PBAF 528: Quantitative Methods II

Prof. Mark Long
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Class meets: Monday / Wednesday 2:30-3:50 in Condon 135
           Exceptions: Monday, May 27 (Memorial Day)
Office Hours: Friday Noon-1:30 (except April 5, when OH will be 10:30-Noon) and by
           appointment.

Teaching Assistant: Vance Larsen
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Review Session: Friday 8:30-9:20 or 9:30-10:20, Condon 115.
Office Hours: Tuesday Noon-2.
Office Hours Location: 313 Condon Hall

Course Website: https://canvas.uw.edu/courses/1289492/
Course listserv: pbaf528b_sp19@uw.edu. Note: I prefer to send class announcements through regular email, rather than through Canvas. Please check email daily.

Course Description and Objectives

This course is the second in a two-course sequence aimed at helping Evans School MPA students become informed users and critical consumers of research and statistical analyses. This course introduces the application of probability, hypothesis testing, and confidence intervals to multivariate models in the context of policy and management research. We strive to isolate and measure the effects of one factor (an independent variable – often the introduction of a policy) on an outcome (a dependent variable) while controlling any other factors. We begin with the linear regression model in its basic form and move on to modeling techniques. Along the way we will consider some of the limitations and potential problems associated with using regression models and alternative models. Students will develop a first hand appreciation of these topics through in-class exercises and homework problems.

By the end of this course, you will:
- Understand how complex policy analysis can be conducted using multivariate regression analysis.

- Be aware of the conditions necessary to establish causal relationships on a given outcome, emphasizing the need to disentangle the effects of multiple factors.
- Select appropriate univariate, bivariate, or multivariate analytic techniques to answer a given policy or management question.
- Understand the mechanics, assumptions, and interpretation of regression models to policy or management questions, how to use regression models for both prediction and hypothesis testing, and the assumptions behind and possible "fixes" for problems with models.
- Learn how to read and analyze empirical studies
- Recognize how policy analysis, program evaluation, and performance measurement employ research methods and statistical techniques.
- Be exposed to nonlinear models and understand their purposes.

Readings

Required Textbook:
> Using Econometrics: A Practical Guide, by A.H. Studenmund, 7th Edition, Addison Wesley, 2017.

Other required readings will be available on Canvas.

Software

I will teach you how to use STATA, building off what you learned in PUBPOL 527.

Programming Stata is easy 😊. With a small number of basic commands you can run very sophisticated models.

Stata is available on the CSDE and Evans School servers. If you are interested in buying your own copy of STATA, individual student licenses for Stata/IC 15 cost $125 for 12 months or $235 for a perpetual license: http://www.stata.com/order/new/edu/gradplan.html.

Excel may also be useful for some of the assignments and for data manipulation.

Grading and Requirements

The course requirements include six homework sets, two in-class exams, and a final data analysis exam. The purpose of the two in-class exams is to help diagnose your progress in learning the mechanics and interpretation of regression. *[The in-class exams will be closed book, but you will be allowed to use 2 pages (4 sides) of notes.]* The data analysis exam allows you to consolidate your learning about regression models, apply what you are

learning to a policy context. We will provide calculators to be used during the exams. Bring pencil and/or pen.

Homework assignments (on time and complete for credit)	10% of final grade
First-Half Exam 1 in discussion section (May 3)	30% of final grade
Second-Half Exam 2 in discussion section (May 31)	30% of final grade
Data Analysis Exam (take home, due June 13 at 11:59PM)	30% of final grade

Homework assignments will be graded for completeness/effort (full credit, partial credit, or no credit). Group work is encouraged, but copying is not acceptable. That is, you can work together in developing answers. Each person must turn in their own completed homework.

Course Policy on Missed or Late Assignments

Answer keys for the problem sets will be available on Canvas by class-time the day the assignments are due. Make sure to submit your answers by Canvas BEFORE 8:30am on the Friday when it is due. Answers received after this time will not be reviewed or receive credit. If you cannot submit the homework on time, I recommend that you complete it anyway so that you learn the material.

If an emergency prevents you from taking the exam, you must contact me by phone or by email and provide documentation. Generally, an "emergency" means sickness or injury and does not mean a work or personal commitment. If you know now that you cannot take any of the exams, talk with me now (i.e., on the first day of class).

Tips to Do Well in Class

- **Do the reading *before* you come to class.** Hearing the material after having read it will help things make sense to you. I plan class exercises and lecture with the assumption that you've done the reading.
- **Come with questions** to class and review section. If you do not understand something, ask questions about it in class or in the review session. Usually, you are not the only one who has the same question.
- **Attend class and review section regularly** and keep up with your assignments.
- A good way of learning statistics is to **discuss the material with someone else**. To that end, I recommend you form a study group with whom you work on problem sets. Set a time regular time to meet. Ask questions among yourselves. Seeing material from the perspectives of others will help you better to formulate your understanding of the material. You should hand in your own work after having reviewed your responses to the problems with your group.

Effort Expectation

Attendance at the lectures and quiz sections *is expected and is required for success* in the course. You should anticipate devoting *at least* 12 hours per week for this course (including time in lecture and quiz section). Think of this as one-third of a full-time job. That means, doing work *beyond that which is assigned*. Apply the material we are covering in class to your own projects of interest.

Lecture /
Quiz
Section

Outside
Class-time
Effort
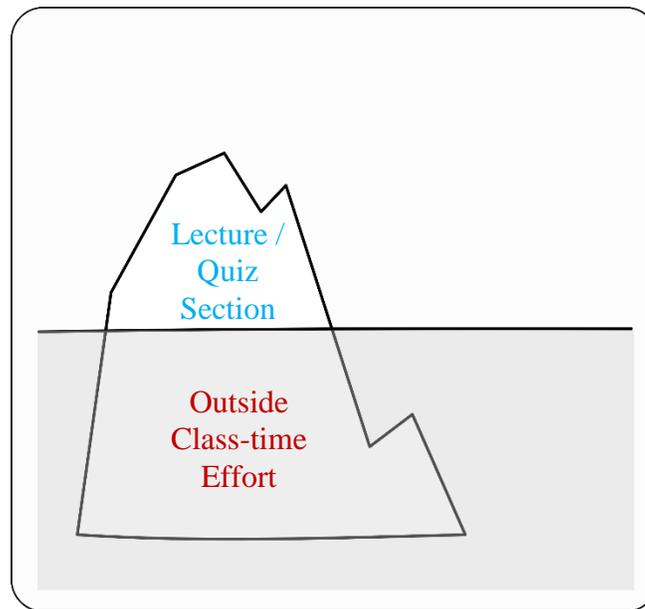
Community Conversation Norms

At the Evans School, we value the richness of our differences and how they can greatly enhance our conversations and learning. As a professional school, we also have a responsibility to communicate with each other—inside and outside of the classroom—in a manner consistent with conduct in today's increasingly diverse places of work. We hold ourselves individually and collectively responsible for our communication by:

- **Listening** carefully and respectfully
- **Sharing** and teaching each other generously
- **Clarifying** the intent and impact of our comments
- **Giving and receiving** feedback in a "relationship-building" manner
- **Working** together to expand our knowledge by using high standards for evidence and analysis

Student Academic Conduct

Students at the Evans School are expected to maintain the highest standards of academic conduct, and, of course, most do. Cheating harms the person cheating, as it deprives them of the opportunity to learn the material. It also harms honest students who are frustrated by the unfairness of cheating that goes undetected and therefore unpunished.

Academic misconduct occurs if you present as your own work something that you did not do. It is also considered academic misconduct if you help someone else present work that is not his or her own.

Plagiarism

One of the most common forms of cheating is *plagiarism*, which is using another's words or ideas without proper citation. When students plagiarize, they usually do so in one of the following six ways:
1. Using another writer's words without proper citation.
2. Using another writer's ideas without proper citation.
3. Citing your source but reproducing the exact words of a printed source without quotation marks.
4. Borrowing the structure of another author's phrases or sentences without crediting the author from whom it came.
5. Borrowing all or part of another student's paper or using someone else's outline to write your own paper.
6. Using a paper writing "service" or having a friend write the paper for you.

Exams

Another common form of cheating involves exams. The following will all be considered violations of the student conduct code:
- Copying from someone else's exam, or allowing another student to copy from your exam;
- Aiding another student during an exam where collaboration is prohibited, including talking, signs, gestures, or sharing notes;
- Using notes (unless expressly allowed by the teacher, in which case notes must follow their specifications);
- Using any electronic device such as a tablet, laptop, or mobile phone unless expressly permitted by the instructor;
- Altering an exam for re-grading;
- Getting an advance copy of the examination;

- Using a surrogate test-taker;
- Working together on a take-home exam when an instructor forbids collaboration;
- Deliberately delaying turning in a timed class exam; such a delay would unfairly give that student extra time and will be considered a form of cheating.

Lying

Lying encompasses the following: the willful and knowledgeable telling of an untruth, as well as any form of deceit, attempted deceit, or fraud in an oral or written statement relating to academic work. This includes, but is not limited, to the lying to administration and faculty members, and falsifying any university document by mutilation, addition, or deletion.

What happens if there is a suspected violation?

It is the responsibility of the entire Evans School community to uphold its academic standards and integrity. It is the Evans School's policy that instructors maintain discretion over whether and how any suspected academic misconduct should be reflected in the grade for that assignment, exam, or for the course. This may include a zero grade. Students who disagree with the instructors' assessment should follow the University's normal grade appeal process. Proven academic misconduct as outlined above could also result in disciplinary action from the University. In addition, instructors who suspect misconduct will report the misconduct to the Evans School's Assistant Dean of Students and the Associate Dean for Academic Affairs.

Appeal Procedures

Students in the Evans School have the right to appeal grades and academic probation and dismissal decisions according to the process outlined in the UW's Student Academic Grievance Procedures and Student Conduct Code on Appeals. Students who want to appeal a grade must first discuss the matter with the relevant faculty member. Students who 1) are not able to resolve a grade appeal request with the relevant faculty member, 2) have been placed on probation, or 3) have been dismissed from the major, and who believe that some facts or documentation have been overlooked or misinterpreted may request reconsideration of the grade or decision by writing a letter to the Assistant Dean of Students and the Associate Dean of Academic Affairs within 30 days of the initial decision. The Assistant Dean of Students and the Associate Dean for Academic Affairs, may bring the matter to the Dean at their discretion. If the matter cannot be resolved with the Evans School, then the student may pursue the formal UW appeals process.

Schedule

April 1/3: How to Answer the Causal Question: Does/Did Policy *X* cause a Change in Outcome *Y*?

- Hierarchy of Designs to Answer Casual Questions
- Readings:
    - Chambliss and Schutt, *Making Sense of the Social World: Methods of Investigation*, Chapter 5: Causation and Experimental Design, pp. 106-135.
    - Babbie, *The Basics of Social Research*, pp. 89-99
    - Berman, *Essential Statistics for Public Managers and Policy Analysts*, pp. 1-26.
    - Long, M, Conger, D, and Iatarola, P. "Effects of High School Course-Taking on Secondary and Post-Secondary Success." *American Educational Research Journal*, 49(2), pp. 285–322, 2012.
    - Conger, D., Kennedy, A, Long, MC, McGhee Jr., R. "Effects of Advanced Placement Science Courses on Skill, Confidence, and Interest in Science." Working Paper.

- **April 5: Quiz Section – How to write a program in Stata**

April 8/10: Introduction to Regression Analysis
- Readings:
    - Studenmund, Chapters 1-2
- **HW1 Due, April 12, 8:30am, Discussed in Quiz Section**

April 15/17: Using Regression Analysis and Hypothesis Testing
- Readings:
    - Studenmund, Chapters 3-5
    - Ronald L. Wasserstein & Nicole A. Lazar (2016) The ASA's Statement on p-Values: Context, Process, and Purpose, *The American Statistician*, 70:2, 129-133:
- **HW2 Due, April 19, 8:30am, Discussed in Quiz Section**

April 22/24: Multivariate Regression
- Readings:
  - Studenmund, Chapter 6
- **HW3 Due, April 26, 8:30am, Discussed in Quiz Section**

April 29/May 1: Multivariate Regression (Continued)
- **May 3: First-Half Exam in Quiz Section**

May 6/8: Specification: Choosing a Functional Form
- Readings:
  - Studenmund, Chapter 7
- **HW4 Due, May 10, 8:30am, Discussed in Quiz Section**

May 13/15: Specification: Choosing a Functional Form (Continued). Multicollinearity, Serial Correlation, and Heteroskedasticity
- Readings:
  - Studenmund, Chapters 8-10
- **HW5 Due, May 17, 8:30am, Discussed in Quiz Section**

May 20/22: Multicollinearity, Serial Correlation, and Heteroskedasticity (Continued). Dummy Dependent Variables and Fixed Effects Models
- Readings:
  - Studenmund, Chapters 13, 16.2
- **HW6 Due, May 24, 8:30am, Discussed in Quiz Section (as well as Review for Second-Half Exam)**

May 27: Memorial Day
May 29: Dummy Dependent Variables and Fixed Effects Models (Continued).
- **May 31: Second-Half Exam in Quiz Section**

June 3/5: How to do a Multivariate Research Project / Causation versus Prediction.
- Readings:
    - Studenmund, Chapter, 11
    - "Facebook is using AI to try to prevent suicide", Hayley Tsukayama, November 27, 2017, Washington Post.
    - "Suicide prediction technology is revolutionary. It badly needs oversight", Mason Marks, December 20, 2018, Washington Post.
    - Watch "Neural Networks": https://youtu.be/aircAruvnKk
    - Watch "How Machines Learn": https://youtu.be/IHZwWFHWa-w
    - Watch "Backpropagation": https://youtu.be/Ilg3gGewQ5U
- June 7 review section: Return and Discussion of Second-Half Exam

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June 13: Data Analysis Take-Home Exam Due at 11:59pm