SOC252H1: INTERMEDIATE QUANTITATIVE METHODS IN SOCIOLOGY (LEC0101)

University of Toronto

Term: Winter 2018 – Lecture Date/Time: Tuesday 2-4pm – Location: ESB142

INSTRUCTOR

Geoff Wodtke
Office: Room 394, 725 Spadina Ave
Office Hours: Friday 2-4pm
Email: geoffrey.wodtke@utoronto.ca

TEACHING ASSISTANT

Jon Koltai
Office: Room 36 (basement), 725 Spadina Ave
Office Hours: Friday 2-4pm
Email: jon.koltai@mail.utoronto.ca

COURSE DESCRIPTION

Social scientists regularly ask questions that can be answered with quantitative data from a population-based sample. For example, how much more income do college graduates earn compared to those who don't attend college? Do men and women who have attended college and who work in similar jobs earn different incomes? Do individuals with different levels of education hold different types of political attitudes and engage in different types of political behavior? This course explores statistical methods that can be used to answer these and many other questions of interest to social scientists. The main objective is to provide students with working knowledge of the linear regression model and various extensions. Specifically, this course covers simple and multivariate linear regression analysis, including least squares estimation, inference, and diagnostics.

PREREQUISITES

The prerequisite to take this course is SOC202H1 (Introduction to Quantitative Methods in Sociology). Students without this requirement will be removed at any time discovered and without notice. In general, students are expected to have a solid background in univariate statistical analysis, including the basics of probability and statistical inference.

TEXTS

Required

This course is divided into weekly topics. Most of these topics are covered in assigned readings from the following required course text: Wooldridge, Jeffrey M. 2013. *Introductory Econometrics: A Modern Approach (5th Edition)*. Mason, OH: South-Western Cengage Learning.

Supplementary

Although not required, there is another text that you may find helpful in this course. Specifically, one supplementary text that I recommend is: Acock, Alan C. 2016. *A Gentle Introduction to Stata*. College Station, TX: Stata Press.

SOFTWARE

All statistical computing for this course will be done using Stata (http://www.stata.com). Stata is command driven—that is, computations are executed from a set of typed commands in an executable script called a "do" file. For a brief introduction to Stata's command language, see http://data.princeton.edu/stata/ or http://www.ats.ucla.edu/stat/stata/modules/default.htm. Stata is available for personal licensing from Stata's official website, and it is installed on all computers in the sociology department computer lab (Room 36 at 725 Spadina Ave).

EVALUATION

Homework Assignments

Throughout the semester, you will be asked to complete four homework assignments based on material covered in lecture. Each assignment will have about 5 to 10 questions that will ask you to apply a method using Stata with real data and interpret the results. You are expected to complete these assignments individually, although some consultation among classmates is normal and expected. Your assignments should be double-spaced, in 12-point font, and accompanied by a clearly demarcated Stata log file containing the necessary statistical output. Electronic copies of the assignment will not be accepted—students must hand in a hard copy at their tutorial. Each of these assignments will count for 10 percent of your final grade, and thus altogether, they will count for 40 percent of your final grade. Late homework assignments will not be accepted and will receive a mark of zero.

In-class Midterm Test

The midterm test will be held in class on February 13. It will cover all readings, lectures, and tutorials from January 9 to February 6 and will count for 35 percent of your final grade. You will have the full class period (110 minutes) to complete the test, which will consist of both multiple choice and short-answer questions that may involve some calculations.

In-class Final Test

The final test will be held in class on April 3. It will count for 25 percent of your final grade. This test will be cumulative but it will focus predominantly on material from the second half of the course (i.e., after the midterm). You will have the full class period (110 minutes) to complete the test, which will consist of both multiple choice and short-answer questions that may involve some calculations.

Grades

Grades for this course will be assigned as follows: homework assignments (40 percent), midterm test (35 percent), final test (25).

COURSE POLICIES

Attendance
Attendance and punctuality are basic requirements for effective learning. You are expected to attend every class.

Communication
The best way to ask questions about course material or assignments is in person during your TA's or instructor's office hours. The following are guidelines for email communication with your TA and the course instructor: please make sure that you have a legitimate need before you write and that you cannot resolve your question during office hours; email messages should state the course number and the purpose of the email clearly in the subject line.

Make-up Tests and Late Homework Assignments
Students who miss a test or fail to turn in a homework assignment on time will receive a mark of zero, unless within one week of the missed test or homework assignment, students provide a written request for special consideration which explains why the test was missed or the homework was late, accompanied by proper documentation from a physician or college registrar. In the case of a missed test, the request should be accompanied by contact information (the student's telephone number and email address) so the date, time and place of a make-up test can be communicated to the student. A student who misses a test and the subsequent make-up test for a valid reason will not have a third chance to take the test. Instead, the grade assigned for the missed test will be the same as the grade the student earns for the other test in this course.

If you miss a test or a homework deadline, do not contact the instructor or TA unless you have followed the steps described here. Telling the professor or TA why you missed a deadline or a test will not be considered. In case of illness, you must supply a duly completed Verification of Student Illness or Injury form (available at www.illnessverification.utoronto.ca). A doctor's note is not acceptable. The form must be placed in a sealed envelope, addressed to the instructor, and submitted in class or during office hours. If a personal or family crisis prevents you from meeting a deadline, you must get a letter from your college registrar. The letter must be placed in a sealed envelope, addressed to the instructor, and submitted to the instructor or your TA during class or office hours.

Accessibility
If students require accommodations or have any accessibility concerns, please visit http://studentlife.utoronto.ca/accessibility as soon as possible.

Academic Misconduct
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 University of Toronto 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.

Cheating, misrepresentation, and plagiarism will not be tolerated. Students who commit an academic offence face serious penalties. Know where you stand by reading the "Code of Behaviour on Academic Matters" in the Calendar of the Faculty of Arts and Science.

TUTORIALS

This course has weekly tutorials on Tuesdays from 4-6pm and 6-8pm in Room 36 at 725 Spadina Ave. The tutorials are designed to provide instruction in the application of methods covered in lecture using the statistical software package Stata. Each will involve working through an applied analysis of data as part of your homework assignments with the guidance of a teaching assistant.

SCHEDULE

January 9: Preliminary Material

Topics: course outline; probability distributions, expected values, and variance; parameters, estimators, and estimates

Reading: Wooldridge Pp. 703-707, 722-754, and 755-763

Tutorial: Introduction to Programming in Stata

New assignments: None

Assignments due: None

January 16: Simple Linear Regression – Estimation

Topics: the conditional expectation function with a single explanatory variable; the simple linear regression (SLR) model; least squares estimation; interpreting SLR coefficients and predicted values; variance decomposition and goodness-of-fit

Reading: Wooldridge Pp. 22-40

Tutorial: Estimation of Simple Linear Regression Models in Stata

New assignments: Homework 1

Assignments due: None

January 23: Simple Linear Regression – Inference

Topics: the Gauss-Markov assumptions for SLR; properties of the SLR least squares estimator; standard error of the SLR least squares estimator; sampling distribution of the

SLR least squares estimator; testing hypotheses about SLR coefficients with the t-test; confidence intervals for SLR coefficients

Reading: Wooldridge Pp. 45-59

Tutorial: Inference for Simple Linear Regression Models in Stata

New assignments: Homework 2

Assignments due: Homework 1

January 30: Multivariate Linear Regression – Estimation (Part 1)

Topics: the conditional expectation function with two explanatory variables; the multivariate linear regression (MLR) model; the MLR least squares estimator with two explanatory variables; interpreting MLR coefficients and predicted values; variance decomposition and goodness-of-fit

Reading: Wooldridge Pp. 68-83

Tutorial: Estimation of Multivariate Linear Regression Models in Stata

New assignments: None

Assignments due: None

February 6: Multivariate Linear Regression – Estimation (Part 2)

Topics: the conditional expectation function with more than two explanatory variables; the MLR least squares estimator with more than two explanatory variables; the Gauss-Markov assumptions for MLR; properties of the MLR least squares estimator

Reading: Wooldridge Pp. 83-88, 93-94, and 99-105

Tutorial: Midterm Test Review

New assignments: None

Assignments due: Homework 2

February 13: MIDTERM TEST

February 20: NO CLASS (READING WEEK)

February 27: Multivariate Linear Regression – Inference (Part 1)

Topics: standard error of the MLR least squares estimator; sampling distribution of the MLR least squares estimator; testing hypotheses about MLR coefficients with the t-test; confidence intervals for MLR coefficients

Reading: Wooldridge Pp. 118-140

Tutorial: Inference for Multivariate Linear Regression Models in Stata (Part 1)

New assignments: Homework 3

Assignments due: None

March 6: Multivariate Linear Regression – Inference (Part 2)

Topics: testing hypotheses about multiple linear restrictions of MLR coefficients with the F-test; asymptotic inference

Reading: Wooldridge Pp. 143-158 and 168-178

Tutorial: Inference for Multivariate Linear Regression Models in Stata (Part 1)

New assignments: None

Assignments due: None

March 13: Multivariate Linear Regression – Diagnostics

Topics: detecting non-linearity, heteroscedasticity, and non-normality with residual plots; multicollinearity

Reading: Fox Pp. 266-273, 296-303, and 308-312 (***pdf posted on blackboard***)

Tutorial: Regression Diagnostics in Stata

New assignments: Homework 4

Assignments due: Homework 3

March 20: Multivariate Linear Regression – Extensions (Part 1)

Topics: MLR models with polynomials, qualitative explanatory variables, and interactions

Reading: Wooldridge Pp. 194-200, 710-712, and 227-248

Tutorial: Regression models with polynomials, interactions, and qualitative predictors

New assignments: None

Assignments due: None

March 27: Multivariate Linear Regression – Extensions (Part 2)

Topics: robust variance estimation; variable transformations; weighted least squares estimation with complex random samples

Reading: Wooldridge Pp. 268-273, 41-44, and 712-716 Fox Pp. 460-462 (***pdf posted on blackboard***)

Tutorial: Final Test Review

New assignments: None

Assignments due: Homework 4

April 3: IN-CLASS FINAL TEST