

SOCI 504: Quantitative Analysis I

Fall 2023

Seminar: Fridays 12:35 p.m.-2:25 p.m.
Leacock 212

Professor: Shelley Clark (she/her)
(email: shelley.clark@mcgill.ca)
Office hours: Wednesdays 1:30 p.m. to 3:30 p.m.
<https://calendly.com/shelley-d-clark/office-hours>

T. A.: Khandys Agnant
(email: khandys.agnant@mail.mcgill.ca)
Office hour: Thursdays 10:00 a.m. to 12:00 p.m.

Course Content

This course provides an introduction to regression analysis. The course will begin by examining assumptions underlying regression analyses, options for building multivariate regression models, and the proper interpretation of regression results. It will then explore the consequences when these assumptions are violated. Lastly, we will provide a (somewhat cursory) overview of some of the most common methods used in sociology including logistic regression, categorical dependent variables, and fixed effects with panel data. The emphasis of this course will be on a conceptual understanding of these issues, with mathematical and technical explanations provided to aid your understanding.

Mode of Instruction

Classes will be held in person unless otherwise directed by McGill University. Students are strongly encouraged to attend class lectures and to participate by both responding to and asking questions. Learning statistics is a dynamic, not passive, process.

Office Hours

Please schedule your office hours with me via <https://calendly.com/shelley-d-clark/office-hours>. I am happy to meet in person or via Zoom <https://mcgill.zoom.us/j/2709990709>, simply indicate your preference on calendly. If you wish to meet as a group or require more time, you are welcome to schedule more than one 15 minute time slot consecutively.

Reading Materials

Required: James Stock and Mark Watson, *Introduction to Econometrics*, 2019. Fourth Edition. Addison-Wesley Series, Pearson

Textbooks are available at the McGill Bookstore. An E-Textbook can be purchased online at Amazon or rented at VitalSource <https://www.vitalsource.com/products/introduction-to-econometrics-james-h-stock-mark-w-watson-v9780134448046>

Assignments, Exams and Grading

There will be five problem sets, several of which will require the use of a statistical package. You may, indeed are encouraged to, work with classmates on the problems sets, but you must turn in your own answers and your own code. You will find that you learn very little from this class if you simply copy your classmate's answers or run his/her do_files.

Grades will be determined as follows:

Participation	5%	
Problem sets (5)	50%	
Project selection checklist	5%	Due September 22
Project verification analysis	10%	Due October 20
Project robustness analysis	10%	Due November 17
Final project	20%	Due December 1

Problem sets and projects must be turned in by the beginning of the class time on each day they are due. Late problem sets will not be accepted without a medical excuse or genuine emergency. You are responsible for downloading and uploading the homework assignments from MyCourses. For questions about your homework or project assignments you should attend your TA's or professor's office hours. General questions may be posted to MyCourses Discussion Boards. We will not respond to individual emails about the homework or projects as most statistic questions are not well suited to discussion by email.

Statistical Programs

This course will be taught using Stata. If you are new to regression analyses, I highly recommend that you use this statistical program as 1) it is comparatively user friendly and 2) I will be able to assist you when you run into programing/coding problems. There is also a large Stata network of users online as well as excellent instructional videos and reference book.

- <https://www.stata.com/links/video-tutorials/>
- <https://stats.idre.ucla.edu/stata/modules/>
- Lawrence Hamilton Statistics with Stata: Version 12, 2013. Duxbury

Information on how to obtain a free Stata license is posted in MyCourses.

Alternatively, you can use a free statistical package, R, which can be downloaded at <http://www.r-project.org/>. Although the initial learning curve with R is very steep (and can be quite frustrating), if you are intending to conduct sophisticated data visualization or take advanced statistical classes, you may wish to start with R. As with Stata, there are many useful online tutorials and a robust online user group, which can assist you in self-instruction. Your TA may also be able to provide some assistance. However, assistance from your instructor will be limited.

(Recommended as it intended to be compatible with the assigned Stock & Watson textbook)

- <https://www.econometrics-with-r.org/index.html>
- <https://sites.google.com/site/econometricsacademy/econometrics-models/>
- Grolemond, Garrett and Hadley Wickham (2016). R for Data Science
- <https://r4ds.had.co.nz/>

Course Schedule

Week 1: September 1

Two Variable Regression Analysis

Fitting lines to data; Residuals and error terms; Estimating coefficients and standard errors; Hypothesis testing; Confidence intervals; Goodness of fit (R-squared).

Assignment: Stock and Watson: Chapters 4 & 5

Assigned Homework #1 due September 15

Week 2: September 8

Properties of OLS

Assumptions of OLS; Heteroskedasticity and homoskedasticity; BLUE

Assignment: Stock and Watson: Chapter 4 & 5

Week 3: September 15

Replication Project

Introduction to Stata

Submit Homework #1

Assignment: Freese & Peterson “Replication in Social Science”

Assigned Homework #2 due September 29 (requires Stata)

Week 4: September 22

Multivariate Regression Analysis

Estimation, hypothesis testing, and confidence intervals of single coefficients; Joint hypothesis testing; Omitted variables; Adjusted R-squared

Submit Project Selection Checklist

Assignment: Stock and Watson: Chapter 6 & 7

Week 5: September 29

Building models with nonlinear regression functions (functional forms), part 1

Dummy variables; Interactions

Submit Homework #2

Assignment: Stock and Watson: Chapter 8

Assigned Homework #3 due October 27 (requires Stata)

October 6 -- No Class, Reading Break

Week 6: October 13

Building models with nonlinear regression functions (functional forms), part 2

Polynomials, Scaling

Getting Started on Verification Analysis

Assignment: Stock and Watson: Chapter 8

Week 7: October 20

Problems When OLS Assumptions are Violated

Heteroscedasticity; Multicollinearity; Model misspecification; Omitted variable bias;

Simultaneous causality; Sample selection; Measurement errors; Non-linear dependent variables

Assignment: Stock and Watson: Chapter 9

Submit Project Verification Analysis—Table 1 & OLS Results

Week 8: October 27

Non-linear Dependent Variables

LPM; Probits.

Assignment: Stock and Watson: Chapter 11

Submit Homework#3

Assigned Homework #4 due November 10 (requires Stata)

Week 9: November 3

Non-linear Dependent Variables

Logits

Week 10: November 10

Ordered logits; multinomial logits

Submit Homework#4

Assignment: Stock and Watson: Chapter 11

Assigned Homework #5 due November 24 (requires Stata)

Week 11: November 17

Missing data

Submit Project Robustness – Replication and Robustness Tests for Tables 2 & 3

Week 12: November 24

Catch-up/Project completion work period

Submit Homework#5

Week 13: December 1

Fixed Effects using Panel Data

Longitudinal data; First differences; Fixed effects

Assignment: Stock and Watson: Chapter 10

Replication projects due

Course Policies:

Extraordinary Circumstances:

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

Copyright:

All slides, video recordings, lecture notes, etc. remain the instructor's intellectual property. As such, you may use these only for your own learning (and research, with proper referencing/citation) ends. You are not permitted to disseminate or share these materials; doing so may violate the instructor's intellectual property rights and could be cause for disciplinary action.

Instructor generated course materials (e.g., handouts, notes, summaries, exam questions, recorded lectures, etc.) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that infringements of copyright can be subject to follow up by the University under the Code of Student Conduct and Disciplinary Procedures.

Recording Statement:

By enrolling in this course, you accept that some sessions may be recorded. You must consent to being recorded if you are attending a lecture or participating in a component of a course that is being recorded.

Inclusive Learning Environment:

As the instructor of this course, I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and the Office for Students with Disabilities, 514-398-6009

Language of Submission:

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté (sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue). Les étudiants de ce cours peuvent rédiger tous leurs travaux (incluant les examens) en français, mais doivent pour ce faire obtenir la permission préalable de la professeure. Aucune permission rétroactive ne sera accordée.

Indigenous Land Statement:

McGill University is located on land which has long served as a site of meeting and exchange amongst Indigenous peoples, including the Haudenosaunee and Anishinabeg nations. McGill honours, recognizes, and respects these nations as the traditional stewards of the lands and waters on which we meet today.

Academic Integrity Policy:

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/ for more information)

L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site www.mcgill.ca/students/srr/honest/).

Note that to support academic integrity, your assignments may be submitted to text-matching or other appropriate software (e.g., formula-, equation-, and graph-matching)."