Browse the leading journals in political science, and you will find many articles featuring regression analyses. Yet to the uninitiated, terms like $R^2$, serial correlation, multicollinearity, heteroskedasticity, and dummy variables may seem far removed from the concepts and theories covered in POL 610, POL 620, POL 630, and POL 640. The goal of this seminar is to forge better connections between data analysis and substantive political inquiry.

Building on the research methods covered earlier in POL 501 (or equivalent courses you may have had), this seminar takes graduate students through the fundamentals of regression-based modeling in the social sciences. How do we know a cause when we see one? Where do regression coefficients come from, and what do they mean? How can we know whether the assumptions of regression analysis are plausible in a particular research application? Over the next four months, we will cover such questions.

Welcome to the class – I hope you have an enjoyable semester!

**Reading Materials:**

**Required**

- Many articles and book chapters, noted below.

**Recommended**

- Peter Kennedy, *A Guide to Econometrics, Fifth Edition*. Cambridge, MA: The MIT Press, 2003. This is a remarkably readable reference guide. Ample used copies should be widely available through on-line vendors. A sixth and final edition was published in 2008, but copies seem to be in short supply; Amazon has a waiting list.
- Lawrence S. Meyers, Glenn Gamst, and A. J. Guarino, *Performing Data Analysis Using IBM SPSS*, John Wiley & Sons, 2013. If you are proficient in STATA and wish to continue using this software in POL 605, this is fine. Ditto for MS-Excel, SAS, or any other well-tested data analysis package. But because the university has a site license for SPSS, and many public-use datasets are archived in SPSS ‘saved’ files, many of the techniques we cover during the seminar will be presented via SPSS. In my own work, I switch back and forth between SPSS, STATA, and various other software packages. Why be monolingual? Note that SPSS has an excellent on-line help feature.
• Michael N. Mitchell, *Interpreting and Visualizing Regression Models Using Stata*, Stata press, 2012. This will be a handy guide for STATA users. It is also worth noting that STATA has very useful help features. This book is on reserve in the HSSE library.


• Jane E. Miller, *The Chicago Guide to Writing About Numbers*. University of Chicago Press, 2004. If there is a good reason to estimate statistical parameters for a model, there is a good reason to interpret the results cleanly. This book will help develop your interpretive skills.

**Course Requirements:**

• Several short essays, homework assignments, and active seminar participation (collectively worth 30% of your seminar grade). When each assignment is given, the due date and submission procedures will be stated. Work that is turned in late will be penalized unless prior arrangements have been made.

• In-class homestretch examination (30%), April 17.

• Final research project (40%) that explores one or more hypotheses using some of the techniques we cover in POL 605, due on Monday of Finals Week in hardcopy form unless other arrangements are made.

**Schedule of Topics:**

*Note:* The best kind of teaching involves showing – not just telling. I will bring lots of application examples to class each week, and I encourage you to share your own “research in progress” with the other seminar members. This will make our sessions more engaging and informative, but it could also throw off our timetable. Unless you hear otherwise, we will keep to this schedule of topics. Please read the assigned material in advance of the seminar meeting.

**January 16**  
Introduction and review of some principles of research design. How do we know an interesting research question when we see it? What are operational hypotheses? What is an indeterminant design? How do we know good empirical measurements when we see them? What are some common measures of central tendency and dispersion?

These are some of the core themes from POL 501. The following works may be useful as you consider the design of your own research projects. Review them over the course of the semester:


• King, et al., *Designing Social Inquiry*, especially Chapters 1-4; also on reserve, if you have not yet bought a copy.

January 23
An overview of random variables and sampling theory, followed by a discussion of variance, covariance, and correlation

- Dougherty, “Review: Random Variables, Sampling, and Estimation”
- Kennedy, Chapters 1-2, and Appendix B [optional]
- Miller, Chapter 9 [optional]
- Fox, entire [optional]

January 30 – February 6
I have a continuous interval-level measure of an interesting variable (e.g., level of support for Barack Obama among voters, the amount countries spend on their military, or the concentration of hazardous chemicals in underground streams). I’d like to explain why some cases (citizens, governments, streams) have high scores on this continuum, while others score low. One causal factor seems particularly important – at least according to theory, previous research, and my own hunches. How can ordinary least squares (OLS) regression help me assess this causal effect?

- Dougherty, Chapters 1-2
- Kennedy, Chapters 3, optional

Illustrative examples of bivariate OLS regression:
- Jeffrey A. Segal and Albert D. Cover, “Ideological Values and the Votes of U.S. Supreme Court Justices,” American Political Science Review 83:2 (June, 1989), 557-65.

February 13 – February 20
My theories about politics are complex. How can I build multivariate regression (or “multicausal”) models? Since my understanding of any political process is incomplete, what happens if I leave an important predictor out of the model? What if I include an irrelevant predictor? What should I do if two or more of my independent variables are highly inter-correlated? When specifying and interpreting my model, what use, if any, is $R^2$? Adjusted $R^2$?

- Dougherty, Chapters 3 and 6
- Kennedy, Chapters 4, 5, and 11, optional

February 27
Going “non-linear” in linear models: fitting curvilinear functional forms and interaction effects.

- Dougherty, Chapter 4
March 6

Some of my predictors are “qualitative” (i.e., categorical). How do I incorporate these variables into my regression analysis?

- Dougherty, Chapter 5
- Kennedy, Chapter 14, optional
- Markus Prior, “Political Knowledge after September 11,” *PS: Political Science and Politics* 35:3 (September 2002), 523-29
- James L. Gibson, “Truth, Justice, and Reconciliation: Judging the Fairness of Amnesty in South Africa,” *APSR* 46:3 (July 2002), 540-56. Available at JSTOR. Here you will see how data from an experiment can be analyzed in regression analysis, with dichotomous predictors indicating the presence of an experimental treatment.

March 13

Turning to the residuals, how do I assess the homoskedasticity assumption? If the residual variance is not constant, how are inferences affected? What correctives would be in order?

- Dougherty, Chapter 7
- Kennedy, Chapter 8, optional

March 27

Are my residuals independent from each other? Or are they correlated in some way? If so, what difference does this make in the regression model?

- Dougherty, Chapter 12

April 3 – April 10

Is there any reason to doubt that my independent variables are exogenous? How would “endogeneity” affect the regression findings? What steps could I take to arrive at better inferences?

- Dougherty, Chapter 9
- Anthony C. Krautmann and William Sander, “Grades and Student Evaluations of Teachers,” *Economics of Education Review* 18(1999), 59-63. Available through http://www.sciencedirect.com. This piece addresses that old question in higher education: can instructors raise their student evaluations by giving out easier grades? Since it is quite possible that instructor evaluations and grades are simultaneously determined, OLS regression would lead to biased and inconsistent inferences. Note how the authors deal with this possibility through two-stage least squares. In class, we will also consider how
two-stage least squares might be useful when your predictors are measured with a substantial amount of error.

- Jan Leighley, “Participation as a Stimulus of Political Conceptualization,” *Journal of Politics* 53:1 (February 1991), 198-211. This is another example of two-stage least squares. It explores the potential simultaneity between political sophistication and involvement in elections. Note how the author goes about finding reasonable exogenous variables for the “first-stage” regressions.

**April 17**
We’ve covered so much material. Isn’t it about time for a closed-book, in-class midterm (errrr, “homestretch”) examination?

**April 24**
My dependent variable is qualitative (e.g., the decision to vote or not in an election). Can ordinary least squares regression be used effectively in this case? What are some alternatives to OLS?
- Dougherty, Chapter 10
- Kennedy, Chapter 15, optional

**Week of May 1**
One-on-one discussion of final projects!
Appendix: Course Policies

Adapted from the template recommended by the Purdue University Center for Instructional Excellence

- During class, please turn off any device that beeps, rattles, buzzes, lights up, or does anything else that could be distracting. In a typical seminar meeting, we will take a short break after the first 60-75 minutes. This will allow you to check messages or take care of other business.

- I often work in my office outside of the regular office hours listed on the first page of this syllabus. In general, if the office door is open, I am fair game for colleagues, students, and other visitors. If the door is closed, that likely means that I am working on research projects or preparing for class meetings.

- When students contact me by email about a course assignment, an activity, or to set up an appointment, I am usually able to respond within twenty-four hours.

- Final grades for the seminar will include a “plus” or “minus” when appropriate. “Incompletes” can be given only under truly exceptional circumstances and must be arranged well before final grades are submitted.

- The leaders that political scientists study might not always display the highest ethical standards in the pursuit of power. Henry Kissinger once remarked that “90% of all politicians give the other 10% a bad reputation.” In contrast, we academics are duty bound to go about our business with unfailing honesty and integrity. As a reminder, here is the university policy on scholarly ethics –

  Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, University Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972] Any violation of this university policy will result in an “F” for the course.

- The following policy on attendance will also apply in this course –

  Students are expected to be present for every meeting of the classes in which they are enrolled. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts or absences can be anticipated, such as for many University sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email, or by contacting the main office of the Department of Political Science. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor’s department because of circumstances beyond the student’s control, and in cases of bereavement, the student or the student’s representative should contact the Office of the Dean of Students.
• And here is another policy that hopefully will not be relevant this semester --

Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). GAPS Policy: Students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missed assignments or assessments in the event of the death of a member of the student’s family.

• This is the policy on violent behavior --

Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity.

• Regarding students with disabilities, here is our policy --

Purdue University is required to respond to the needs of the students with disabilities as outlined in both the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 through the provision of auxiliary aids and services that allow a student with a disability to fully access and participate in the programs, services, and activities at Purdue University. If you have a disability that requires special academic accommodation, please make an appointment to speak with me within the first two (2) weeks of the semester in order to discuss any adjustments. It is important that we talk about this at the beginning of the semester. It is the student’s responsibility to notify the Disability Resource Center (http://www.purdue.edu/drc) of an impairment/condition that may require accommodations and/or classroom modifications.

• Concerning emergencies, this is the policy we will follow --

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor’s control. Relevant changes to this course can be obtained by contacting the instructor via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

• Finally, a nondiscrimination policy --

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Executive Memorandum No. D-1, which provides specific contractual rights and remedies. Any student who believes he or she has been discriminated against may visit www.purdue.edu/report-hate to submit a complaint to the Office of Institutional Equity. Information may be reported anonymously.