GOVT 300-002: Research Methods and Analysis (DRAFT)

Spring 2019
Tuesdays 4:30-7:10 PM

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Office Hours: W 1:30PM-3:00PM, F 11:30AM-1:00PM

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Office Hours: TBA

Students are required to enroll in one of the lab sections:
• Section 204, Fridays 10:30-11:20 AM
• Section 206, Wednesdays 4:30-5:20 PM

Course Description

This course provides an introduction to research methods in social science, with a focus on government, politics, and policy. The course is designed to teach students how to address questions about these topics by introducing them to the basic principles of statistical inference and causal reasoning as well as programming skills for data analysis using the R statistical software. The goal of the course is to provide students with foundational skills to manipulate and describe data, analyze it in their own research, and to become informed consumers of statistical findings and claims produced by others.

Course Objectives

1. Knowledge and understanding
   • Students should be able to read and understand journal articles that involve basic statistical analyses.
   • Students should be able to critically assess social scientific and policy arguments, comments, reports and other materials that use statistical analysis.
   • Where relevant, students should be able to make social scientific generalizations and policy remarks and draw implications/conclusions based on the findings of various
studies that apply statistical techniques.

2. Develop quantitative skills
   • Students should be able to conduct basic statistical analyses to analyze various social scientific and policy issues.
   • Students should be able to properly interpret the outputs of various statistical analyses covered in this course.
   • Students should acquire basic programming skills necessary to conduct basic statistical analysis in the R language.
   • Students should understand the importance of producing reproducible research.

3. Professional development and leadership
   • Students should learn to work effectively in a team setting through lab sessions and homework assignments.
   • Students should learn how to seek assistance when needed and communicate effectively with classmates and instructors.
   • Students should learn how to deliver assignments and outputs in a timely fashion.

Textbook

We will use the following textbook to guide the course:

  • Denoted QSS below.

Software

We will use the statistical software R to manipulate and analyze data. Learning R can be difficult, but a variety of resources will be available to help on this task. We will also use RStudio, which is a user interface that makes R more friendly to operate. Fortunately, R and RStudio are open-source (free!):

• **R**: [https://www.r-project.org](https://www.r-project.org)
  • Free, open source statistical programming language. You can download R from CRAN (“Comprehensive R Archive Network”) using any mirror you choose.

• **RStudio**: [https://www.rstudio.com](https://www.rstudio.com)
  • A user interface that makes R friendlier to use. Please note that you need to install R, in addition to RStudio (in fact, install R first).

• **Swirl**: [http://swirlstats.com](http://swirlstats.com)
  • This is a package you can use in R to learn how to use R. Using Swirl you can learn commands and syntax that will help complete your assignments.
- **Swirl QSS**
  - This is a package you can use in **R** that follows the chapters in the textbook. Using the QSS-Swirl package, you can review and learn **R** straight from the book.

- **Slack**: https://slack.com
  - Slack is a tool for collaboration and communication. For this class, it’s a place to interact outside of our normal meeting time and with students in other lab sections. We’ll also use it for in-class interactive activities.
  - At your earliest convenience, join our class’s Slack domain at http://govt300-spring2019.slack.com - I recommend also installing the Slack app on your phone and/or other computational devices.

**Resources**

- **R for Data Science.** Wickham, Hadley, and Garrett Grolemund. 2017. O’Reilly. [http://r4ds.had.co.nz/](http://r4ds.had.co.nz/)
  - Free on-line textbook that is very helpful for learning **R**, looking up commands, and getting advice. Please use it as a reference.

- **R Bloggers.** [https://www.r-bloggers.com/](https://www.r-bloggers.com/)
  - Contains a wealth of resources and cool example code.

- **StackOverflow.** [https://stackoverflow.com/questions/tagged/r](https://stackoverflow.com/questions/tagged/r)
  - A forum where people post questions (about **R** and other programming applications) and other users will answer them. Search their archives to find help with all sorts of puzzles.

**Course Requirements & Evaluation**

The final grade in this course is a combination of several requirements. Final grades are on a non-curved A-F scale:

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• **Information Technology Ethics Module (5%)** This course fulfills a university requirement in the responsible use of technology and information. Successful completion of all the self-directed online modules (on Blackboard) is required. Failure to do so will result in an **F grade** being assigned. The modules will be made available through the course on Blackboard and must be completed by midnight of Sunday LAST WEEK OF CLASS, 2019. The modules involve reading through and studying online materials and taking tests online, which can be completed multiple times.

• **Participation in Lab/Lecture (5%)** Participation points will be awarded to students in the classroom and lab sections on the basis of participation in classroom discussions.

• **Homeworks (20%)** There will be 6 homeworks that will be distributed, collected, and evaluated by the teaching assistant. They will combine both programming activities to be submitted electronically and/or hand-written assignments. Students can discuss and collaborate with other students in the course for these homeworks. If there is collaboration, each student must submit their own homework, which must include a list of students with whom they collaborated.
  - Only 5 of the 6 assignments will be considered for the final grade. The assignment with the lowest grade will be excluded.
  - There will also be Swirl exercises to learn and practice **R** programming. These are non-graded, but recommended.

• **Midterm Exam (20%)** There will be a take home midterm examination that will be due in class on SOME DATE WEEK 8. **No collaboration is allowed on the midterm exam.** Students will sign an honor code statement indicating that all work is their own.

• **Final Exam (25%)** There will be an in-class final exam. The exam will cover all the material from class. The exam will be closed book/OPEN notes (no electronics!). The exam date is EXAM DATE, 2019.

• **Research Paper (25%)** All students are required to write a short research paper on a topic of their choosing. The research paper may be solo or in groups of up to 3 students. The goal of the project is to demonstrate your ability to apply the knowledge from the course and carefully test an applied research question of your interest. It is strongly recommended that you turn in portions of the paper at the suggested dates before the end of the semester so you can get feedback on your progress and make appropriate modifications, if necessary. Each paper should include:
  - An introduction that sets up the research question.
  - A review of the literature (a brief 2-page summary of research that examines how others have examined similar research questions).
  - A section that discusses your hypotheses and the techniques you will use to test them.
  - An analysis section .
  - A brief conclusion or discussion.
Late Work & Make Ups

- **Late Work**: Assignments can be submitted past their due date. However, there is a penalty of 5 percentage points for every 24-hour period that the assignment is late. Late work longer than a week will receive no points.
- **Make-Up Exams**: There are no make-up exams, except in case of verified emergency or illness. Students who are late for an exam may sit for the exam as long as no other student has already submitted theirs.
- **Assignment Re-dos**: Students who receive a 72 or lower may re-do assignments for a new grade. The new grade will be capped at 72. Re-dos must be turned in a week after the assignments were returned (regardless of student attendance that day). Assignments that were originally late are not eligible for re-do. Late re-do assignments are not allowed.

Schedule

1. **Introduction**

   **Week 1 - 1/22 (Labs on 1/23 and 1/25)**
   - Topics: Course Intro and R
   - Reading: Chapter 1 of QSS
   - Assignment: NULL
   - Lab: Workflow, installation, getting started
   - Practice: Swirl R-Programming 1-3; QSS Intro I & II

2. **Causality**

   **Week 2 - 1/29 (Labs on 1/30 and 2/1)**
   - Topics: Randomized Experiments
   - Reading: Chapter 2 (sections 2.1-2.4) of QSS
   - Assignment: HW1 handed out in lab
   - Lab: Data types, subsetting/filtering, functions
   - Practice: Swirl R-Programming 4-6; QSS Causality I

   **Week 3 - 2/5 (Labs on 2/6 and 2/8)**
   - Topics: Observational Studies
   - Reading: Chapter 2 (Sections 2.5-2.7) of QSS
   - Assignment: **HW 1 due in lab**
     - HW2 handed out in lab
Lab: Summary statistics
Practice: Swirl QSS Causality II

3. Measurement

Week 4 - 2/12 (Labs on 2/13 and 2/15)
- Topics: Survey Sampling
- Reading: Chapter 3 (sections 3.1-3.4) of QSS
- Assignment: HW 2 due in lab
- Lab: Visualization
- Practice: Swirl QSS Measurement I

Week 5 - 2/19 (Labs on 2/20 and 2/22)
- Topics: Correlation/Research Ethics
- Reading: Chapter 3 (sections 3.5-3.7) of QSS
- Assignment: Complete Blackboard modules on IT ethics (if you haven’t already)
- Lab: Correlation, clustering, new object types
- Practice: Swirl R-Programming 7-8; QSS Measurement II

4. Prediction

Week 6 - 2/26 (Labs on 2/27 and 3/1)
- Topics: Prediction and Classification
- Reading: Chapter 4 (sections 4.1-4.2) of QSS
- Assignment: HW3 handed out in lab
- Lab: More functions and loops
- Practice: Swirl R-Programming 9-11; QSS Prediction I & II

Week 7 - 3/5 (Labs on 3/6 and 3/8)
- Topics: Linear Regression
- Reading: Chapter 4 (section 4.3) of QSS
- Assignment: HW 3 due in lab
  - Take home midterm available in lecture, due Friday 3/8
- Lab: Regression
  - Practice: Swirl QSS Prediction III

**Week 8 - SPRING BREAK**

- **No class, No labs**

**5. Probability**

**Week 9 - 3/19 (Labs on 3/20 and 3/22)**
- Topics: Probability I
- Reading: Chapter 6 (sections 6.1-6.2) of QSS [OR, ALTERNATIVE]
- Assignment: HW4 handed out in lab
- Lab: Simulations and conditional probability
- Practice: Swirl R-Programming 13; QSS Probability I

**Week 10 - 3/26 (Labs on 3/27 and 3/29)**
- Topics: Probability II (random variables and probability distributions)
- Reading: Chapter 6 (sections 6.3-6.5) of QSS [OR, ALTERNATIVE]
- Assignment: HW 4 due in lab
- Lab: Simulations, Monte Carlo, and more visualization
- Practice: Swirl R-Programming 12 & 15; QSS Probability II

**6. Uncertainty**

**Week 11 - 4/2 (Labs on 4/3 and 4/5)**
- Topics: Bias, Consistency, and Uncertainty
- Reading: Chapter 7 (section 7.1) of QSS [OR, ALTERNATIVE]
- Assignment: HW5 handed out in lab
- Lab: Standard errors, confidence intervals
- Practice: Swirl QSS Uncertainty I

**Week 12 - 4/9 (Labs on 4/10 and 4/12)**
- Topics: Hypothesis Testing
- Reading: Chapter 7 (section 7.2) of QSS [OR, ALTERNATIVE]
- Assignment: HW 5 due in lab
  - HW6 handed out in lab
- Lab: hypothesis testing, reproducible tables using stargazer
- Practice: Swirl QSS Uncertainty II
Week 13 - 4/16 (Labs on 4/17 and 4/19)
- Topics: Regression and Uncertainty
- Reading: Chapter 7 (section 7.3) of QSS [OR, ALTERNATIVE]
- Assignment: HW 6 due in lab
- Lab: regression, reproducible tables using stargazer
- Practice: Swirl QSS Uncertainty III

7. Next

Week 14 - 4/30 (Labs on 5/1 and 5/3)
- Topics: “Dummy” Dependent Variables
- Reading: Chapter 12 of Bailey’s Real Stats book [posted to Blackboard]
- Assignment: NULL
- Lab: MLE in R
- Practice: Download replication data from a recent political science paper and try to get the results found in the paper

Final Exam
- TBA - Exam week is May 13-17

Policies

Academic Integrity. The integrity of the University community is affected by the individual choices made by each of us. Mason has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that: (1) all work submitted be your own, unless explicit collaboration has been allowed; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using MLA or APA format. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.
- **Students with Disabilities.** If you have a disability for which you are or may be requesting an accommodation, please let me know and contact the Disability Services (https://ds.gmu.edu).

- **Notice of mandatory reporting of sexual assault, interpersonal violence, and stalking.** As a faculty member, I am designated as a Responsible Employee, and must report all disclosures of sexual assault, interpersonal violence, and stalking to Masons Title IX Coordinator per University Policy 1412. You may seek assistance from Masons Title IX Coordinator, Jennifer Hammat, by calling 703-993-8730 or email cde@gmu.edu. If you wish to speak with someone confidentially, please contact one of Masons confidential resources, such as Student Support and Advocacy Center (SSAC) at 703-993-3686 or Counseling and Psychology Services (CAPS) at 703-993-2380. The 24-hour Sexual and Intimate Partner Violence Crisis Line for Mason is 703-380-1434.

- **Students must use their MasonLive email account to receive important University information, including communications related to this class.** I encourage using your Mason email to sign up for our Slack channel and prefer substantive course communications through direct messages using that channel. For more sensitive issues, you can of course contact me through my Mason email address.