

Quantitative Political Methodology  
L32 363

### Class information

**Lecture** Monday and Wednesday  
1:00 – 2:00  
Seigle Hall 304

**Labs** Seigle Hall L016  
Lab A: Thursday 9:00–10:00  
Lab B: Thursday 10:00 – 11:00  
Lab C: Friday 9:00 – 10:00  
Lab D: Friday 10:00 – 11:00

**Instructor Information** Jacob M. Montgomery, Ph.D.  
Associate Professor, Department of Political Science  
**Office:** Seigle 285  
**E-mail:** jacob.montgomery@wustl.edu  
**Office Hours:** Tues. 1:30-3:30 and by appointment

**Textbooks/Readings** Alan Angresti and Barbara Finlay. 2009. *Statistical Methods for the Social Sciences, Fourth Edition*. Upper Saddle River, NJ: Prentice Hall. ISBN: 978-0130272959  
James E. Monogan III. 2015. *Political Analysis Using R*. New York: Springer. ISBN 978-3-319-23446-8 (An online version of this book is available for free through Springer Link in library)  
See the Online Course Book for additional reading materials.

**Software** You will be using the R statistical package (<http://www.r-project.org/>). This package is widely used in political science, economics, psychology, sociology, and biostatistics. R is available for every computing platform, and most importantly, is free. As such, you need not rely on computer labs to complete your assignments. Please feel free to contact Professor Montgomery or a TA if you have any questions about software. *Please bring your laptops to the first lab session for help installing the program.*



**Course description** We are on the doorstep of a new era of social science. Never before have political scientists had access to so much data about the attitudes and actions of individuals, institutions, and nations. Data on everything from the votes of members of the U.S. Senate in 1855 to terrorist attacks from around the globe are only a few clicks away.

This class is designed to make you an active participant in this new data-rich world. The goal is to introduce you to the methods and practices by which you can use this data to answer questions that are important to us as political scientists and citizens. What policies are most effective at reducing poverty? Which campaign ads are most effective at persuading voters? Can we affect the behavior of our Facebook friends just by sharing our opinions?

The purpose of this class is to teach you how to use data to answer these kinds of questions. This class will introduce you to the theoretical concepts you need to test claims about the political world and the practical skills you will need to conduct and present statistical analyses.

Although students will certainly be expected to engage with mathematics, formulas, and data analysis, the goals of the class are primarily conceptual rather than narrowly mathematical. The course will focus on helping students to understand the core concepts behind statistical tests, understand their uses (and limitations), learn to apply them appropriately to substantive problems of interest, and learn how to communicate findings to others. In addition, a major component of the course include learning how to collect, manage, and analyze data using computer software, and how to effectively communicate results to others.

**Learning objectives** By the end of this course, you should be able to:

- Present data using graphics and descriptive statistics in a clear and informative manner
- Apply basic concepts from probability theory to social science research questions
- Describe the threats to making causal inferences from observational data and identify how they could change the conclusions of a study
- Make inferences about the distribution of populations based on a sample
- Correctly conduct and interpret hypothesis tests
- Understand linear regression in theory and practice (i.e., be able to read and interpret regression tables in academic articles)
- Work collaboratively with other students to complete problem sets that apply concepts from class readings and short lectures
- Independently gather, analyze, interpret, and present your own data

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**Assistants to instructor** There are three graduate and two undergraduate assistant to instructor. The graduate students concentrate in social science or applied statistics and have vast experience in applied quantitative analysis. The undergraduate teaching assistants have successfully completed this course.

Each laboratory session will be led by one of the graduate assistants to instructor. Most grading will be done by the graduate students; some will be done by Professor Montgomery. The graduate assistants to instructor will work closely in conjunction with Professor Montgomery on all issues of grading. I encourage you to get to know the assistants to instructor responsible for your lab.

**Graduate ATIs (office hours and location)**

Taishi Muraoka	Erin Rossiter	Min Hee Seo
tmuraoka@wustl.edu	erinrossiter@wustl.edu	minheeseo@wustl.edu
Seigle 274	Seigle 277	Seigle 258
Tuesday 3:00-5:00	Friday 3:15-5:15	Monday 3:00-5:00

**Undergraduate ATIs (office hours and location)**

Cara DiLiberti	Joe Ludmir
cdiliberti@wustl.edu	jludmir@wustl.edu
Cafe Bergson	Cafe Bergson
Tuesday 4:00-6:00	Tuesday 6:00-8:00
Thursday 5:00-6:30	Thursday 5:00-6:30

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**Team Based Learning** This course will feature as little traditional lecturing as I can manage while still ensuring you understand the materials. Students will be expected to learn the basic content of the readings before class so that the majority of class time can be dedicated to discussion, group work, and hands-on demonstrations, which are more likely to facilitate successful learning. We will work in teams throughout the semester to maximize active engagement with the course material. By working in teams, students will not only develop communication and collaboration skills but assist each other in understanding and applying concepts successfully. Early in the semester, you will be assigned to a team of five students. You will work with this team throughout the semester on both in-class assignments and your final research project. To ensure that each student contributes to the group's success, your contributions will be assessed via the self- and peer-evaluation components discussed below.

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**Requirements and Evaluation** Grading in this class will be based on the components described below. *Late work will not be accepted without prior permission.* Makeup exams will not be given, and students who miss exams will receive a score of 0 absent extraordinary circumstances.

If you get	you get an
$\geq 94$	A
$\geq 90$	A-
$\geq 87$	B+
$\geq 83$	B
$\geq 80$	B-
$\geq 77$	C+
$\geq 73$	C
$\geq 70$	C-
$\geq 67$	D+
$\geq 63$	D
$\geq 60$	D-
$< 60$	Fail

**Peer assessments - 10%** Early in the semester, you will be assigned into a team of 4-6 individuals. You will work with this team throughout the semester on in-class assignments and your final research project. To help ensure that all members of the team are actively contributing, students will be asked to evaluate their teammates' contributions, effort, and performance. You will receive ungraded midterm evaluations from your group to help you know how well you are doing and identify areas in need of improvement. You will also complete a midterm self-evaluation of your own contributions, effort, and performance using an identical form to help you reflect on your own effort and performance. (All peer and self-evaluation forms are provided at the end of the syllabus.)

**Problem sets, in-class work, and quizzes - 20%** Problem sets

*Problem sets*, or homeworks, will be distributed throughout the course (10%). These are individual assignments that you should prepare yourself, though you may ask your colleagues for help. Please turn them in at the on the specified date **at the beginning of class** with only your WUSTL ID number (i.e., not your name) written in the space provided. If you have a printing problem, you are responsible for emailing it to your

graduate TA before class starts. Each student's lowest homework grade will be dropped in the final grade calculations. This option should be reserved for illness, family emergencies, broken alarm clocks, or other unforeseen events. No additional waivers will be granted.

#### IPAs

*Individual preparedness assessments* (IPAs) are open book quizzes that will be taken using R before each class (5%). They will be posted at least 24 hours before they are due and are available and must be completed before class begins. Note that the specific time when your IPA is completed will be reported along with your score, so late tests will not be graded.

IPAs are designed to ensure that students arrive to class prepared to engage in discussion and team activities based on the assigned reading. (Many in-class team activities will be graded, so these assessments are necessary to ensure that all members are ready to contribute.) You should complete these assessments yourself with no assistance from your colleagues; you may not discuss them with other students prior to class. Each student's two lowest IPA grades will be dropped in final grade calculations. This option should be reserved for illness, family emergencies, broken alarm clocks, computer crashes, or other unforeseen events. No additional waivers will be granted.

*Note:* We are trying a new system for IPAs using R (and moving away from the horrible Blackboard system). Additional details about how these IPAs will be posted and graded will be discussed in detail later in the class. This section of the syllabus will be updated at that time.

#### In-class assignments

*In-class assignments* will be completed during class with your research team (5%). All members will turn in a single assignment at the end of class and will share their grade. However, **all absent students will receive a zero**; any attempt to include an ID number for an absent student will be considered an academic integrity violation. Students missing more than five minutes of class time will be counted as absent. Each student's two lowest in-class assignment grades will be dropped in the final grade calculations. This option should be reserved for illness, family emergencies, broken alarm clocks, or other unforeseen events. No additional waivers will be granted.

**Midterm exam - 20%** The midterm exam will be held in class on October 11th and will cover the material discussed in class up to that point. Students will be provided with relevant statistical tables and are allowed to use a calculator with no information stored in memory.

**Research project - 25%** Working with your assigned team, students will select a social science research question of interest, collect data, and conduct a quantitative analysis of their results. These findings will be written up and presented as scientific posters during the final lab period. Each group should submit a Powerpoint or PDF file of their poster and replication data/annotated R code generating your results *before the final lecture period on December XX*.

- Don't worry about whether your hypothesis was supported! Evaluation will be based on the criteria specified in the rubric on the final page of this syllabus, not the statistical significance of your results.
- Teams receiving the best poster grades are inevitably those that start early and those teams that come to me early and often to *me* for feedback.
- There will also be an optional "poster session" (location/date TBD). The best poster in each section as selected by Political Science Department faculty will receive 1% extra credit toward their overall course grade.

**Final exam - 25%** A comprehensive final exam will be held December 20th at 1:00PM - 3:00PM. Students will be provided with relevant statistical tables and are allowed to use a calculator with no information stored in memory.

**Extra credit** No adjustments will be made to final grades under any circumstances. Students will have the opportunity to earn extra credit over the course of the semester to provide an extra cushion in case of lazy team-mates, a malfunctioning calculator, or unusual anxiety during finals due to the opening of the Chamber of Secrets, an attack by rogue dementors, the sudden death of the Headmaster, or the return of You Know Who.

- As noted above, the team that earns the most votes for the best research poster will earn 1%.
- Students can also increase their final grade 1% by completing their official online course evaluations for both Professor Montgomery and assistants to the instructor for their lab.
- Students may earn up to another 1% for creating a video tutorial or other online content to be added to the course website. The topic of this video must be approved in advance, and the final product must be delivered to me before the final exam.



## Class policies

**Grade Appeals** I am happy to meet with students about grading issues, but only after they have met with their graduate assistant to the instructor. Please meet first with the leader of your lab with any concerns about evaluation.

If you wish to appeal the grading of an exam or assignment, you must return it to either me or an assistant to the instructor within 72 hours of the time when the graded assignment is returned to the class or your section. Assignments returned on Thursday or Friday must be returned by Noon on the following Monday. You must staple to the original graded exam or assignment a note that states which question(s) is (are) to be re-graded and why you believe that your answer deserves more credit. Nothing additional (notes, explanations, etc.) should be written on the original assignment and NO changes or erasures should be made on the original before regrading. A percentage of all written assignment are photocopied and compared to the regrade requests. Cheating will not be tolerated.

**Technology in the classroom** You will frequently make use of computers in this course, during some lecture periods and during every lab. Please be respectful to your instructors and your peers by using your computers only for class-related purposes. Please put your phone away before class starts and don't bring it out.

**Academic Honesty** Cheating and plagiarism will not be tolerated. I strongly encourage you to review the University's policies regarding academic honesty, which you can read at: <http://www.wustl.edu/policies/undergraduate-academic-integrity.html>.

In general, if you have any question, please feel free to ask your lab leader or Professor Montgomery. Specific rules for this course:

- You may work together on homework in small groups, but you should each prepare your answers separately.
- The homeworks and in-class work are open book and open notes. However, you *may not* make use of answer keys or graded assignments provided by students from previous years for either homeworks or in-class assignments.
- You are to consult *only* with Professor Montgomery or a TA during exams.
- You will be allowed to bring one sheet of paper to exams to consult. This may be filled (front and back) with any equations or notes you may find helpful. Otherwise the exams will be closed book.

- Graphic calculators are allowed during exams, but the memory must be cleared. Students should be prepared to show a confirmation of a cleared memory at the beginning of the exam.

All cases of cheating or plagiarism will be referred to Washington University's Committee on Academic Integrity. If the Committee on Academic Integrity finds a student guilty of cheating, then the penalty will be (without exception) automatic failure of the course.

**Students with disabilities** Students with disabilities enrolled in this course who may need disability-related classroom accommodations are encouraged to make an appointment to see me before the end of the second week of the semester. All conversations will remain confidential. Please also arrange to have the required documentation sent to me for any accommodations *at least two weeks prior to the first exam*.

**Religious observances** Some students may wish to take part in religious observances that occur during this semester. If you have a religious observance that conflicts with your participation in the course, please meet with me *before the end of the second week of the semester* to discuss accommodations.

**Accommodations based upon sexual assault** The University is committed to offering reasonable academic accommodations to students who are victims of sexual assault. Students are eligible for accommodation regardless of whether they seek criminal or disciplinary action. Depending on the specific nature of the allegation, such measures may include but are not limited to: implementation of a no-contact order, course/classroom assignment changes, and other academic support services and accommodations. If you need to request such accommodations, please direct your request to Kim Webb (kim\_webb@wustl.edu), Director of the Relationship and Sexual Violence Prevention Center. Ms. Webb is a confidential resource; however, requests for accommodations will be shared with the appropriate University administration and faculty. The University will maintain as confidential any accommodations or protective measures provided to an individual student so long as it does not impair the ability to provide such measures.

If a student comes to me to discuss or disclose an instance of sexual assault, sex discrimination, sexual harassment, dating violence, domestic violence or stalking, or if I otherwise observe or become aware of such an allegation, I will keep the information as private as I can, but as a faculty member of Washington University, **I am required to immediately report it to my Department Chair or Dean or directly to the University's Title IX Coordinator**. If you would like to speak with the Title IX Coordinator directly, Ms. Jessica Kennedy can be reached at (314) 935-3118, jwkennedy@wustl.edu, or by visiting her office in the Women's Building. Additionally, you can report incidents or complaints to Tamara King, Associate Dean for Students and Director of Student Conduct, or by contacting WUPD at (314) 935-5555 or your local law enforcement agency.

You can also speak confidentially and learn more about available resources at the Relationship and Sexual Violence Prevention Center by calling (314) 935-8761.

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**Tentative Schedule** **NOTE:** Below is a tentative schedule of assignments. Please note that this is subject to change. Only assignments through 9/6 are firm at this point. There will be assigned readings/online tutorials before every class session.

Date	Topic	Reading	Assignments	Notes
8/28	Introduction	AF: Chapter 1 CB:		
	Class overview	Chapter 1		
8/30	NO CLASS			PS1 Distributed
	APSA			
	Conference			

Date	Topic	Reading	Assignments	Notes
8/31-9/1	Introduction to R	Monogan: Chapter 1 CB: Chapters 2-3		Lab
9/4	NO CLASS Labor Day			
9/6	Measurement Sampling Bias	AF: Chapter 2 CB: Chapters 4-6		
9/7-9	Plotting in R Opening data in R Subsetting in R	Monogan: Chapters 2-3 CB: Chapters 7-8		Lab
9/11	Descriptive statistics	AF: Chapter 3 CB: Chapters 10-11		
9/13	Basics of probability	AF Chapter 4 CB: Chapter 12	PS1 Due	PS2 Distributed
9/14-15	Describing data Data Types	Monogan Chapter 4 CB: Chapter 13		
9/18	Sampling distributions	AF: Chapter 5 CB: Chapters 14-15	IPA (In class)	<b>Bring laptops</b>
9/20	Working with probability distributions	CB: Chapters 16-18	IPA	
9/21-22	Working with data			
9/25	Confidence intervals describing a population	AF: Chapter 5 CB: Chapter 19		
9/27	Hypothesis testing intro	AF: Chapter 6 CB: Chapters 21 - 22	PS2 Due	PS3 Distributed
9/28-29	Confidence intervals in R	CB: Chapter 25		
10/2	Null hypothesis testing	AF: CHapter 6 CB: Chapters 23-24		
10/4	Poster discussion	CB: Chapter 26	PS3 Due	Midterm review distributed
10/5-6	Functions in R (NHP)			
10/9	Exam review			
10/11	Midterm			PS4 Distributed
10/16	NO CLASS Fall Break			
10/18	Causality	CB: Chapter 27-28 AF: Chapter 10		
10/19-20	Advanced plotting			
10/23	Experiments: Comparing means	CB: Chapter 29 AF: 7.1-7.3		

Date	Topic	Reading	Assignments	Notes
10/25	Experiments: Contingency tables	CB: Chapter 31 AF: 8.1-8.4	PS4 Due	PS5 Distributed
10/26-27	T-tests Tables	CB: Chapters 30, 32-33		
10/30	Regression and prediction	AF: 9.1-9.4 CB: Chapter 34		
11/1	Regression and inference	AF: 9.5 CB: Chapters 35-36		
11/2-3	Regression in R	CB: Chapters 37-39		
11/6	Multiple regression	AF: 11.1-11.2, 11.4 CB: Chapter 40-41		
11/8	Dummies and interactions	AF:11.5 CB: Chapter 42	PS5 Due	PS6 Distributed
11/9-10	Multiple regression			
11/13	Difference in differences	CB: Chapters 43-44		
11/15	Regression discontinuity	CB: Chapters 45-46	PS6 Due	PS7 Distributed
11/16-17	DID and RD			
11/20	Instrumental variables			
11/22	NO CLASS Thanksgiving			
11/27	Model fit			
11/29	Regression diagnostics		PS7 Due	PS8 Distributed
11/30-31	Diagnostics in R			
12/4	Slack/catch up			
12/6	Exam review		PS8 Due	
12/7-8	Poster presentations			
12/20	Final Exam 1:00-3:00pm			

### Poster rubric (40 points total)

Score	5	4	3	2
Introduction and theory	Precisely identifies null and alternative hypotheses and provides strong substantive and theoretical motivations for research project	Identifies null and alternative hypotheses and provides substantive and theoretical motivations for research project	Hypothesis described but null and/or alternative hypotheses not precisely or correctly specified; substantive and theoretical motivations incomplete or unconvincing	Theory incorrectly or vaguely stated; lacks appropriate substantive and/or theoretical motivation



Score	5	4	3	2
Methods	Specifies all important aspects of how study was conducted in detailed and replicable fashion; convincingly motivates and defends key choices in design process	Specifies most important aspects of how study was conducted in relatively clear manner; addresses possible concerns about key choices in design process	Specifies some important aspects of how study was conducted; methods not always well-explained; does not sufficiently address possible concerns about choices in design process.	Does not provide or clearly explain most important aspects of how study was conducted; lacks appropriate justification of key design choices
Results	Figures and tables illustrate findings in an intuitive and easy-to-understand way; text explains results precisely and without statistical errors; investigation of hypothesis thorough and detailed	Figures and tables illustrate findings reasonably clearly; textual explanations of results is clear; statistical approach largely correct and error-free	Figures and tables unappealing or poorly constructed; some imprecision or errors in textual discussion of results; hypotheses not thoroughly investigated	Figures and tables sloppy or hard to understand; text vague or incorrect; statistical errors in analysis; cursory investigation of hypotheses
Limitations and conclusions	Perceptive and detailed discussion of limitations of findings, potential explanations for those findings, substantive and theoretical conclusions, and possible future research	Clear and thoughtful discussion of limitations of findings, potential explanations for those findings, substantive and theoretical conclusions, and possible future research	Some useful discussion of limitations of findings, potential explanations for those findings, substantive and theoretical conclusions, and possible future research	Vague, incomplete, or unconvincing discussion of limitations, implications, and conclusions
Statistical analysis (poster)	Innovative use of statistical methods to answer research question; no errors in statistical analysis	Correct use of statistical methods to answer research question; no or few errors in statistical analysis	Potentially problematic use of statistical methods to answer research question; some errors in statistical analysis	Flawed use of statistical methods to answer research question; significant errors in statistical analysis
Statistical analysis (R script)	Duplicates poster findings exactly from original data; clear, descriptive, and precise comments; correct and error-free statistical analyses and use of R	Statistical analysis and R code are largely correct; comments relatively clear and descriptive	Some errors in statistical analysis or R code; failure to fully replicate poster or provide appropriate comments	Does not replicate poster; lacks comments; many statistical and/or R errors
Graphic design	Exceptionally attractive design and layout; free of formatting problems	Attractive design and layout; no or few formatting problems	Somewhat attractive poster; some formatting problems	Difficult-to-read or messy poster design; many formatting problems

Score 5	4	3	2
WritingExceptionally quality well-written—precise, clear, and mistake-free; concise and elegant	Very well-written—clear and articulate; few or no typos; not too long	Moderately well-written; some typos; wordy or vague	Unclear, awkward, or imprecise writing; numerous typos; too long and wordy or too short and vague\

### Peer evaluation form (end of semester)

**Name/team #/Poster Title:** Please assign scores that reflect how you really feel about the extent to which the other members of your team contributed to your learning and/or your team's performance. This will be your only opportunity to reward the members of your team who worked hard on your behalf. (Note: If you give everyone pretty much the same score, you will be hurting those who did the most and helping those who did the least.)

**Instructions:** In the space below, please rate each of the other members of your team. Each member's peer evaluation score will be the average of the points they receive from the other members of the team. To complete the evaluation you should: 1) List the name of each member of your team in the alphabetical order of their last names and, 2) assign an average of ten points to the other members of your team and, 3) differentiate some in your ratings; for example, you must give at least one score of 11 or higher (maximum = 15) and one score of 9 or lower.

Rank	Team member	Score
1		
2		
3		
4		

### Additional feedback

Please briefly describe the reasons for your highest and lowest ratings in the space below. These comments will be shared anonymously. Note: Your comments should be descriptive, not evaluative; as clear and specific as possible; phrased in constructive terms; and focused on areas in which the student has made especially valuable contributions or could improve in the future.

Reason(s) for your highest rating(s):

Reason(s) for your lowest rating(s):