PUBPOL 639/EDUC 794
Quantitative Methods for Program Evaluation
Fall 2016

Instructor:	Kevin Stange (kstange@umich.edu)
Office hours:	TBD (Signup via Google calendar)
GSI:	Chiara Ferrero (ferreroc@umich.edu)
Office Hours:	TBD (Signup via Google calendar)
Lecture:	Tuesday & Thursday 2:30-4:00pm, 1120 Weill Hall
Sections:	Friday 2:30-4:00pm, 1120 Weill Hall
Final Exam:	Wednesday 12/21 from 4-6pm in 1120 Weill Hall

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 and claims about empirical relationships made 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 (any edition OK, just find the cheapest one).
2) Angrist and Pischke, *Mastering Metrics*. 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. We will have a diagnostic quiz during the second lecture.

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
Your 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. Section attendance is strongly encouraged.

Course Components
In-class Quizzes (5) 24%
Short in-class 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 (6) 46%
Homework assignments consist of data analysis and short essays (< 1 page) that interpret your findings and evaluate the methods in readings. They are graded on a three-point scale: check (=acceptable), check-plus (=great), check-minus (=deficient). For the purpose of comparing these problem set grades to quiz and exam grades, a check-plus will count as 95%, a check will count as 85% and a check-minus will count as 75%. Students who do not turn in the assignment at all will receive a score of 50% for the purpose of calculating the final course grade. You 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, converted to a PDF, and uploaded to the course website. Stata do-files and log files should accompany all your assignments (in the same PDF). The final assignment will ask you to describe and critically evaluate two empirical papers which I provide to you and will be done in small groups.

Class Participation 10%
I expect you to attend and participate in class regularly. During each class, I may 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. Your class participation grade will also be based on your participation in the iclicker exercises in class. You will receive 2 points for a correct answer, 1 for an incorrect answer, and zero for no answer (e.g. you were not in class).

In-class Final Exam 20%
A comprehensive in-class final exam will be held Wednesday 12/21 from 4-6pm in 1120 Weill Hall. The exam is closed-book. You may consult a single index card of notes during the exam.

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 for license or purchase for a very affordable price. Order through the Stata website (http://www.stata.com/order/new/edu/gradplans/student-pricing/). We recommend Stata/IC 14 (6-mo license: $75, 12-mo license: $125, perpetual license: $198) which works with an unlimited number of observations. Do not purchase "Small Stata" – it will not be sufficient for this course. Alternatively, you can use Stata software through UM computing or in the computing labs.

Laptops
To keep us focused on the class, laptop use will not be permitted during class. I will distribute copies of overhead slides for you to take notes on and will post a pdf of the slides after lecture.

Clickers
We will use i>clickers during class to facilitate discussion and to provide feedback to me about your understanding of the material. You can purchase one from the UofM Computer Showcase in the Student Union or North Campus for $28 (used) or $38 (new). You will most likely need these starting in Lecture 2.

Quiz and Assignment Schedule
All assignments are due at 12pm (noon) on the date listed. Answers should be posted using the assignment tool in CTools in a single pdf file. Assignments will be distributed 7-14 days before due date. Quizzes will be in lecture and will begin promptly at 2:40pm. They will last about 20 minutes. Quizzes will be cumulative, but focused on the most recent material.

Accommodations
If you need an accommodation for a disability, please let me know as soon as possible. (Of course if a problem arises during the semester, you should see me as soon as you can). Some aspects of this course maybe modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with the Office of Services for Students with

Disabilities to help us determine appropriate accommodations. I will treat any information you provide as private and confidential.

Ford School Academic Expectations
Please review the discussion of the Ford School's statement on academic integrity, student mental health and wellbeing, inclusivity, and expectations for communications, attendance, assignments, and technology here: http://fordschool.umich.edu/academics/expectations

Inclusivity
Members of the Ford School community represent a rich variety of backgrounds and perspectives. We are committed to providing an atmosphere for learning that respects diversity. While working together to build this community we ask all members to:

- share their unique experiences, values and beliefs
- be open to the views of others
- honor the uniqueness of their colleagues
- appreciate the opportunity that we have to learn from each other in this community
- value one another's opinions and communicate in a respectful manner
- keep confidential discussions that the community has of a personal (or professional) nature
- use this opportunity together to discuss ways in which we can create an inclusive environment in Ford classes and across the UM community

Quizzes (5) and Final Exam	**Assignments (6)**
Diagnostic Quiz Thursday Sept 9th, 2016 Quiz 1 Thursday Sept 22nd, 2016 Quiz 2 Thursday Oct 13th, 2016 Quiz 3: Thursday Nov 3rd, 2016 Quiz 4: Tuesday Nov 29th, 2016 Quiz 5: Thursday Dec 8th, 2016 Final Exam Wednesday Dec 21st, 2016 **4-6pm**	Assignment 1 Selection and RCTs Due Tuesday Sept 20th, 2016 Assignment 2 Regression Due Tuesday Oct 11th, 2016 Assignment 3 Multiple regression Due Tuesday Nov 1st, 2016 Assignment 4 Nonlinearity, binary outcomes Due Tuesday Nov 22nd, 2016 Assignment 5 Fixed effects and difference in differences Due Tuesday Dec 6th, 2016 Assignment 6 (done in groups) Evaluating a study Due Thursday Dec 15th, 2016

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

PART I: CAUSAL INFERENCE BASICS					Assignments
WEEK 1	Tues	9/6	Lecture 1: Overview and Introduction	1. Angrist & Pischke Introduction	
	Thurs	9/9	Lecture 2: Causal Inference I	1. Angrist & Pischke Ch 1. 2. Paul W. Holland (1986). "Statistics and Causal Inference." *Journal of the American Statistical Association* 81:396 (Dec), pp. 945-960.	Diagnostic Quiz
WEEK 2	Tues	9/16	Lecture 3: Causal Inference II	1. Angrist & Pischke Ch 1 (continued) 2. Stock & Watson, Ch. 1	
PART II: REGRESSION (BIVARIATE AND MULTIVARIATE)					
	Thurs	9/15	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)	
WEEK 3	Tues	9/20	Lecture 5: Observational Analysis & Introduction to Bivariate Regression	Stock and Watson Ch. 4.1-4.4, Appendix 4.1	Assignment 1 due (selection and RCTs)
	Thurs	9/22	Lecture 6: Bivariate Regression & Testing Hypotheses	Stock and Watson Ch 4.5; 5.1-5.2	Quiz 1
WEEK 4	Tues	9/27	Lecture 7: Dummy Variables, Heteroskedasticity	Stock and Watson Ch 5.3, 5.4	
	Thurs	9/29	Lecture 8: Measures of Fit, Interpreting Output	No new readings	

WEEK 5	Tues	10/4	Lecture 9: Introduction to Multiple Regression, Omitted Variable Bias	1. Stock & Watson Ch 5.7, 6.1-6.6 2. Angrist & Pischke Ch 2 (pages TBD)	
	Thurs	10/6	Lecture 10: Multiple Regression and Regression Output	Continue Stock & Watson 6.1-6.6	
WEEK 6	Tues	10/11	Lecture 11: Multiple Regression & Omitted Variable Bias	Stock & Watson 6.1-6.6 and 7.5	Assignment 2 due (regression)
	Thurs	10/13	Lecture 12: Hypothesis testing in multiple regression	Stock & Watson Ch. 7	Quiz 2
WEEK 7	Tues	10/18	No class (fall break)		
	Thurs	10/20	Lecture 13: Multiple dummy variables and multicollinearity	Stock & Watson Ch. 6.7	
WEEK 8	Tues	10/25	Lecture 14: Multiple Regression & Causality	Angrist & Pischke Ch 2 (finish)	
	Thurs	10/27	Lecture 15: Nonlinearity: "Non-parametrics" and Polynomials	Stock & Watson Chs. 8.1-8.2	
WEEK 9	Tues	11/1	Lecture 16: Nonlinearity: Logs	Stock & Watson Chs. 8.1-8.2	Assignment 3 due (multiple regression)
	Thurs	11/3	Lecture 17: Interaction Terms	Stock & Watson Ch. 8.3 - 8.5	Quiz 3
WEEK 10	Tues	11/8	Lecture 18: Binary Dependent Variables: Linear Probability Model	Stock & Watson Ch. 11	
	Thurs	11/10	Lecture 19: Probit and Logit	Stock & Watson Ch. 11	

PART III: ADDRESSING UNOBSERVABLES					
WEEK 11	Tues	11/15	Lecture 20: Intro to Matching Methods and Intro to Addressing Unobservables		
	Thurs	11/17	Lecture 21: Fixed Effects	Currie, Janet and Duncan Thomas, (1995). "Does Head Start Make a Difference?" *American Economic Review* 85(3): 341-364. Stock & Watson Ch. 10	
WEEK 12	Tues	11/22	Lecture 22: Panel Data	Stock & Watson Ch. 10 (entirety)	Assignment 4 due (nonlinearity, binary outcomes)
	Thurs	11/24	No class (Thanksgiving)		
WEEK 13	Tues	11/29	Lecture 23: Difference in differences	Angrist & Pischke, Ch 5. 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.	Quiz 4
	Thurs	12/1	Lecture 24: Internal and External Validity	Stock & Watson Ch. 9, 13.1, 13.2, 13.5, 13.6	

WEEK 14	Tues	12/6	Lecture 25: Instrumental Variables	1. Stock & Watson Ch 12.1-12.3 2. Angrist & Pischke, Ch 3 3. Angrist, Joshua and Alan Krueger (1991). “Does Compulsory Schooling Attendance Affect Schooling and Earnings?” Quarterly Journal of Economics 106:4, pp. 979-1014.	Assignment 5 due (fixed effects and difference in differences)
	Thurs	12/8	Lecture 26: IV/Regression Discontinuity	1. Angrist & Pischke Ch. 4 2. DiNardo & Lee, 2004. "Economic Impacts of New Unionization on Private Sector Employers: 1984-2001," in Quarterly Journal of Economics, 119(4), 1383-1441. 3. 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.	Quiz 5
WEEK 15	Tues	12/13	Lecture 27: Regression Discontinuity & Wrap-up	Jacob, Zhu, Somers, and Bloom 2012 A Practical Guide to Regression Discontinuity.	
	Thurs	12/15	No class - Study Days		Assignment 6 due (evaluating studies, in group)
WEEK 16	Tues	12/20	No class - Study Days		
	Wed	12/21	Final Exam, 4-6pm		Final Exam