**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. To promote a safe learning environment all health and safety protocols will be followed. 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. However, for students who are unable to attend a particular class lecture, I will post last year’s recorded lectures, if available.

**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, you are welcome to schedule more than one 15 minute time slot.
Assignments, Exams and Grading

There will be six 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 (6) 60%
- Project selection checklist 5% Due October 4
- Project verification analysis 10% Due October 25
- Project robustness analysis 10% Due November 8
- Final project 10% Due December 6

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.

Reading Materials

Required:

An E-Textbook can be purchased online at Amazon or rented at VitalSource

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

During the fall of 2021, the McGill administration will provide you with free access to Stata. You may also purchase a 6-month student version of Stata for about $50.

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/
- Grolemund, Garrett and Hadley Wickham (2016). R for Data Science
- https://r4ds.had.co.nz/

Course Schedule

Labour Day, No Class, September 6

Week 1: September 13
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 27

Week 2: September 20
Properties of OLS
Assumptions of OLS; Heteroskedasticity and homoskedasticity; BLUE, Gauss-Markov Theorem.
Assignment: Stock and Watson: Chapter 4 & 5

Week 3: September 27
Introduction to Stata and Replication Project
Submit Homework #1
Assignment: Freese & Peterson “Replication in Social Science”
Assigned Homework #2 due October 14 (requires Stata)

Week 4: October 4
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

Thanksgiving, Class Rescheduled from October 11 to October 14
Week 5: October 14
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 November 1 (requires Stata)

Week 6: October 18
Building models with nonlinear regression functions (functional forms), part 2
(Recorded Lectures)
Levels and logs; Polynomials
Assignment: Stock and Watson: Chapter 8

Week 7: October 25
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

Week 8: November 1
Non-linear Dependent Variables
LPM; Probits.
Assignment: Stock and Watson: Chapter 11
Submit Homework#3
Assigned Homework #4 due November 15 (requires Stata)

Week 9: November 8
Non-linear Dependent Variables
Logits
Submit Project Robustness

Week 10: November 15
Ordered logits; multi-nomial logits
Submit Homework#4
Assignment: Stock and Watson: Chapter 11
Assigned Homework #5 due November 22 (requires Stata)

Week 11: November 22
Fixed Effects using Panel Data
Longitudinal data; First differences; Fixed effects
Submit Homework#5
Assignment: Stock and Watson: Chapter 10
Assigned Homework #6 due November 29 (requires Stata)
Week 12: November 29
Random intercepts; Hierarchical models
Project completion work period
Submit Homework#6
Assignment: Reading TBA

Week 13: December 6
Replication debrief or missing data
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).”