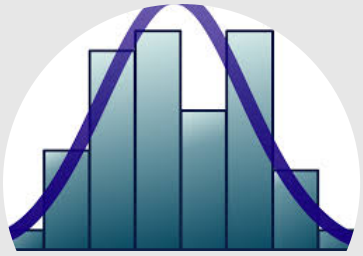

Introduction to Quantitative Methods in Political Science

GOVT 653

Instructor Info

Andrew R. Flores

W 5–7pm on Zoom or by appointment

Kerwin Hall 217

american.edu/spa/faculty/

aflores@american.edu

Course Info

T 5:30pm-8pm

Th 5:30pm-6:30pm

Kerwin Hall 101

Description

Application of techniques of bivariate analysis to measure of political behavior; emphasis on techniques relevant for political scientists and students of public administration.

AMERICAN UNIVERSITY
WASHINGTON, DC

Overview

This course is designed to get graduate students systematically trained and well equipped to work with and analyze quantitative data to answer central questions of political and social science; such as, how do we know what causes what? How confident can we be in the measurement of constructs? How certain can we be in the relationships among constructs? How do we assess and evaluate quantitative models that are applications of empirical theories? This course will teach students how to address these and other social science questions through the analysis of quantitative data. The course introduces basic principles of statistical inference and programming skills for data analysis. The goals of this course are twofold:

1. Provide a foundation to enable students to conduct their own data analyses for their own research
2. Have students become critical consumers of statistical claims in news reports, policy papers, and scientific papers

We will review statistical concepts in probability and hypothesis testing. We will discuss measurement and data visualization. We will then examine linear regression. Finally, we will learn the steps of data preprocessing to prepare for analysis.

Prerequisites: GOVT 650: Political Analysis

Materials

Required Text

Gelman, Andrew, Jennifer Hill, and Aki Vehtari. 2021. *Regression and Other Stories*. New York, NY: Cambridge University Press. ("ROS").
Available at: https://users.aalto.fi/ ave/ROS.pdf

Recommended Texts

Imai, Kosuke. 2017. *Quantitative Social Science: An Introduction*. Princeton, NJ: Princeton University Press. ("QSS").

Illowsky, Barbara and Susan Dean, et al. 2018. *Introductory Statistics*. Houston, TX: Rice University. Available online at: https://openstax.org/details/books/introductory-statistics

Other

Any additional assignments or readings will be provided on Canvas.

Statistical Software

R http://www.r-project.org/

RStudio http://www.rstudio.com/

Grading Scheme

25%	Research Paper	20%	Midterm Exam	20%	Final Exam
16%	Homework	9%	R programming	5%	Discussion Questions
5%	Poster Presentation				

"A" >93%; "A-" 90–93%; "B+" 87–89%; "B" 84–86%; "B-" 80–83%; "C+" 77–79%; "C" 74–76%; "C-" 70–73%; "D+" 60–69%"; "D" 55–59%; "F"' <55%.

Learning Objectives

- Identify, solve, and make decisions on problems based on relevant analytic skills.
- Apply in-depth quantitative analytics across policy areas.
- Communicate research findings following professional standards.
- Analyze and interpret quantitative data and the results from analyses of data.

Acknowledgments: Portions of this syllabus were drawn from Kosuke Imai's statistics syllabi.

Research Paper

Students will on their own complete an original, article-length research paper (25–35 pages double-spaced inclusive of references, tables, and figures). This research paper, under most circumstances, should be a revised version of the proposal you drafted in GOVT 650. Students will submit to me their proposal from GOVT 650 on the first week, so I can assist with identifying appropriate data sources. Under some circumstances, students may propose to do something different from their GOVT 650 proposal.

Student will find a dataset(s) or create their own that is relevant to their topic, analyze it, and report findings. The analyses should be appropriate to the research question. Papers should:

1. Identify a research question clearly
2. Provide a comprehensive literature review
3. Develop a theory & hypothesis or hypotheses
4. Describe the data chosen for analysis
5. Describe the analyses performed
6. Report the results from the analysis with appropriate use of tables and/or figures
7. Discuss how the results inform the research question, theory, & hypotheses
8. Describe limitations of the study and areas for future research

Under most (if not all) circumstances, these research papers are expected to contain at least one regression model. Research papers should appropriately format tables in MS Word, LaTeX, or similar word processing/typesetting program (i.e., do not copy/paste your R output).

A first draft of the research paper will be due on March 10, 2022 (before Spring Break). The first draft of the manuscript must contain all portions of the manuscript up to and including the description of the data chosen for analysis. This will count for 25% of the grade for the paper. Final drafts of the research papers are due on April 25, 2022, which should revise the first draft in addition to analyze the data, report results, and discuss the findings in relation to the research question, theory, & hypotheses. The final draft will count for 75% of the grade for the paper.

The research paper should use standard 12pt. serif font (e.g., Times New Roman), 8.5" x 11" paper, and have 1" margins on all sides. Manuscripts should follow the American Political Science Association citation style, American Psychological Association style, or Chicago Manuscript style (author-date). Do not use Chicago Manuscript footnote/endnote or Modern Language Association styles. Papers should be consistent in their citation style.

Examinations

Two exams will be fielded during the semester, consisting of multiple choice, short-answer questions, longer (essay) questions, and statistical problems to be solved in R. On the quantitative section of both exams, you will be expected to show all your work. If you do not show sufficient work to indicate how you arrive at your answer, you will not receive any credit for that question, even if you answer is mathematically "correct." Similarly, if you show your work but do not arrive at the right answer, you will receive partial credit.

Homework Assignments

There will be *five* problem sets during the semester. These will offer greater opportunity to conduct data analysis and learn concepts. *Collaboration is permitted on the programming aspects of these assignments.* All interpretations of output should be done individually (i.e., I do not want to read the exact sentences from multiple submissions).

These assignments will be graded for their:

1. Accuracy and correctness
2. Clarity of `R` code
3. Ability to explain key concepts

All assignments must be done in `RMarkdown`, and they should be submitted as .doc(x) format through Canvas. Problem sets include *both* programming and interpretation of output/results. Thus, you are evaluated on both, so be sure to completely answer the questions in problem sets - if you are asked to produce results *and* interpret results, I expect both `R` code and interpretation of output.

R Programming

I have setup a group on DataCamp Learn. You will need to create an account with your american.edu email address. We will cover this on the first day of classes. There are 18 assigned credit-hours worth 9% of your grade, and they should be completed *before* coming to lecture on the current topic, except for the first class meeting. Here is the assignment schedule:

Course Title	Points	Due date:
Introduction to `R`	2	Jan. 24
Intermediate `R`	3	Jan. 31
Introduction to Data Visualization with `ggplot2`	2	Mar. 7
Introduction to the Tidyverse	2	Mar. 21

Students may collaborate on these assignments. These will not be graded for accuracy but for successful completion. Students complete the assignments through the DataCamp website, and your completion will be automatically documented. Students should successfully complete all the programming assignments by March 21, 2022.

Note: DataCamp Learn has several lessons that you can access for free for a 6-month window because you are enrolled in this course. I can individually assign additional lessons to students who want to learn specific programming/analytics skills with `R` or other programming languages.

Discussion Questions & Participation

We will generally devote the first portion of our class sessions to a Q&A session on the material from readings, prior lectures, and DataCamp lessons to clarify your understanding of the topics for each week. To facilitate, you will each prepare *at least* two discussion questions for the next class. Questions will not need to be submitted unless I gather students have not prepared questions in advance. Students will also be asked to actively participate during the class to build their `R` skills and other key concepts from class.

Poster Presentation

In addition to the research paper, students will be required to present their research to the class at the end of the semester on the day of the final exam. As part of the presentation, students will potentially address questions from the instructor, other members of the Government faculty, and other students in class.

Quantitative Academic Support

You have additional support from American University when it comes to data and research software questions. The Math & Stats Program provides free mathematics and statistics support:

https://www.american.edu/provost/academic-access/mathstat.cfm

Statistical Consulting

You have additional support from the Library at American University for research design, statistical methods, and interpreting statistical output, among other services. Further information is available here:

https://www.american.edu/cas/mathstat/statistical-consulting.cfm

Library Resources

If you're not sure where to get started with your research papers, then there are useful subject guides developed by the AU Library. You can also e-mail Olivia Ivey (oivey@american.edu) to meet if you are having trouble with finding literature or data for additional assistance.

Graduate Assistant and Additional Office Hours

Dakota Strode (ds4090a@american.edu) is the Graduate Assistant for this course. He will hold weekly office hours to help you throughout the semester on Thursdays 5:30pm–6:30pm.

Academic Integrity Code

All students are required to follow the University's Academic Integrity Code. If you have not already done so, please familiarize yourself with the standards & requirements of the University's Academic Code of Conduct. Violations of the Code of Conduct will not be tolerated & will be reported appropriately. You can find more information about the University's Academic Integrity Code here: http://www.american.edu/academics/integrity/code.cfm

Misconduct

American University is an equal opportunity, affirmative action institution that operates in compliance with applicable laws and regulations. The University does not discriminate on the basis of race, color, national origin, religion, sex, pregnancy or parenting, age, sexual orientation, disability, marital status, personal appearance, gender identity and expression, family responsibilities, political affiliation, source of income, veteran status, an individual's genetic information or any other bases under applicable federal and local laws and regulations (collectively "Protected Bases") in its programs and activities. The University expressly prohibits any form of discriminatory harassment including sexual harassment, dating and domestic violence, rape, sexual assault, sexual exploitation and stalking.

If you experience any of the above, you have the option of filing a report with the: Assistant Vice President for Equity and Title IX Officer, Office of Equity and Title IX

Phone: 202-885-8080

For complaints and report for sexual misconduct, email: TitleIX@american.edu

For complaints and reports for other discrimination, email: equityoffice@american.edu

Please keep in mind that all faculty and staff — with the exception of counselors in the Counseling Center, staff in the Office of Advocacy Services for Interpersonal and Sexual Violence, medical providers in the Student Health Center, and ordained clergy in the Kay Spiritual Life Center — who are aware of or witness this conduct are required to report this information to the university, regardless of the location of the incident.

For more information, including a list of supportive resources on and off-campus, contact: Office of Advocacy Services for Interpersonal and Sexual Violence (OASIS), Health Promotion & Advocacy Center

Phone: 202-885-7070

Email: OASIS@american.edu

Accommodations

All effort will be offered to make this class accessible to all students. Though "reasonable accommodation" is the legal right of people with disabilities, this course is designed to be universally accessible for students regardless of disability or other individual categorization.

The Academic Support & Access Center supports the academic development & educational goals of all American University Students & is committed to providing access for individuals with disabilities within the university's diverse community.

Location: Mary Gradyon Center (MGC-243), x3360, Fax: x1042, M–Th: 9am-7pm & F: 9am-5pm,
https://www.american.edu/provost/academic-access/index.cfm

Emergency Preparedness

In an emergency, AU will implement a plan for meeting the needs of all members of the university community. Should the university be required to close for a period of time, we are committed to ensuring that all aspects of our educational programs will be delivered to our students. These may include altering & extending the duration of the traditional term schedule to complete essential instruction in the traditional format &/or use of distance instructional methods. Specific strategies will vary from class to class, depending on the format of the course & timing of the emergency. Faculty will communicate class-specific information to students via AU e-mail & Canvas, while students must inform their faculty immediately of any absence due to illness. Students are responsible for checking their AU e-mail regularly & keeping themselves informed of emergencies. In the event of a declared pandemic or other emergency, students should refer to the AU website (http://www.american.edu/emergency) & the AU information line x1100 for general university-wide information, as well as contract their faculty &/or respective dean's office for course & school/college-specific information.

COVID-19 Precautions

We will be following all the requirements that American University has established to have a safe semester. This includes vaccination, regular testing, face masks while indoors (if mandated), and quarantining if anyone shows COVID-19 symptoms. Students should take care of their physical and mental health throughout the semester. There are resources on campus, and I am happy to share further details as necessary. It is understandable that unexpected events may introduce additional burdens on students during this time. Please feel free to communicate with me if something does arise, and I will be as flexible as possible.

Sharing of Course Content

To supplement the classroom experience, lectures may be audio or video recorded by faculty and made available to students registered for this class. Faculty may record classroom lectures or discussions for pedagogical use, future student reference, or to meet the accommodation needs of students with a documented disability. These recordings are limited to personal use and may not be distributed, sold, or posted on social media outlets without written permission of the instructor.

Unauthorized downloading, file sharing, or distribution of any part of course materials, or using information for purposes other than student's own learning, may be deemed a violation of American University's Student Conduct Code and subject to disciplinary action (see Student Conduct Code VI. Prohibited Conduct).

Schedule

All readings and other assignments should be performed prior to coming to the lecture.

MODULE 1: Introduction to Quantitative Methods: A Review

Week 1

- Jan. 17 Course introduction, data, & measurement
  - Syllabus
  - ROS Ch. 1–2; Appendix A
  - Recommended: QSS Ch. 1, 2.1–2.4, 3.5–3.7
  - Recommended: Wickham, Hadley and Garrett Grolemund. "Data Visualization." In: *R for Data Science*. Sebastopol, CA: O'Reilly Media, Inc.
  - Recommended: Healy, Kieran. *Data Visualization*. Princeton, NJ: Princeton University Press
  - Watch Prediction by the Numbers (requires your AU login to access the video)
  - Homework 1 posted on Canvas

Week 2

- Jan. 24 Mathematics & probability
  - ROS Ch. 3–Ch.4.2
  - Recommended: QSS Ch. 6

Week 3

- Jan. 31 Statistical inference & simulation
  - ROS Ch. 4.3–5
  - Recommended: QSS Ch. 7

MODULE 2: Linear Regression

Week 4

- Feb. 7 Regression 1: Fitting Single Variable Models
  - ROS Ch. 6–7
  - Recommended: QSS 4.2
  - Due: Homework 1
  - Homework 2 posted on Canvas

Week 5

- Feb. 14 Regression 2: Fitting models & making predictions with Bayesian inference
  - ROS Ch. 8–9
  - Recommended: QSS 7.3

Week 6

- Feb. 21 Regression 3: Multiple regression
  - ROS Ch. 10
  - Recommended: QSS 4.3, 7.3

Week 7

- Feb. 28 Regression 4: Assumptions & diagnostics
  - ROS Ch. 11

Week 8

- Mar. 7 Regression 5 : Transformations & binary dependent variables
  - ROS Ch. 12
  - Due: Draft of Research Paper
  - Midterm Exam posted on Canvas

Week 9

- Mar. 14 No Class: Spring Break

MODULE 3: Data Wrangling & Preprocessing

Week 10

- Mar. 21 Welcome to the tidyverse
  - Wickham, Hadley and Garrett Grolemund. "Data Transformation." In: *R for Data Science.* Sabastopol, CA: O'Reilly Media, Inc.
  - Wickham, Hadley and Garrett Grolemund. "Tidy Data." In: *R for Data Science.* Sabastopol, CA: O'Reilly Media, Inc.
  - Easy conditional recoding in R with tidyverse.
  - Due: Homework 2 & Midterm Exam
  - Homework 3 posted on Canvas

MODULE 4: Causal Inference

Week 11

- Mar. 28 Randomized experiments & regression
  - ROS Ch. 18–19
  - Recommended: QSS 2.1–2.4, 4.3
  - Due: Homework 3
  - Homework 4 posted on Canvas

Week 12

- Apr. 4 Observational Studies 1: Assumptions, subclassification and propensity score
  - ROS Ch. 20
  - Recommended: QSS 2.5.2

Week 13

- Apr. 11 Observational Studies 2: Causal identification strategies
  - ROS Ch. 21
  - Recommended: QSS 2.5, 4.3.4

MODULE 5: Research Paper Workshop & Presentations

Week 14

- Apr. 18 Research paper workshop
  - Bring a draft of your paper along with your working data & analyses
  - Due: Homework 4
  - Homework 5 posted on Canvas

Week 15

- Apr. 25 Research paper presentations
  - Due Homework 5

Examinations Week

- May 4
  - Final exam posted to Canvas, due by the end of examinations week
  - Due: Research Papers