

Boston College
Department of Economics

Econometric Methods
EC 228
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Econometric Methods

This is a course in the theory and application of regression analysis--a sequel to your statistics course. As in statistics, we will concentrate on problems of estimation and hypothesis testing. Unlike statistics, the primary focus is not on means of distributions, but rather on something much more interesting--relationships between variables. Most social science is about relationships between variables, and we will develop some statistical techniques to estimate the direction and magnitude of these relationships, and test hypothesis about them.

We will first address these topics with a number of simplifying assumptions, and discuss some very nice statistical properties of the estimators we develop--unbiasedness and efficiency (minimum variance). We will then ask what happens to these properties when the simplifying assumptions do not hold, and ask whether these properties can be revived by adjustments to the estimating technique.

My approach to teaching undergraduate econometrics is based on learning by doing. The text reflects my belief that both an intuitive understanding of the theory, and hands on training are important to develop an understanding and appreciation of econometrics as a powerful, marketable, and fun tool to use. You will learn how an uncountable number of interesting (and even uninteresting) questions can be explored with the use of econometrics.

Learning econometrics requires developing and implementing many skills simultaneously. These skills are math, statistics, economic theory, computer, writing, presentation and common sense. Please be prepared for an exhilarating and rigorous experience. We will the portions of the text outlined below. Those of you who feel a bit rusty on your algebra and basic differential calculus should brush up starting now. I have put a few books on reserve for your math reference.

Regression analysis (econometrics) is done by computer programs. You will use STATA for the research paper and some of the problem sets. STATA for both PCs and real computers (Apples) are available on the BC computer system, and for purchase through me.

Text:

Required:

Introductory Econometrics--A Modern Approach, 2nd ed. by Jeffrey M. Wooldridge, South Western Publishing Company. The text is available at the Boston College Bookstore.

Optional: Study Guide/Solutions Manual.

Supplementary Readings:

Any major newspaper. Suggestions: Boston Globe, New York Times, Wall Street Journal. There will also be several fascinating econometric articles assigned during the semester.

Course Requirements: The requirements for the course (and approximate grade weights) are:

Two quizzes. Thursday, February 13th and Tuesday, April 15th. 7.5% each.
Midterm Thursday February 27th. 25%
Class Participation and Problem Sets. 5%
Final Exam--Exam Week. 30%
Research paper, and presentation, Due April 29th. (Details below.) 25%

If school happens to be canceled (e.g. snow day) on the day of a scheduled exam, the exam will be given the next class meeting. There are no make up exams. If there is an excused absence from an exam, i.e. documentation from the dean, the following or previous exam will be weighted more heavily.

Academic Integrity:

I expect all students to do only their own work on exams and quizzes, and to make a serious individual effort on the problem sets and research paper. Any breach of academic integrity (e.g. cheating on a quiz or plagiarism) will result in a failure for the *entire class*. We will discuss collaboration on the problem sets and the paper in class.

Research Paper:

One very important component of this course is a significant research paper, done by groups of three students. This will be a practical application of econometrics to test some hypothesis that your group finds interesting. The topic is up to the group and can come from economics or from any other discipline.

Timetable:

Students usually find this research paper to be one of the most rewarding and useful parts of the course. Students also find it one of the most time consuming. Below is a timetable designed to spread this work over the semester. A draft of the paper is due *before* the end of the semester (Thursday, April 11) allowing some time for some quick extensions and revisions.

Tuesday January 14: Opening Day

-3 weeks-

Tuesday February 4 Submit a brief description (abstract) of your group's topic--Carefully thought out. (1 page)

-2.5 weeks-

Thursday Feb. 20 Submit the first progress report. *Substantial* progress on every section of the paper (3 pages)

-4.5 weeks-

Thursday March 20 Submit the second progress report. *Significant* improvement from first progress report. Includes basic data analysis. (5 pages)

-3.5 weeks-

Thursday April 10 First draft of paper due.

-3 weeks-

Thursday April 24, and Tuesday April 29

Presentations. and final draft of the paper due.

Here is a possible outline for the research paper:

I. Introduction

- What are the hypothesis being tested?
- Why are they interesting?
- What does theory (economic? other?) predict about the relationships being tested?
- What are your methods? (Briefly)
- What are your results? (Briefly)

II. Brief Literature Review

- What other work has been done on these issues?
- What has been found?
- How does your paper differ from the others?

III. Data

- What data would you like to have?
- What data have you been able to obtain?
- What special data problems did you encounter?

IV. Empirical Work

- Regression Analysis
- Interpretation of the results

V. Conclusions and Summary

- What have you learned
- What are the policy implications?
- Are there suggestions for future research?

Topic:

The topic of the paper is up to the group, although you should clear it with me. Pick an area where data are readily available, and avoid topics requiring new surveys (although this has been done) or involving simultaneous equations (for example supply and demand). Experience shows that cross-sectional studies work better than time-series for this assignment, although the later has been done. The Census volumes, for example provide excellent and abundant data on U.S. states and cities. Topics from previous years include:

- State by state variations in divorce rates
- Voter behavior
- Crime rates in U.S. cities
- Wage, earnings or poverty differentials by state
- The determinants of teen-age pregnancies by state
- State by state alcohol consumption
- Baseball attendance across cities
- Salary determination in major league sports
- Determination of MCAS results
- Determinants of U.S. strike activity
- Determination welfare participation
- State by state variations in suicide rates
- State by state variations in traffic fatalities
- State by state variations in fertility rates
- Voter turnout in Presidential election years

Course Outline:

Part I The Basic Regression Model--Cross Sectional Data

1. Introduction--An overview of Regression Analysis (Chapter 1, 19, Appendices A, B, C)
The big picture, What is econometrics and regression analysis, The setting, Examples.
2. Ordinary Least Squares (Chapters 2, 3)
Estimation--Single independent models, Multivariate regression, The classical assumptions, Gauss-Markov Theorem, Omitted variables, Irrelevant variables, Multicollinearity.
3. Multivariate Regression: Inference (Chapter 4)
t-tests, F-tests, Economic vs. Statistical significance.
4. OLS Asymptotics, and Further Issues (Chapter 5, 6)
Consistency, Scaling, Functional forms, etc.
5. Qualitative Information (Chapter 7)
Dummy Variables.
6. Heteroskedasticity (Chapter 8)
Consequences, Robust Inference, Testing for heteroskedasticity.
7. Specification and Data Problems (Chapter 9)
Lagged dependent variables, measurement error in dependent and explanatory variables.

Part II and III Time Series and Advanced Topics

8. Regression with Time Series Data (Chapter 10)
9. Panel Data Methods (Chapter 13)
Chow Test, Policy Analysis.
10. Advanced Panel Data Methods (Chapter 14)
Fixed Effects, Random Effects.
11. Instrumental Variables Estimation (Chapter 15)
Two Stage Least Squares, Endogeneity
12. Simultaneous Equation Models (Chapter 16)
Identification