POL419H1S: Quantitative Methods and Data Analysis

University of Toronto
Winter 2020

Meeting Room:	SS 561
Meeting Time:	Wednesday, 12:00pm-2:00pm
Instructor:	Kenichi Ariga
Email:	kenichi.ariga@utoronto.ca
Office:	SS 3047
Office Hours:	Wednesday, 2:30pm-4:30pm

Overview

This is an advanced-level seminar on quantitative empirical research methods for political science for those who have taken the POL 222-232 sequence, or equivalent, and have basic understanding of statistical inference and linear regression model.

The primary goals of this class are:
1. To learn the basics of *statistical computing* using R, a freely available, increasingly popular statistical software (http://www.r-project.org); and
2. To understand the theoretical foundations, various methods, and applications for *causal inference* in political science research.

Part 1. Statistical Computing

Quantitative political science research requires the use of computers. In the past three decades, the development of affordable yet very powerful personal computers has revolutionized the use of statistical analyses in political science. Various statistical models have been developed and made readily available for researchers. The number of political scientists who have been trained for applying those models has increased, and the volume of applied empirical work using quantitative data and methods has skyrocketed. One of the key driving forces behind these advancements is the wide adaptation of statistical software among political scientists.

In this class, you will learn the basics of how to use R to conduct statistical analyses in political science research. Being designed as a political science course rather than a computer programming course, the class will place emphasis on using the program, applying models, and interpreting results rather than on learning how to program. By the end of the semester, you are expected to be able to conduct a basic quantitative empirical analysis using R on your own.

Part 2. Causal Inference in Political Science Research

Those who have taken courses on statistical inference and regression must have heard a mantra that goes "correlation is not causation." It correctly describes the fact that statistically and substantively significant coefficients in a linear regression model do not necessarily imply a causal relationship of the variables in question. Quantitative empirical evidence in political

science research — many of which has been based on observational data — is to be carefully interpreted with this fact in mind.

Recent development in quantitative empirical analysis on social science research, however, has shifted its attention to the question of when our analysis can provide empirical support to a causal claim. Based on the counterfactual framework, also called the potential outcomes model, specific conditions under which statistical analysis can provide causal inference have been identified. Moreover, many researchers have also begun to adopt various "design-based" researches — experiments and natural experiments — in which they try to identify a causal relationship mainly from how to design empirical research rather than from how to statistically adjust observed data.

The second part of this class will review these recent attempts of causal inference in political science research. It will be a reading seminar on the recent applications in political science research of major research designs and methods for causal inference, such as laboratory experiments, field experiments, survey experiments, matching, natural experiments, instrumental variable analysis, and regression discontinuity design. Students are expected to learn the basic theoretical framework of causal inference and various research designs applied in the current political science research.

Required Textbook for Part 2

> Thad Dunning. 2012. *Natural Experiments in the Social Sciences: A Design-Based Approach.* Cambridge: Cambridge University Press.

The above textbook is available online from the University of Toronto's library (the link may be found in the Library Course Reserves at the class Quercus site).

Quercus

Quercus (https://q.utoronto.ca/) is the primary means through which class announcements and assignments will be distributed. Readings will be made available on the class Quercus site as well. Discussion Board on the class Quercus site will be the primary medium by which you will ask simple questions about the course materials and get them addressed (more on this below). It will be your responsibility to obtain access to Quercus and regularly check it. There will be an important update to the class Quercus site at least once a week.

Discussion Board

We will use the Discussion Board in the class Quercus site as the main medium through which you can ask questions regarding class material and get them addressed. Given the nature of the course material, other students may have the same question as yours and they would benefit from your posting the question and getting them addressed on the Discussion Board.

You are also encouraged to post an answer to the questions posted by your classmates so that we can maintain a mutually-supporting learning community from which all of you will benefit. As specified below, your response to your classmate's questions on the Discussion Board will be reflected on your class participation mark.

The instructor will regularly check the Discussion Board and address questions which have not been adequately addressed by peers. For more complex questions or those that would require an extensive treatment, you are best advised to visit the office hours.

Course Requirements

Your grade will be determined by the following components:

1. R Tutorials & Exercises (Part 1):   15%

    R Tutorials: 5%
    R Exercises: 10%

In the first part of the class, a series of self-study R tutorials will be assigned every week. R tutorials assigned in that week are due by the beginning of the next lecture. When you complete R tutorials for that week, you should report it through the class Quercus site. R tutorials will be graded on a pass/fail basis. If you complete R tutorials before the next lecture, you will be given a pass — you will receive a full credit for this week's tutorials. If you don't complete them before the next lecture, you will be given a fail and no credit.

During each week's lecture in the first part, you will work on R exercises based on these tutorials. You are required to complete and submit these exercises by the end of that lecture. R exercises will also be graded on a pass/fail basis. You should show the results of your R exercise to the instructor at the end of the lecture. If you complete the exercise by the end of the lecture, you will be given a full credit for this exercise. If you only partially complete the exercise, then you will be given a marginal pass and half the credit for that exercise. An example R script for each exercise will be posted on the class Quercus site after each week's lecture.

2. Quantitative Empirical Research Paper (Part 1)

    Initial Submission: 40%   Due Friday, Feb. 28th, 11:59pm
    Revise & Resubmit: 15%   Due Friday, Apr. 3rd, 11:59pm

By the end of the semester, you will write an empirical research paper based on a linear regression analysis using R and a dataset of your choice, which addresses the causal theory of your interest.

You are required to complete and submit your paper by Friday, Feb. 28th. Then, based on the instructor's comments and suggestions, you will revise your paper and resubmit it by Friday, April 3rd. The initial submission counts toward 40% of your final mark and the revision 15%.

3. Seminar Presentation (Part 2):   15%

In the second part of the class, we will have reading seminars. Each week, we will read and discuss several articles published in leading political science journals. For each article, one

student will play the role of an author, make a presentation on the main findings of the article, and participate in the discussion from the author's perspective. Another student will play a role of a discussant and make a presentation to offer constructive critiques to the article and raise important discussion questions. You will be assigned to either role at least once (the exact number of occasions will be decided and adjusted based on the number of students taking the class).

4. Critiques and Discussion Questions on the Assigned Readings (Part 2): 5%

For the reading seminar in the second part of the class, you are required to post a short paragraph of critiques and discussion questions to each of the assigned readings of the week on the Discussions Board of the class Quercus site before Monday, 11:59pm. The post will be used as a reference for our in-class discussions.

Critiques and discussion questions to each article will be graded on a pass/fail basis. If you post them for all articles assigned in that week by their due (Monday, 11:59pm), you will be given a pass (a full credit). If you post them for part of the articles assigned in that week by their due, you will be given half the credit. If you don't post them by their due, you will be given a fail (no credit).

5. Class Participation (both Part 1 and 2): 10%

Your class participation marks will be determined by the following items.

a. Engagement in class lab sessions and seminar discussions (i.e., regularly attend the class, actively raise questions, participate in class discussions, help your classmates during lab sessions) and how often and well you responded to your classmates' questions on the Discussions section on Quercus: 9%

c. Participation in an online feedback survey on the class through the class Quercus site at the end of the semester: 1%

Group Work and Collaboration

Group work and collaboration is encouraged in this class. Given somewhat technical nature of the class materials, it is essential to have an opportunity to discuss with your classmates the concepts and methods you learn in class and how to apply them. Everyone has different strengths and weaknesses in their understanding of materials and learning style. Through working together, you are expected to facilitate learning for each other and deepen your understanding of the materials, which would be difficult if you worked alone.

Collaboration in a team is encouraged in this class so much so that the submission by a team of two or three students is allowed for an empirical research paper assignment. If you submit your assignment as a group, everyone in the group will receive the same mark for that assignment.

Collaboration in a team of multiple scholars is a norm for contemporary social science research in general, and quantitative empirical political science research in particular. As a

course on the methods of such research, this class will provide you with an opportunity to practice scholarly collaboration by allowing the group submission of the empirical research paper assignment.

Note that a group submission is voluntary. There will be neither credit nor penalty for submitting your empirical research paper assignment in a group or individually. The instructor cannot help you organize your group or resolve any conflicts related to the group work. Conflicts or difficulties in coordinating the group work will not be considered as an acceptable reason to request an extension or a waiver of late penalty. It is your responsibility to coordinate all group work appropriately and submit your empirical research paper assignment in time.

If you choose to submit the empirical research paper in a group, then you need to do so for both initial submission and revision.

Turnitin

Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site.

Students who wish to not use Turnitin.com may make an alternative arrangement. If you want to make an alternative arrangement, you need to send an email to the instructor at least one week before the deadline of the assignment and ask for an alternative way to submit the paper. If you choose an alternative arrangement, you will be required, for example, to save every version/draft of your essay electronically and submit all of them at the time you submit the essay, and to hand in all notes, outlines, and bibliographic research at the same time.

Late Penalties and Extension

All work is late if submitted after the date and time specified as due. To ensure fairness, the late-penalty policy specified below will be strictly enforced. Conflict with other class's assignment/exam schedule, leaving for a non-academic trip, or vacation is not an acceptable reason to miss the assignments or request an extension.

➢ Empirical Research Paper Assignment

Extension for the empirical research paper assignment may be made only when there is a legitimate reason, such as an unforeseeable medical emergency, an accessibility issue, religious observances, and a family emergency, and there is an acceptable official documentation, which verifies the specific reason given, such as the UofT Verification of Student Illness or Injury form, the Accessibility Services Letter, and the College Registrar's Letter.

Students who know in advance they will need an extension for a legitimate reason should contact the instructor as early as possible before the deadline. Those who missed the

deadline for a legitimate, unforeseeable reason should contact the instructor as soon as possible and no later than one week after returning to class.

Empirical research paper assignments handed in late will result in a penalty of 2-percentage-point reduction per day (e.g., from 72% to 70%). Submitting the assignments within 24 hours from the due date and time will be considered one day late; submitting after 24 hours but before 48 hours will be two days late, and so forth.

Since the Turnitin submission on Quercus is used to submit the empirical research paper assignment, your submission must be accepted by Turnitin on Quercus before the due date and time. Note that the date and time recorded on Quercus will be your submission date and time. If this is after the deadline even only by one minute, then your submission will be considered late. In other words, completing your paper and start uploading it to the Turnitin submission link on Quercus before the due date and time is not enough. Your upload must be complete before the due date and time.

Computer-related problems, such as the crash of your computer, a slow Internet connection, and an occasional slow response of the server, will not be considered as an acceptable reason to request for extension or waiver of a late penalty. Also sending your assignment to the instructor via email will not be considered as a submission. For these reasons, I strongly suggest you avoid a last-minute completion or submission of assignments. I also suggest you frequently take a backup of the electronic files of your draft paper in an electronic storage other than your computer.[1] If you have a UTmail+ account, you have access to 1TB of storage in your OneDrive at the UofT (see https://email.utoronto.ca/students/ for details). You may take a backup in your OneDrive.

➢ Other Requirements

There will be no extension for other requirements, such as R tutorials, R exercises during lectures, and the post of discussion questions and critiques on the assigned articles. Instead, if you miss these requirements for a legitimate reason, you will be given a waiver for them. An official documentation to verify the specific reason given, such as the UofT Verification of Student Illness or Injury form, the Accessibility Services Letter, and the College Registrar's Letter, will be required for this waiver.

Grade Appeals

Grade appeals must be received within two weeks from when the grade is assigned. When you appeal your grade, you are required to submit a brief documentation substantiating why you believe the grade is not appropriate.

---

[1] For example, you may use a free cloud storage space, such as DropBox, Google Drive, iCloud, and OneDrive. Or you may send your draft to your UofT email address so that your draft file will be stored in your mailbox of the UofT server.

Office Hours

You are welcome to visit during the instructor's office hours, which will be held during the time and date specified at the beginning of the syllabus, if you have any questions on the class material.

Email Policy

If you have questions of personal nature (e.g., accessibility, deadline extension for legitimate reasons), you may email the instructor and expect a response within two working days. Please start the subject heading of your email with "POL419:..." I will not respond to, however, any questions over email that are of substantive nature concerning the class material. You will need to post those questions on the Discussion Board of the class Quercus site or visit office hours.

Please note that I will not be able to answer emails or questions on the Discussion Board during weekends.

In the case of your questions of substantive nature on the Discussion Board or those of personal nature over email not answered within two working days (excluding weekends), send me an email to let me know they have not been addressed. Please include "POL419: Unanswered Question" in the subject heading of your email.

Accessibility

The University of Toronto is committed to accessibility. If you require accommodation for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact Accessibility Services at www.accessibility.utoronto.ca, accessibility.services@utoronto.ca, or (416) 978-8060 as soon as possible.

Academic Integrity

Academic integrity is fundamental to learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the U of T degree that you earn will be valued as a true indication of your individual academic achievement, and will continue to receive the respect and recognition it deserves.

You are expected to be familiar with the Code of Behaviour on Academic Matters, available at https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity, which is the rule book for academic behaviour at the U of T. Another website (https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity/academic-misconduct) lists nine categories of academic offences defined in the Code. Potential offences include, but are not limited to, plagiarism, cheating on tests and exams, misuse of iClickers (e.g., using someone else's iClicker during lectures to earn a participation credit for that student), fraudulent medical documentation and improper collaboration on marked work.

For specific examples of the potential academic offences, please read *The Scope of Academic Integrity* (https://www.academicintegrity.utoronto.ca/perils-and-pitfalls/). Please note that, in general, not knowing the University's expectations cannot be an excuse. Under the Code, "the offense shall likewise be deemed to have been committed if the person ought reasonably to have known" (*Code of Behaviour on Academic Matters*, web version, p.2).

For further information on plagiarism, visit the pages available from the links listed at http://advice.writing.utoronto.ca/using-sources/. This list is part of *the Advice on Academic Writing* at the University of Toronto (http://advice.writing.utoronto.ca/). You may also find other resources available on this website helpful.

The University of Toronto treats cases of academic misconduct very seriously. All suspected cases of academic dishonesty will be examined following the procedures outlined in the Code. The consequences for academic misconduct can be severe, including a failure in the course and a notation on your transcript. If you have any questions about what is or is not permitted in this course, do not hesitate to contact the instructor. SEP

Class Schedule
The class schedule may be adjusted according to the actual progress of the class. In addition, some assigned readings may be replaced by others, and there may be additional readings.

Week 1 (Jan. 8) Introduction

Part 1. Statistical Computing

Week 2 (Jan. 15)
　　Lecture & R Session: Descriptive Statistics and Visualization for Single Variable

Week 3 (Jan. 22)
　　Lecture & R Session: Linear Regression As Descriptive Tool

Week 4 (Jan. 29)
　　Lecture: Statistical Inference
　　R Session: Edit Dataset

Week 5 (Feb. 5)
　　Lecture & R Session: More Topics on Linear Regression

Week 6 (Feb. 12)
　　R Session: Basic Theoretical Framework for Causal Inference
　　R Session: Monte Carlo Simulation

No Class (Feb. 19) --- Reading Week

Week 7. (Feb. 26)
    Empirical Research Paper Consultation

Empirical Research Paper, Initial Submission, Due 11:59pm, Feb. 28 (Fri.).

Part 2. Causal Inference in Political Science Research

Week 8. (Mar. 4) Reading Seminar 1

Laboratory Experiment
Fridkin, Kim L., Patrick J. Kenney, Sarah Allen Gershon, Karen Shafer, and Gina Serignese Weedall C. 2007. "Capturing the Power of a Campaign Event: The 2004 Presidential Debate in Tempe." *Journal of Politics* 69(3).

Field Experiment
Butler, Daniel M. and Hans J.G. Hassell. 2018. "On the Limits of Officials' Ability to Change Citizens' Priorities." *American Political Science Review* 112 (4).

Week 9. (Mar. 11) Reading Seminar 2

Survey Experiment
Barber, Michael, and Jeremy C. Pope. 2019. "Does Party Trump Ideology? Disentangling Party and Ideology in America." *American Political Science Review* 113 (1).

Matching
Boyd, Christina L., Lee Epstein, and Andrew D. Martin. 2010. "Untangling Causal Effects of Sex on Judging." *American Journal of Political Science* 54(2).

Week 10. (Mar. 18) Reading Seminar 3

Standard Natural Experiment with True Randomization
Peter John Loewen, Royce Koop, Jaime Settle, and James H. Fowler. 2014. "A Natural Experiment in Proposal Power and Electoral Success." *American Journal of Political Science* 58(1).

Standard Natural Experiment with As-If Randomization
Posner, Daniel N. 2004. "The Political Salience of Cultural Difference: Why Chewas and Tumbukas are Allies in Zambia and Adversaries in Malawi." *American Political Science Review* 98 (4).

Week 11. (Mar. 25) Reading Seminar 4

Instrumental Variable
Ansolabehere, Stephen and James M. Snyder, Jr. 2004. "Using Term Limits to Estimate Incumbency Advantages When Officeholders Retire Strategically." *Legislative Studies Quarterly* 29 (4).

Regression Discontinuity

Klasnja, Marko. 2015. "Corruption and the Incumbency Disadvantage: Theory and Evidence" *Journal of Politics* 77 (4).

Week 12. (Apr. 1) Reading Seminar 5

Difference-in-Difference

Fukumoto, Kentaro, and Yusaku Horiuchi. 2011. "Making Outsiders' Votes Count: Detecting Electoral Fraud through a Natural Experiment." *American Political Science Review* 105 (3).

Sensitivity Analysis

Nyhan, Brendan, Christopher Skovron, Rocio Titiunik. 2017. "Differential Registration Bias in Voter File Data: A Sensitivity Analysis Approach." *American Journal of Political Science* 61 (3).

Empirical Research Paper, Revise & Resubmit, Due 11:59pm, Apr. 3 (Fri.).

Syllabus Change Policy ⌞SEP⌟

The policies and contents of this syllabus may be changed by the instructor with advanced notice. If any, such a change will be announced during lectures.