is based on class participation, four problem sets, a mid-term exam, a final exam, and the Research Paper and Presentation. Students may work on the problem sets in groups, but all analyses and interpretations must be submitted individually. Both exams are in-class, and students can use textbooks, notes, and other materials (including calculators) to complete them. The Research Paper and Presentation are prepared on an individual basis. Each component is weighted as follows:

Class participation and preparation: 20%

Problem sets: 10%

Mid-term exam: 15%

Final exam: 15%  
Research Paper: 30%  
Research Presentation: 10%

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	Equivalence
A	93-100%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
C-	70-72%
D+	67-69%
D	63-66%
F	0-62%

Please abide by all ASU policies, including those for academic integrity, the Student Code of Conduct and computer use. See the links below for additional information.

Academic Integrity: [http://www.asu.edu/studentaffairs/studentlife/judicial/academic\\_integrity.htm](http://www.asu.edu/studentaffairs/studentlife/judicial/academic_integrity.htm)

Student Code of Conduct: <http://www.abor.asu.edu/1%5Fthe%5Fregents/policymanual/chap5/>

Electronic Communications Policy: <http://www.asu.edu/aad/manuals/acd/acd125.html>

Please be sure to turn off all pagers, cell phones, and other electronic devices before class begins. Also, students are prohibited from using computers in class. Please leave them at home, at work, or in your bag, and plan to take notes the “old fashioned” way: using notebooks and pencils.

## **Course Schedule: Topics, Readings, and Assignments**

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### **Week 1: August 24, 2009**

- Introduction to the course and each other
- Topic: Review the method of least squares and univariate regression; least squares assumptions
- Reading: JW: Chapter 1, 2
- Assignment: None

### **Week 2: August 31, 2009**

- Topic: Concepts in multivariate regression I: interpreting regression coefficients, inference, and assessing goodness-of-fit
- Introduction to Stata
- Reading: JW: Chapter 3 (skip pgs. 95-99), 4; LF: Chapter 1, 2; Han et al., (2001)
- Assignment: Independent work on Stata; Problem Set 1 handed out

### **Week 3: September 7, 2009 (No Class -- Labor Day)**

**Week 4: September 14, 2009**

- Topic: Concepts in multivariate regression II: functional form, building and assessing a regression model, identifying and dealing with data problems
- Reading: JW: Chapter 6 (skip pgs. 214-221), 7 (skip pgs. 252-260), 9; Lopoo & DeLeire (2006)
- Assignment: Continue working on Problem Set 1

**Week 5: September 21, 2009**

- Topic: Regression models for categorical and qualitative dependent variables; concept of a latent variable; linear probability model (LPM)
- Reading: JW: Chapter 7 (pgs. 252-260); Haider et al., (2004); Lopoo (2004)
- Assignment: Research Paper Proposal due; Problem Set 1 due; Problem Set 2 handed out

**Week 6: September 28, 2009**

- Topic: Binary dependent variables: logistic and probit regression models
- Reading: JW: Chapter 17 (pgs. 582-595); LF: Chapter 4; Anderson, Butcher, & Levine (2003); Dickert-Conlin & Chandra (1999)
- Assignment: Continue working on Problem Set 2

**Week 7: October 5, 2009**

- Topic: Nominal dependent variables: multinomial logistic regression models
- Reading: LF: Chapter 6; Herbst & Stevens (forthcoming)
- Assignment: Problem Set 2 due

**Week 8: October 12, 2009**

- **Mid-term Exam (Wow, so soon?!)**
- Reading: None
- Assignment: Concentrate on the Research Paper and Presentation

**Week 9: October 19, 2009**

- Topic: The evaluation of public policies: causality and the use of randomized experiments versus observational data in empirical research; counterfactuals; ethical considerations in social experiments
- Reading: Burtless (1995); Heckman & Smith (1995); Katz et al., (2001)
- Assignment: Concentrate on the Research Paper and Presentation

**Week 10: October 26, 2009**

- Topic: Random and non-random policy variation; self-selection and omitted variable bias; finding suitable control groups; natural and quasi-natural experiments
- Reading: Besley & Case (2000); Meyer (1995); Moffitt (1991)
- Assignment: Draft of Research Paper due

**Week 11: November 2, 2009**

- Topic: Panel data methods; fixed effects and random effects estimators
- Reading: JW: Chapter 13, 14; Bitler et al., (2004); Donohue & Levitt (2001)
- Assignment: Problem Set 3 handed out

**Week 12: November 9, 2009**

- Topic: Instrumental variables and simultaneous equations models
- Reading: JW: 15, 16; Levitt (1997); McClellan et al., (1994)
- Assignment: Continue working on Problem Set 3

**Week 13: November 16, 2009**

- Topic: Difference-in-differences estimators
- Reading: Card & Krueger (1994); Eissa & Liebman (1996)
- Assignment: Problem Set 3 due; Problem Set 4 handed out

**Week 14: November 23, 2009**

- Research Presentations

**Week 15: November 30, 2009**

- Research Presentations
- Assignment: Problem Set 4 due

**Week 16: December 7, 2009**

- Research Presentations
- Assignment: Research Paper Due

**Week 17: December 14, 2009**

- **Final Exam (Aren't We Done Yet?)**

**References for Course Readings**

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Anderson, P., Butcher, K., & Levine, P. (2003). Maternal Employment and Overweight Children. *Journal of Health Economics*, 22(3), 477-504.

Besley, T. & Case, A. (2000). Unnatural Experiments? Estimating the Incidence of Endogenous Policies. *The Economic Journal*, 110, F672-F694.

Bitler, M., Gelbach, J., Hoynes, H., & Zavodny, M. (2004). The Impact of Welfare Reform on Marriage and Divorce. *Demography*, 41, 213-236.

Burtless, G. (1995). The Case for Randomized Field Trials in Economic and Policy Research. *Journal of Economic Perspectives*, 9(2), 63-84.

Card, D. & Krueger, A. (1994). Minimum Wages and Employment: A Case Study of the Fast Food Industry in New Jersey and Pennsylvania. *American Economic Review*, 84(4), 772-793.

Dickert-Conlin, S & Chandra, A. (1999). Taxes and the Timing of Births. *Journal of Political Economy*, 107(1), 161-177.

Donohue, J. & Levitt, S. (2001). The Impact of Legalized Abortion on Crime. *Quarterly Journal of Economics*, 116(2), 379-420.

- Eissa, N. & Liebman, J. (1996). Labor Supply Response to the Earned Income Tax Credit. *Quarterly Journal of Economics*, 111(2), 605-637.
- Haider, S., Schoeni, R., Bao, Y., & Danielson, C. (2004). Immigrants, Welfare Reform, and the Economy. *Journal of Policy Analysis and Management*, 23(4), 745-764.
- Han, W., Waldfogel, J., & Brooks-Gunn, J. (2001). The effects of early maternal employment on later cognitive and behavioral outcomes. *Journal of Marriage and the Family*, 63(2), 336-354.
- Heckman, J. & Smith, J. (1995). Assessing the Case for Social Experiments. *Journal of Economic Perspectives*, 9(2), 85-100.
- Herbst, C. & Stevens, D. (forthcoming). The Impact of Local Labor Market Conditions on Work and Welfare Decisions: Revisiting an Old Question Using New Data. *Population Research and Policy Review*. Available at [www.chrisherbst.net](http://www.chrisherbst.net).
- Katz, L., Kling, J., & Liebman, J. (2001). Moving to opportunity in Boston: Early results of a randomized mobility experiment. *Quarterly Journal of Economics*, 116(2), 604-654.
- Levitt, S. (1997). Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime. *The American Economic Review*, 87(3), 270-90.
- Lopoo, L. (2004). The Effect of Maternal Employment on Teenage Childbearing. *Journal of Population Economics*, 17(4), 681-702.
- Lopoo, L. & DeLeire, T. (2006). Did Welfare Reform Influence the Fertility of Young Teens? *Journal of Policy Analysis and Management*, 25(2), 275-298.
- McClellan, M., McNeil, B., & Newhouse, J. (1994). Does More Intensive Treatment of Acute Myocardial Infarction in the Elderly Reduce Mortality? *Journal of the American Medical Association*, 272(11), 859-66.
- Meyer, B. (1995). Natural and Quasi-Experiments in Economics. *Journal of Business and Economic Statistics*, 13, 151-161.
- Moffitt, R. (1991). Program Evaluation with Nonexperimental Data. *Evaluation Review*, 15(3), 291-314.

## **Research Paper and Presentation**

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And this mess is so big  
 And so deep and so tall  
 We can not pick it up.  
 There is no way at all!  
 --Dr. Suess, *The Cat in the Hat*

Preparation of the Research Paper and Presentation is, by far, the most interesting part of the course. It is intended to help students develop confidence in applying the empirical methods learned in class. But it

also provides a great opportunity to dive into a policy area of interest and evaluate its impact on...whatever!

Once you have picked a topic, you should identify an appropriate dataset and perform an empirical analysis of the data using the tools learned throughout the semester. As you search for a topic, be sensitive to the set of empirical tools that are appropriate, data limitations, and time constraints. Evaluations of public policies should always take note of the policy and legal environment in which they are implemented, and this so-called “policy context” should ground your research question and empirical methods. Ideally, you should develop and identify a treatment and control (or comparison) group that will allow you to draw conclusions about the impact of your chosen policy. Please refrain from providing descriptive evidence between or within groups, and instead focus on how policies influence those groups.

*Your research proposal* should discuss the issue you want to investigate (i.e., ask an appropriate question), the data you expect to use, and your hypothesized findings. This should be no more than a page in length.

*Your research paper* should be structured as follows:

**Section I: Introduction to the Policy Problem, Research Question, and the Policy Context.**

This could include a short literature review or a framing of the policy issues involved. Be sure to motivate your topic and convince us—the readers—why your topic is relevant.

**Section II: Data Sources and Empirical Implementation.**

Introduce readers to your dataset. What data are you using? Where is it coming from? When was it collected? Why are you using it? What type of data are you using (e.g., panel or cross-sectional), and what is the unit of analysis (e.g., individuals, firms, states, or countries)? How many observations are included in the analysis? Also, be sure to mention any drawbacks associated with the dataset.

Next, present your regression model and describe why you have chosen a given empirical technique (e.g., linear regression, logit/probit model, panel data methods, or IV). Spend some time walking readers through the variables included in the model. What is the outcome variable, and how is it measured? What is your key explanatory variable, and how is that measured? Other control variables? Be sure to justify why you have included some variables while omitting others.

**Section III: Present Summary Statistics and Regression Results.**

Present sample means, compare the two (or more) groups under investigation, and perform simple descriptive tests (e.g., t-tests and chi-squared tests). Explain your results, and discuss the limitations of this simple analysis. Next, present and interpret your regression results. What is the impact of the policy reform? Are the results statistically significant? Are they economically significant?

**Section IV: Conclusions and Discussion of Policy Implications.**

What has your analysis determined, and more important, *why should we—the readers—care about your results?* How would you change policy, if at all, on the basis of your results? What are the policy implications? Finally, provide some assessment of the drawbacks associated with your research.

The paper should be no more than 10-15 pages (including tables and references). Do not get too complicated or carried away with your model, and evaluate only a few measures of the policy. The research proposal is due on **September 21**. A draft of the research paper is due on **October 26**, and the final draft is due on **December 7**. Please submit these as hard-copies, in class.

Finding an appropriate dataset for your analysis is essential. You should plan on spending considerable time looking for a good match between your research interests/question and data availability. A few datasets to consider:

**Education:**

National Education Longitudinal Study of 1988 (NELS:88): <http://nces.ed.gov/surveys/NELS88/>

**Children and Families:**

Fragile Families and Child Wellbeing Study: <http://www.fragilefamilies.princeton.edu/>

Welfare Children and Families: A Three City Study: <http://web.jhu.edu/threecitystudy>

**Early Childhood Programs and Experiences:**

NICHD Study of Early Child Care and Youth Development: <http://secc.rti.org/>

Early Childhood Longitudinal Study—Kindergarten Cohort: <http://nces.ed.gov/ECLS/>

Early Childhood Longitudinal Study—Birth Cohort: <http://nces.ed.gov/ECLS/>

**Politics, Elections, Civic Engagement, and Public Opinion:**

National Youth Survey: <http://www.civicyouth.org/research/products/data.htm>

American National Election Studies: <http://www.electionstudies.org/>

General Social Survey: <http://www.norc.org/projects/General+Social+Survey.htm>

**Census Data: Employment, Income, and Welfare Program Participation**

Current Population Survey: <http://www.census.gov/cps/>, [http://www.nber.org/data/cps\\_index.html](http://www.nber.org/data/cps_index.html)

Decennial Census: <http://www.ipums.umn.edu/>

**National Vital Statistics: Births, Mortality, Fertility, Marriage, and Divorce**

Births: <http://www.nber.org/data/births.html>, <http://www.nber.org/im/>

Mortality: <http://www.nber.org/data/mortality-data.html>

Marriage and Divorce: <http://www.nber.org/data/marrdivo.html>

Also, see: <http://www.cdc.gov/nchs/products/pubs/pubd/vsus/vsus.htm>

Abortion: <http://www.guttmacher.org/> and various editions of *Abortion Surveillance*