PADM-GP 2902 | Fall 2022
Multiple Regression and
Introduction to Econometrics

Instructor Information

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- Office hours sign up: https://www.wejoinin.com/sheets/nvqiu

Teaching Colleagues

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Course Description

Multiple regression is the core econometric technique used by policy and financial analysts. In this course, you will learn how to use and interpret this critical statistical method. Specifically, you learn how to build and estimate multiple regression models, how to evaluate whether regression coefficients are biased, whether standard errors (and thus t statistics) are valid, and whether regressions used in policy and finance studies support causal arguments.

In addition, employing one consistent dataset for all your computer exercises, you perform statistical analyses discussed in class using Stata, an econometric statistical package, and you see how the results reflect econometric concepts. Finally, with a group of your classmates and project datasets provided by your professor, you do a project that involves estimating your own regression model and applying the techniques we learn in class.

Course and Learning Objectives

By the end of the course, you should be able to:

1. Understand what an Ordinary Least Squares (OLS) regression does and why it is useful
2. Write and interpret mathematical equations representing various regression models
3. Interpret regression results as they are typically represented in statistical software packages and academic articles

4. Use Stata to run your own regressions to suggest answers to interesting policy questions
5. Think critically about the assumptions underlying your (or another researcher's) interpretation of regression output and test whether these assumptions are likely to hold
6. Conduct a research project in which you formulate, estimate, write about, and present an econometric model
7. Have a better understanding of the statistics that underlie research in your field of interest

Lectures

- Wednesday 6:45 PM - 8:25 PM
- Location: Silver (32 Waverly Pl), Room 208

Recitations (PADM-GP 2902.002)

- Tuesdays 8.35 PM - 9.35 PM
- Location: Virtual

Recitations (PADM-GP 2902.003)

- Thursdays 8.35 PM - 9.35 PM
- Location: Virtual

Recitation attendance is optional but highly recommended. In these sessions, you will discuss the learning objectives of the problem set (and some specific questions). As time allows, the TA will also answer follow-up questions from lectures and Stata.

Tutoring

- Time: TBD
- Location: Virtual

Prerequisite

CORE-GP 1011 or equivalent

Brightspace

You will need to have access to the class Brightspace page found under "Academics" on your NYU Home site (https://home.nyu.edu/). The most up-to-date syllabus and all class related documents (problem sets, computer exercises, databases, solutions, PowerPoints, etc.) will be posted there.

Summary of Course Grading

1. 20% Problem Sets and Computer Exercises
2. 35% Midterm Exam
3. 45% Regression Project

Course Requirements and Grading

1. **(20%) Fourteen problem sets (PS) and computer exercises (CE) (100 possible points each)**
   a. Problem Sets will be graded for completion of the entire exercise. You should try to obtain correct answers, however, as this will help you on the exam. Copying others or previous semesters will result in a zero.
   b. Answers to problem sets must be submitted via Brightspace. No late assignments will be accepted.
   c. For problem sets, submit your answers on the answer sheet provided for each set.
   d. Solutions will be posted to Brightspace on the day following their due date.
   e. I will drop the lowest one grade, thus the grades on all your problem sets will be added, divided by 13 and multiplied by 0.2.

2. **(35%) Exam (100 possible points)**
   a. An exam will be given in class (see Course Schedule). You may bring a non-graphing calculator and two pages (single-sided) of notes.

3. **(45%) Group Project (100 possible points)**

In groups of four to five, you will conduct a regression analysis and write a paper. (Note: All group members will complete peer evaluations that will factor into grades.)
   a. Fill out Project Data Set Preference Form (Link on Brightspace) by **Friday, Sept. 16**, at 12pm and I will put you in groups. See datasets and their descriptions in Brightspace, Resources, Project Descriptions and Datasets.
   b. Once groups have been assigned, I encourage you to meet with your group as soon as possible to plan the paper. Teams must email me the question you propose to answer and at least one specification that will be estimated by **Friday, Oct. 7**, at 12pm.
   c. Read chapter 11, "Running Your Own Regression Project," in the course text.
   d. Each group will give a brief presentation of their project in class on one of the three final class days. This presentation should cover the research question of interest, the dataset you are using to answer the question, at least one model specification, and initial results. Send the Professor your slides by noon on the day of your presentation.
   e. Write an 8-10 page paper, double spaced, organized into five sections as shown in the Paper Outline below. The paper should include at least two tables and may include one or more figures (i.e. graphs). Tables and figures will appear at the end of the paper and

do not count toward the page limit. Email a PDF version to the Professor and place a physical copy in the Professor's mailbox (Puck, 3rd Floor) by **Tuesday, Dec. 20** at 5 p.m. No late submissions will be accepted.

Paper Outline

I. Introduction: What is the goal of your regression study? Why is it interesting? Why do we care? (This does not have to be momentous – but you should explain why the results could be interesting or valuable to someone.)
II. Data: Describe your sources and discuss the descriptive statistics in Table 1.
III. Model and Empirical Strategy: What is your model (equation), and how does it achieve the goal of your analysis? Why are the specific variables used and measured as they are? Do you have any prior expectations about the signs of coefficients? How will you estimate this model? (Usually OLS with fixed effects.)
IV. Results: Discuss the results that are presented in Table 2.
V. Conclusions: What does your model say about your goal or issue? What is the next step in this research?
VI. Appended at end of paper:
    a. Figures (with titles): Histograms, bar charts, scatterplots, or other figures.
    b. Table 1 (with title): Descriptive statistics of all the variables in your model(s).
    c. Table 2 (with title): Results of your models, presented in four or five columns.
    d. Final cleaned up, annotated Stata log file of your results.

Course Materials

1. Required Text:

A. H. Studenmund, Using Econometrics: A Practical Guide, 6th ed, cited as S. ISBN: 0131367730 (note: there are newer editions, which are fine to use, but the syllabus will refer to chapters and page numbers as they appear in the 6th edition)

2. Required Software:

Stata/BE, purchased and loaded onto your computer by week one.

You should purchase this software here in order to obtain a student discount.

Purchase Stata/BE (not Small Stata). The least-cost option is an annual license. If you are planning to take Estimating Impacts, Advanced Empirical Methods, or the Research Capstone, you may want to consider a perpetual license. Stata/BE is not platform-dependent and will run on either Windows or Mac operating systems.

No previous knowledge of Stata is necessary. In addition to learning Stata through the problem sets and computer exercises and in class, the Data Services Studio in Bobst offers short courses (tutorials) and on-site help.

Stata is also available free-of-charge at [NYU's Virtual Computer Lab](http://www.nyu.edu/life/resources-and-services/information-technology/instructional-technology-support/instructional-technology-tools-and-services/virtual-computer-lab.html) (VCL): (http://www.nyu.edu/life/resources-and-services/information-technology/instructional-technology-support/instructional-technology-tools-and-services/virtual-computer-lab.html)

If you choose to use Stata on the VCL, please note that:
- Specifying a file path is slightly different (there is an additional prefix: \\Client\$...).
- You must not save your work on the VCL but on your actual computer. Otherwise, you will lose your work once you log out or get disconnected for any reason.

3. Required: Materials from Brightspace.

Throughout the semester, lecture notes, PowerPoint slides, problem sets, and solutions will be posted on Brightspace. There will also be one dataset – newschools9810.dta – posted on Brightspace that we will be using throughout the course. Please make sure you have access to Brightspace. See the course schedule below for when assignments are due. There is also a brief video on using Stata created by Professor Dan Smith, who taught this class in the past.

Course Outline

The Required Readings are taken from the textbook, **A. H. Studenmund, Using Econometrics: A Practical Guide**, 6th ed, cited as S. ISBN: 0131367730.

Class 1. September 7– Introduction & Bivariate Regression

Topics:
- OLS; interpretation; correlation coefficient; R-squared

Required Readings:
- Chapters 1, 2

Class 2. September 14 – Multivariate Regression Mechanics and Assumptions

Topics:
- Omitted variable bias; OLS estimator for multiple regression; multiple regression as a prediction model; Classical Liner Model (CLM) Assumptions; Sampling distribution of $\hat{\beta}$

Required Readings:
- Chapters 3, 4

Deliverables Due: Friday, 9/16

- Fill out Project Data Set Preference Form (Link on Brightspace) by Friday, Sept. 16, at 12pm

Class 3. September 21– Hypothesis Testing

Topics:

- Standard error of $\hat{\beta}$; significance tests; confidence intervals; F test; R^2; Adjusted R^2

Required Readings:

- Chapter 5 (skip appendix)

Homework due:

- PS 2

Class 4. September 28 – Function Form I

Topics:

- Polynomials; dummy variables; F-Tests of joint significance

Required Readings:

- Ch. 6 & Ch. 7 (207-213, 218-220, 223-226); Appendix Ch. 5

Homework due:

- PS 3; CE 3

Class 5. October 5 – Function Form II

Topics:

- Interactions; logarithmic transformations (percent change or elasticity)

Required Readings:

- Ch. 7 (213-218, 220-223, 226-232)

Homework due:

- PS 4

Deliverables Due: Friday, 10/7

- Email the Professor the question you propose to answer and at least one specification that will be estimated by Friday, Oct. 7, at 12pm

Class 6. October 12 – Regression Diagnostics I

Topics:

- Multi-collinearity
- Autocorrelation

Required Readings:

- Chapter 8
- Chapter 9

Homework due:

- PS 5; CE 5

Class 7. October 19 – Regression Diagnostics II

Topics:

- Heteroskedasticity

Required Readings:

- Chapter 10

Homework due:

- PS 6; CE 6

Class 8. October 26 – Panel Data

Topics:

- Pooled cross-sectional and time series data; panel data; fixed effects estimation.

Required Readings:

- Chapter 16

Homework due:

- PS 7; CE 7

Class 9. November 2 – Binary Dependent Variables

Topics:

- Introduction to Linear Probability, Probit, and Logit Models

Required Readings:

- Chapter 13

Homework due:

- PS 8; CE 8

Class 10. November 9 – Quasi-experimental methods

Topics:

- Randomized Controlled Trial (RCT); Instrumental Variables (IV), Regression Discontinuity (RD); Matching

Homework due:

- PS 9; CE 9

Class 11. November 16 – Exam

November 23 – No lecture and no recitation – Thanksgiving

Class 12. November 30 – Group Presentations

Email the Professor your slides by noon on the day of your presentation.

Class 13. December 7 – Group Presentations

Email the Professor your slides by noon on the day of your presentation.

Class 14. December 14 – Group Presentations

Email the Professor your slides by noon on the day of your presentation.

Deliverables Due: Tuesday, 12/20

- Submit on Brightspace and place final papers in Professor's and mailbox (Puck, 3rd Floor) by Dec. 20 at 5 p.m.

Academic Integrity

Academic integrity is a vital component of Wagner and NYU. All students enrolled in this class are required to read and abide by Wagner's Academic Code. All Wagner students have already read and signed the Wagner Academic Oath. Plagiarism of any form will not be tolerated and students in this class are expected to report violations to me. If any student in this class is unsure about what is expected of you and how to abide by the academic code, you should consult with me.

Henry and Lucy Moses Center for Students with Disabilities at NYU

Academic accommodations are available for students with disabilities. Please visit the Moses Center for Students with Disabilities (CSD) website and click on the Reasonable Accommodations and How to Register tab or call or email CSD at (212-998-4980 or mosescsd@nyu.edu) for information. Students who are requesting academic accommodations are strongly advised to reach out to the Moses Center as early as possible in the semester for assistance.

NYU's Calendar Policy on Religious Holidays

NYU's Calendar Policy on Religious Holidays states that members of any religious group may, without penalty, absent themselves from classes when required in compliance with their religious obligations. Please notify me in advance of religious holidays that might coincide with exams to schedule mutually acceptable alternatives.