NEW YORK UNIVERSITY
ROBERT F. WAGNER GRADUATE SCHOOL OF PUBLIC SERVICE

PADM-GP 2902:
MULTIPLE REGRESSION AND INTRODUCTION TO ECONOMETRICS
Summer 2018

FACULTY
Professor: Jacob William Faber
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Office hours:
Tuesdays: 12-1:30pm (Puck Building Office 3092)

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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.

By the end of the course, you should be able to:
- Understand what an Ordinary Least Squares (OLS) regression does and why it is useful
- Write and interpret mathematical equations representing various regression models
- Interpret regression results as they are typically represented in statistical software packages and academic articles
- Use Stata to run your own regressions to suggest answers to interesting policy questions
- Think critically about the assumptions underlying your (or another researcher's) interpretation of regression output and test whether these assumptions are likely to hold
- Conduct a research project in which you formulate, estimate, write about, and present an econometric model
- Have a better understanding of the statistics that underlie research in your field of interest

LECTURES
6/4-7/3; Mondays and Tuesdays; 6:15–9:15pm (25W4, Room:C-17)

RECITATIONS (PADM-GP 2902 (002))
Wednesdays; 6:15–9:15pm (Academic Resource Center/18 Washington Place, Room: LL04)

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.

PREREQUISITE
CORE-GP 1011 or equivalent

NYU CLASSES
You will need to have access to the NYU Classes 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%) Four problem sets (100 possible points each)*
    a) The grades on all your problem sets will be added, divided by 4 and multiplied by 0.2.
    b) 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**.
    c) Answers to problem sets **must be emailed (as a PDF) to both the professor and TA**. No late assignments will be accepted.
    d) For problem sets, submit your answers on the answer sheet provided for each set.
    e) Solutions will be posted to *NYU Classes* on the day following their due date.

2. *(35%) Exam (100 possible points)*
An exam will be given **in class on June 18** (see Course Schedule). Exam rules are listed below:
    a) The exam will include both interpretation of statistical results (e.g. regression tables) as well as a Stata component. Therefore, **you will need to bring your laptop for the exam**.
    b) You are permitted to use course materials during the exam (e.g. lecture slides, Stata exercises, your own notes). However, **you are not allowed to access the internet during the exam**. Your laptop must be in airplane mode or have the Wi-Fi otherwise turned off. When you are ready to submit your exam, get the attention of the Professor or Teaching Assistant before turning your Wi-Fi back on.
    c) You must email your exam (as a PDF) to the Professor and Teaching Assistant by 9:15pm on June 18. **Late submissions will not be accepted**.
    d) You must complete this exam on your own. **Copying others or previous semesters will**

result in a zero.

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 (https://goo.gl/forms/baSi6UvaI6k1fBXy2) by **Friday, June 8, at 12pm** and I will put you in groups. See datasets and their descriptions in *NYU Classes, 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, June 29, 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 7/3**. 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 7/3**.

    e) See me during office hours or after class for quick check-ins on your work. Note that I will hold office hours in the week after the last lecture (Tuesday July 10th).

    f) 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 7/16 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:
    i) Figures (with titles): Histograms, bar charts, scatterplots, or other figures.
    ii) Table 1 (with title): Descriptive statistics of all the variables in your model(s).
    iii) Table 2 (with title): Results of your models, presented in four or five columns.
    iv) Final cleaned up, annotated Stata log file of your results.

Note: questions about the group project should be addressed to the professor, not the TA.

COURSE MATERIALS
1. **Required Text: A. H. Studenmund,** *Using Econometrics: A Practical Guide*, 6th ed, cited as S. ISBN: 0131367730 (note: there is a newer 7th edition, which should be fine to use, but the syllabus will refer to chapters and page numbers as they appear in the 6th edition)

2. Required Software: Stata/IC 14, purchased and loaded onto your computer by week one. You should purchase this software here in order to obtain a student discount: http://www.stata.com/order/new/edu/gradplans/student-pricing/

Purchase Stata/IC 14 (**not** Small Stata). The least-cost option is a 6-month license, at $75. If you are planning to take Estimating Impacts, Advanced Empirical Methods, or the Research Capstone, you may want to consider a one-year or perpetual license. Stata 14 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 (http://library.nyu.edu/dataservice/) offers short courses (tutorials) and on-site help.

Stata is also available free-of-charge at NYU's Virtual Computer Lab (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 NYU Classes. Throughout the semester, lecture notes, PowerPoint slides, problem sets, and solutions will be posted on NYU Classes. There will also be one dataset – newschools9810.dta – posted on NYU Classes that we will be using throughout the course. Please make sure you have access to NYU Classes. 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.

4. Prior to Class 1:
- Fill out the Student Information Sheet (https://goo.gl/forms/9Mn6N46jreWgJAwh2)
- Purchase and install Stata/IC 14
- Download and save, from NYU Classes: newschools9810.dta
- Download and save, from NYU Classes: MR_foreclosure_data.dta
- Watch the video on NYU Classes about using Stata
- Read "How statistics lost their power – and why we should fear what comes next," by William Davies in *The Guardian* (January 19, 2017)

Date	Lecture	Topics	Reading (Studenmund)
Mon 6/4	Bivariate & Multivariate Regression Mechanics	OLS; interpretation; correlation coefficient; R-squared; Omitted variable bias; OLS estimator for multiple regression; multiple regression as a prediction model	Ch. 1, 2, 3
Tues 6/5	Regression Assumptions & Hypothesis Testing	Classical Liner Model (CLM) Assumptions; Sampling distribution of $\hat{\beta}$; Standard error of $\hat{\beta}$; significance tests; confidence intervals; F test; R^2; Adjusted R^2	Ch. 4, 5 (skip appendix)
Problem Set 1: Due 5pm on Fri 6/8 **Final papers:** Fill out Project Data Set Preference Form by noon on Fri 6/8			
Mon 6/11	Function Form I	Polynomials; dummy variables; F-Tests of joint significance	Ch. 6 & Ch. 7 (207-213, 218-220, 223-226); Appendix Ch. 5
Tues 6/12	Functional Form II	Interactions; logarithmic transformations (percent change or elasticity)	Ch. 7 (213-218, 220-223, 226-232)
Problem Set 2: Due 5pm on Fri 6/15			
Mon 6/18	**Exam**	You will need your laptop, but it must remain in airplane mode throughout the exam.	
Tues 6/19	Regression Diagnostics	Multicollinearity, Autocorrelation, & Heteroskedasticity	Ch. 8, 9, 10
Problem Set 3: Due 5pm on Fri 6/22			
Mon 6/25	Panel Data	Pooled cross-sectional and time series data; panel data; fixed effects estimation.	Ch. 16
Tues 6/26	Binary Dependent Variables	Introduction to Linear Probability, Probit, and Logit Models	Ch. 13
Problem Set 4: Due 5pm on Fri 6/29 **Final papers:** Teams must email Professor research question and at least one specification by noon on Fri 6/29			
Mon 7/2	Quasi-experimental methods	Randomized Controlled Trial (RCT); Instrumental Variables (IV), Regression Discontinuity (RD); Matching	See NYU Classes
Tues 7/3	**Group Presentations**	Plan to present for 10-15 minutes and answer questions for 5-10 minutes. Send the Professor your slides by noon on 7/3.	
Final papers: Place in Professor's email and mailbox (Puck, 3rd Floor) by Mon 7/16 at 5 p.m.			