PUBPOL 639
Quantitative Methods for Program Evaluation
Winter 2012

Instructor:	Kevin Stange (kstange@umich.edu)
Office hours:	Monday 8:30-10:00, 5236 Weill Hall
GSI:	Cree Jones (cree.jones@gmail.com)
Office Hours:	Monday 11:00am – 1:00pm
Lecture:	Tuesday & Thursday 10:00-11:30am, 1110 Weill Hall
Sections:	Friday 10:00-11:30, 1110 Weill
Final Exam:	There is no final exam

Overview and Objectives
This course introduces students to multiple regression analysis and other tools of causal inference and program evaluation. The course will focus on applying these tools to real data on various policy topics. Applications will be drawn from a wide range of policy areas including education, welfare, unemployment, discrimination, health, immigration, the environment, and economic development.

The course has two highly related objectives:

1) Train students to *thoughtfully produce* their own empirical research. With the wide availability of data and statistical software, there are very few technical barriers to conducting empirical research. All you need is an internet connection and Excel. However, producing good and convincing empirical research is another matter entirely. In this course, we will develop the core analytical tools of single and multi-variable regression and also discuss fixed effects, difference-in-difference, natural experiment, instrumental variables, regression discontinuity, event study, and matching approaches. Throughout the focus will be on real world applications, understanding the strengths and weaknesses of each approach, and communicating methods and findings in plain English.
2) Train students to *critically consume* empirical research done by others. We will teach you to read and understand empirical research and to judge whether it constitutes a firm basis for policy. This should serve you in your future role as a policy or business analyst, researcher, policy-maker, manager, or voter.

Readings
Since the course is primarily a methods course, the majority of readings will be from one of the course textbooks. Both are required and should serve as a useful reference in your future work:

1) Stock and Watson, *Introduction to Econometrics* 3rd edition (1st or 2nd editions OK).
2) Angrist and Pischke, *Mostly Harmless Econometrics*. Paperback edition.

The textbook readings will be supplemented with additional readings including academic journal articles and policy reports. All readings should be done before lecture.

Prerequisites: PUBPOL 529 (statistics) or equivalent.

Topics
The course is divided into three parts. In Part I, we will discuss causal inference as distinct from statistical inference and contrast evidence from observational data with that from randomized trials. We will also review core statistical inference concepts, though this review will be brief because the course assumes that you know this. In Part II, we will develop the core analytic tool of linear regression. We will cover single and multi-variable regression models, hypothesis testing, dummy variables, heteroskedasticity, model fit, multicollinearity, joint hypothesis testing, and transformations (logs, exponentials, polynomials, interactions). We will also briefly discuss a few alternatives to linear regression, such as Logit and Probit models (when outcomes are binary) and matching. A key limitation of regression is that it requires that all relevant factors can be adequately measured and controlled for. Part III introduces fixed effects and panel data, differences-in-differences, event study, instrumental variables, and regression discontinuity models. These are all techniques to "control for" some unobserved factors that may confound estimates from linear regression.

Section
A GSI will be leading section every Friday. Sections will mostly be used to demonstrate how to put quantitative methods into practice using Stata and to provide guidance on the problem sets. The GSI may occasionally use the time to clarify material covered in lecture or the readings.

Course Components
In-class Quizzes (5) 20%
Quizzes will test material from both the reading and lectures. Quizzes cannot be made up, so plan your schedule accordingly. Your lowest quiz score will be dropped. The quizzes are closed-book. You may consult a single index card of notes during the quizzes.

Homework Assignments (8) 40%
Homework assignments consist of data analysis and short essays (< 1 page) that interpret your findings. At least one will ask you to contrast and evaluate the methods used by a set of papers on a specific topic. They are graded on a scale of 0 to 10. You may (and are encouraged to) discuss the assignments in groups of three or four, but *your answers must be written up individually, in your own words*. So that we may confirm that you have written up answers in your own words, list your study group members on your problem set. Problem sets should be typed and uploaded to the course website.

Class Participation 15%
During each class, I will ask questions of randomly-selected students. This is intended to generate compulsory democratic participation. Questions will be based on the reading, assignments, problem sets and lectures.

Final Paper/Project 25%
There will be a final group paper/project due Tuesday April 24th. You will be asked to critically evaluate the empirical evidence on a specific policy topic and make a recommendation based on the weight of this evidence.

Software

We will do analysis in Stata, a software program used widely by policy analysts. We provide links to online Stata tutorials and offer training in sections. Stata is available in the Ford School computer lab and from the UM computing resources. It is also available for purchase. I recommend you buy it so that you can use it freely and often, the best way to learn any language.

Quiz and Assignment Schedule

All assignments are due at 9am on the date listed. Answers should be posted using the assignment tool in CTools in a single pdf file. Do not post them into your "Drop Box." Assignments will be distributed 7-14 days before due date. Quizzes will be in lecture and will begin promptly at 10:10am. They will last about 20 minutes. Quizzes will be cumulative, but focused on the most recent material.

Quizzes (5)	**Assignments (8 + paper)**
Diagnostic Quiz Tuesday Jan 10th, 2012 Quiz 1 Thursday, Jan 19th, 2012 Quiz 2 Tuesday Feb 7th, 2012 Quiz 3: Thursday Feb 23rd, 2012 Quiz 4: Tuesday March 22nd, 2012 Quiz 5: Thursday, April 12th, 2012	Problem Set 1 Statistics review Due Tuesday Jan 17th, 2012 Problem Set 2 Random assignment Due Tuesday Jan 24th, 2012 Problem Set 3 Bivariate regression Due Tuesday Feb 7th, 2012 Problem Set 4 Multivariable regression, omitted variable bias Due Tuesday Feb 21st, 2012 Problem Set 5 Omitted variable bias and multivariable regression Due Tuesday Mar 6th, 2012 Problem Set 6 Multivariable regression, nonlinearity, Due Tuesday March 20th, 2012 Problem Set 7 Fixed effects, some regression discontinuity Due Tuesday April 10th, 2012 Problem Set 8 (prep for final paper) Evaluating evidence across multiple studies Due Tuesday April 17th, 2012 Final Project/Paper Due Tuesday April 24th, 2012

DETAILED COURSE SCHEDULE
(Note: More supplemental readings will be added)

PART I: CAUSAL INFERENCE BASICS			
WEEK 1	Thurs 1/5	Lecture 1: Overview and Introduction	No readings
	Fri 1/6	No class (IPE)	
WEEK 2	Tues 1/10	Lecture 2: Causal Inference I	1. Angrist & Pischke Ch 1 & 2. 2. Paul W. Holland (1986). "Statistics and Causal Inference." *Journal of the American Statistical Association* 81:396 (Dec), pp. 945-960.
	Thurs 1/12	Lecture 3: Causal Inference II	Stock & Watson, Ch. 1
	Fri 1/13	Section	
PART II: REGRESSION (BIVARIATE AND MULTIVARIATE)			
WEEK 3	Tues 1/17	Lecture 4: Randomized Trials	1. Bertrand and Mullainathan, 2004. "Are Emily and Greg More Employable than Lakisha and Jamal? Evidence on Racial Discrimination in the Labor Market from a Large Randomized Experiment," September 2004, *American Economic Review*. 2. Stock & Watson, Chs. 2 & 3 (to review t-tests, p-values, confidence intervals, hypothesis testing, all of which we will use in class today)
	Thurs 1/19	Lecture 5: Observational Analysis & Introduction to Bivariate Regression	Stock and Watson Ch. 4.1-4.4, Appendix 4.1
	Fri 1/20	Section	
WEEK 4	Tues 1/24	Lecture 6: Bivariate Regression & Testing Hypotheses	Stock and Watson Ch 4.5; 5.1-5.2
	Thurs 1/26	Lecture 7: Dummy Variables, Heteroskedasticity	Stock and Watson Ch 5.3, 5.4
	Fri 1/27	Section	
WEEK 5	Tues 1/31	Lecture 8: Measures of Fit, Interpreting Output	No new readings
	Thurs 2/2	Lecture 9: Introduction to Multiple Regression, Omitted Variable Bias	Stock & Watson Ch 5.7, 6.1-6.6
	Fri 2/3	Section	
WEEK 6	Tues 2/7	Lecture 10: Multiple Regression and Regression Output	
	Thurs 2/9	Lecture 11: Multiple Regression & Omitted Variable Bias	Stock & Watson 6.1-6.6 and 7.5
	Fri 2/10	Section	
WEEK 7	Tues 2/14	Lecture 12: Hypothesis testing in multiple regression	Stock & Watson Ch. 7
	Thurs 2/16	Lecture 13: Multiple dummy variables and multicollinearity	Stock & Watson Ch. 6.7
	Fri 2/17	Section	

WEEK 8	Tues 2/21	Lecture 14: Multiple Regression & Causality	Angrist & Pischke Ch 3 through 3.2.3 (skim very technical stuff, get the gist)
	Thurs 2/23	Lecture 15: Nonlinearity: "Non-parametrics" and Polynomials	Stock & Watson Chs. 8.1-8.2
	Fri 2/24	Section	
WEEK 9	Tues 2/28	Winter break	
	Thurs 3/1	Winter break	
	Fri 3/2	Winter break	
WEEK 10	Tues 3/6	Lecture 16: Nonlinearity: Logs	
	Thurs 3/8	Lecture 17: Interaction Terms	Stock & Watson Ch. 8.3 - 8.5
	Fri 3/9	Section	
WEEK 11	Tues 3/13	Lecture 18: Binary Dependent Variables: Linear Probability Model	Stock & Watson Ch. 11
	Thurs 3/15	Lecture 19: Probit and Logit	Stock & Watson Ch. 11
	Fri 3/16	Section	
PART III: ADDRESSING UNOBSERVABLES			
WEEK 12	Tues 3/20	Lecture 20: Intro to Matching Methods and Intro to Addressing Unobservables	Angrist & Pischke Ch 3.3
	Thurs 3/22	Lecture 21: Fixed Effects	1. Currie, Janet and Duncan Thomas, (1995). "Does Head Start Make a Difference?" *American Economic Review* 85(3): 341-364. 2. Stock & Watson Ch. 10 3. Angrist & Pischke, Ch. 5 (through 5.1)
	Fri 3/23	Section	
WEEK 13	Tues 3/27	Lecture 22: Panel Data	1. Stock & Watson Ch. 10 (entirety)
	Thurs 3/29	Lecture 23: Difference in differences	1. Angrist & Pischke, Ch 5.2 2. Card and Krueger, 1994. "Minimum Wages and Employment: A Case Study of the Fast Food Industry in New Jersey and Pennsylvania." American Economic Review 84 (September 1994). 3. Eissa & Liebman, 1996. "Labor Supply Response to the Earned Income Tax Credit," The Quarterly Journal of Economics, vol. 111(2), pages 605-37, May.
	Fri 3/30	Section	

WEEK 14	Tues 4/3	Lecture 24: Regression Discontinuity	1. Jacob, Zhu, Somers, and Bloom 2012 *A Practical Guide to Regression Discontinuity* . 2. Angrist & Pischke Ch. 6 3. DiNardo & Lee, 2004. "Economic Impacts of New Unionization on Private Sector Employers: 1984-2001," in Quarterly Journal of Economics, 119(4), 1383-1441. 4. Carpenter & Dobkin, 2009."The Effect of Alcohol Access on Consumption and Mortality: Regression Discontinuity Evidence from the Minimum Drinking Age", American Economic Journal: Applied Economics, Vol. 1, Issue 1, pp. 164–821.
	Thurs 4/5	Lecture 25: Regression Discontinuity	Continue readings above
	Fri 4/6	Section	
WEEK 15	Tues 4/10	Lecture 26: Internal and External Validity	Stock & Watson Ch. 9, 13.1, 13.2, 13.5, 13.6
	Thurs 4/12	Lecture 27: Instrumental Variables	Stock & Watson Ch 12.1-12.3 2. Angrist & Pischke, Ch 4 (through 4.1.2) 3. Angrist, Joshua and Alan Krueger (1991). "Does Compulsory Schooling Attendance Affect Schooling and Earnings?" Quarterly Journal of Economics 106:4, pp. 979-1014.
	Fri 4/13	Section	
WEEK 16	Tues 4/17	Final Lecture: Instrumental Variables and Wrap-up	Stock & Watson Ch. 12
	Thurs 4/19	No Lecture	
	Tues 4/24	FINAL PAPER DUE	