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Resource Economics 312
Introductory Econometrics
Spring 2019

Description

The growing importance of information technologies and the increased availability of electronic data make data analysis tools very important in today's job market. This is the third course in the Department of Resource Economics sequence of Statistics and Econometrics. This course will focus on expanding the regression analysis portion of your data analysis tool kit. The emphasis will be on applying regression methods and the problems encountered in estimating economic models. Statistics, algebra, calculus, and an understanding of regression are prerequisites for this course; you must have completed an introductory statistics course through simple regression and an introduction to multiple regression. We will rely on statistical concepts and algebra throughout the course. Application of calculus is limited to total and partial differentiation.

Goals and Objectives

My goal is to guide you as you develop valuable econometric skills and a deeper understanding of empirical methods. These are skills that you can and should add to your resume. Many of our graduates have gone on to apply econometrics in business and government to estimate or predict impacts of changes. Our alums use the tools they learned to estimate how advertising and shelf-position in stores affects sales, the market potential of new drugs, enrollment rates at academic institutions, how costs affect firm pricing decisions, and the effects of EPA polices on consumer welfare to name a few applications. More broadly, we want you to develop key critical thinking skills that all employers seek in their applicants. When you read reports as part of your first job, you will understand what analysts did to generate their results and you will be prepared to think critically about the methods they used, whether they were appropriate, and what those results mean.

We have a variety of materials ready for you to satisfy the following objectives in building your econometric skills:

- Develop an understanding of the theory behind methods used to estimate economic models of firm, consumer and government choices.
- Develop an understanding about the use of economic data with econometric methods to estimate economic models.
- Build an appreciation of the qualities of econometric methods and the crucial assumptions required to ensure the methods possess these qualities (we'll call them desirable properties).
- Understand the consequences of violating crucial assumptions and solutions to the problems caused by bad initial assumptions.
- Take advantage of the opportunities for practice and experience using economic data and computer software so that you are comfortable applying proper procedures and solving problems that might arise.

You will feel well prepared and well-practiced by semester's end and your term project will demonstrate that! As you read these course requirements, you will note that there is a lot to do. Learning econometrics, like statistics, requires that you stay on-task. I want you to leave this course with skills that are highly valued and utilized in business and government decision-making and to do that requires regular active learning exercises in small doses that are reinforced during class. Econometrics, like statistics can be viewed as *discovery through data*.

Course Requirements

Texts: I have recommended several texts including the text from prior years: *Essentials of Econometrics*, by Damodar Gujarati (GU). A stronger more complete text is *Basic Econometrics* (now in its 4th ed.), also by Gujarati (GU2). For each text, there are earlier editions online that are fine. The basic theory has not changed that much over time - there are some improved exercises in the texts and additional references, but I would buy the less expensive option. (I found a 3rd edition for about \$14!) The *Basic Econometrics* volume is a much better resource; it covers additional econometric topics making it an excellent resource if you want to work in the field or if you want to take additional courses in econometrics. Copies of my course notes from previous years are posted in Moodle.

OWL (20% of your grade): There will be OWL **Pre-Lecture assignments** (5% of your grade) due by 1:00 PM the day of each lecture (I drop your three lowest scores). **OWL quizzes** (15% of your grade) draw from Pre-Lecture assignments, lectures, and readings from the text. OWL quizzes will be posted about every week. You will have at least 5 days to complete each quiz and you will have two attempts on each question. One quiz score will be dropped in determining your quiz average.

In Class Exercises (10% of your grade): We will have in-class exercises at least once each week. These will be challenging exercises to develop your problem solving skills and engage you with the course material and applications.

Course Project (40% of your grade): Form a team of two or three and think about a project for the semester. You may encounter econometric analyses in your other courses. I have data sets posted on Moodle that I encourage you to use. If you do not find an idea that strikes you quickly, talk with me and we'll find a project for you. Begin your project immediately by reviewing the literature related to your topic. Synthesize the literature you read to help formulate an economic model. Once you have specified your model, gather data, use statistics to describe the data, and estimate your econometric model. Mid-semester project installments are due: **(1) February 7** - a review of the economic literature on your topic, a discussion of the economic theory relevant to your research problem, your empirical model specification, parameter expectations, and a description of the data you will use (10% of your grade); **(2) April 4** - add to your first installment by including additional sections describing your data, tables and charts presenting descriptive statistics, presentation of your multiple regression results including interpretations and inference (10% of your grade). Throughout the semester, you should regularly apply methods/tools we cover in class to your project data. Your final project, a revision of your prior installments plus your final analysis, interpretations and inference, is due **May 2** at 11:55 PM. Installment grades are based on the organization, content, quality of your work, and your writing. Each team will develop a presentation for their project. We will plan to hold presentations during the final week of the semester. Each presentation will be 15 minutes in length. The term project is 40% of your final grade; the written paper representing 30% and the presentation 10%. This project is a great way to build your portfolio for prospective employers!

Examinations (30% of your grade): There are two exams, a mid-semester exam and a final; **both are comprehensive**. The mid-semester exam is tentatively scheduled for **March 7**. The final exam will be held during the final exam period. Exams will be held in the Department's Willis lab from **6:00 – 9:00 PM** and require that you apply theory and methods from lectures, use software to estimate a model, complete analyses, and interpret the results.

Grading

Course grades combine course components according to the weights shown in the table. A final average of 91 and above is A, 88 to 91 is A-, 85 to 88 is B+, 82 to 85 is B, 78 to 82 is B-, 74 to 78 is C+, 70 to 74 is C, 66 to 70 is C-, 62 to 66 is D+ and 58 to 62 is D.

Computer Software

Applying statistics or econometrics requires the use of computers. I expect that you are proficient with **Word** and

Excel, which we use regularly for exercises and assignments. Your term project will require that you use software to estimate your econometric model and correct problems. You should be familiar with the statistical package *Minitab* from your Res Econ 213 course. The statistical package *JMP* is available to you free – go to <http://www.umass.edu/it/software/jmp-pro-12>. You will be required to demonstrate knowledge of econometrics (theory and interpretation) and your ability to estimate models on exams. I would also encourage you to learn to use the software package *SAS*, which is widely used in private industry and government. All machines in our computer lab (room 308) have *Microsoft Office* and *SAS* on them. Most OIT PC labs have *Minitab* and *SAS*, so no purchase is necessary.

Attendance and Courtesy

You are responsible for everything announced, presented or discussed in class. The way to avoid any misunderstanding associated with this course is to attend class. We are all responsible for maintaining a classroom environment that is conducive to learning and discussion. To ensure that we all have the opportunity to gain from time spent in class, I propose these standards for creating a *respectful learning environment*.

- That the instructor and students notice and respect each other.
- Respect includes appropriate humor, enjoyment, or other indications of a comfortable and pleasant classroom community.
- We are on time for class: no late arrivals and no packing up early. **I start promptly at 2:30 and will end class on time as well.**
- We avoid disruptions during class such as private conversations, reading newspapers, use of a cell phone, using a laptop for something other than current classroom work, and, of course, sleeping.
- We avoid negative language that is considered racist, sexist, or homophobic or in other ways may exclude members of our campus and classroom community.
- Welcome to *Introductory Econometrics*, let's all enjoy the semester!

Course Outline

The outline on these pages is tentative. I reserve the right to change it as the need arises. I post my “inked slides” in Moodle following class.

References: GU, *Essentials of Econometrics* (3rd edition) by Damodar Gujarati.
GU2, *Basic Econometrics* (4th ed.), also by Gujarati

I. Introduction: (Lecture 1)

GU: Chapter 1 – an overview of econometrics.

Lecture Notes: Part I

II. Topics from Basic Statistics (Lecture 2)

Note: A review of basic stats is presented in GU Chapters 2 – 4.

Your basic stats text and notes.
Lecture Notes: Part II

III. Simple Regression (Lectures 3 – 7)

Introduction - Basic Concepts and Ordinary Least Squares

GU: Chapter 6

GU2: Chapter 2 and Chapter 3 (pp. 52-59)

Lecture Notes: Part III, Sections A - D

Classical Regression Model, Variances and Properties of Estimators

GU: Chapter 7: pp. 167-176.

GU2: Chapter 3 (59-74)

Lecture Notes: Part III, Sections E - G

Confidence Intervals, Hypothesis Tests, "Goodness of Fit" and Forecasting

GU: Chapter 7: 178-188.

GU2: Chapter 4 (pp. 101-107)

Lecture Notes: Part III, Section H - J

Chapter 5 (pp. 115-136), pp. 785-790, pp. 74-85 and pp. 137-139

Reporting Results

GU: Chapter 7: pp. 189-190.

IV. Multiple Regression (Lectures 8 – 10)

Classical Regression Model, Ordinary Least Squares, Specification Bias and "Goodness of Fit"

GU: Chapter 8: pp. 208-218.

GU2: Chapter 7 (pp. 191-211 and pp. 231-235)

Hypothesis Tests and Analysis of Variance; Adjusted R^2

GU: Chapter 8: pp. 219-229.

GU2: Chapter 8

Lecture Notes: Part IV, Sections A - G

Lecture Notes: Part IV, Sections H & I

V. Extensions of Multiple Regression (Lecture 11 – 15)

Dummy Variables

GU: Chapter 10

GU2: Chapter 9

Functional Forms

GU: Chapter 9.

GU2: pp. 165-178; pp. 214-221

Scaling Variables

GU: Chapter 9.

GU2: pp. 161-165

Lecture Notes: Part V, Section A

Lecture Notes: Part V, Section C

Lecture Notes: Part V, Section B

VI. Problems and Specification Issues (Lectures 16 – 22)

Model Selection/Specification Issues

GU: Chapter 11

GU2: Chapter 13

Multicollinearity

GU: Chapter 12

GU2: Chapter 10

Heteroskedasticity

GU: Chapter 13

GU2: Chapter 11

Autocorrelation

GU: Chapter 14

GU2: Chapter 12

Lecture Notes: Part VI, Section A

Lecture Notes: Part VI, Section B

Lecture Notes: Part VI, Section C

VII. Introducing Some Advanced Topics in Econometrics (Lectures 23 – 26)

Discrete Choice Models and Selected Topics

GU: Chapter 16 and additional course notes.

GU2: Chapters 15 and 17

Simultaneous Equation Models

GU: Chapter 15

GU2: Chapters 18 – 20