

## **INTRODUCTION TO ECONOMETRICS**

### **PREREQUISITES**

Econometrics is a division of Economics concerned with the empirical estimation of economic relationships. In essence, Econometrics consists of the application of statistical analysis to mathematical formulations of theoretical economic concepts. Consequently, some background is essential as a foundation for discussion. At a minimum, students should have successfully completed micro and macro principles of economics and have had an introductory course in statistics.

### **TEXTS**

Required:

Introductory Econometric, Jeffery Woolridge, South Western.  
EvIEWS: Student Version, Lilien & Hall, Quantitative Micro  
Software. Included with the Wooldridge text.

Optional Reading:

Applied Econometrics, Lott & Ray. Dryden. 1991. This book consists of selected journal articles for which your instructor has a data disk containing the data used in the articles. If any of the topics appeal to you, this is a good way to introduce yourself to the literature of Econometrics. n.b., Consider one of the articles referenced in this book as the basis for your papers.

Interpreting Mathematical Economics and Econometrics. Byron D. Eastman. St. Martin's Press. 1984. This text will serve as a non-intimidating primer for anyone who approaches Econometrics with some apprehension. It will ease you into the discussion.

Statistical Techniques for Data Analysis. John K. Taylor. Lewis Publishers 1990. This compact and easy to understand book contains a wealth of useful statistical techniques most of which were not likely to have been covered in your Introductory Statistics course.

Understanding Econometrics. Dennis Halcoussis. Thompson. 2005. If I were sure that none of our students would go on to graduate school, or if the Department decided to teach econometrics without prerequisites, this is the book I would adopt. For some students, reading this book first, would make attacking Wooldridge easier.

### **TERM PAPER**

A short paper is due during our class on the second Friday in April. This paper will either be an original piece of empirical work testing some economic proposition using a data set made available to you through this class or from some other source (perhaps using data from a family business). If you are studying financial markets this semester, you might consider an econometric analysis of the relationship between some stock price with economic variables. Or, you might consider trying to update the empirical work in the article you reviewed for your

first paper.

Your topic must be approved by our last class day in February. Your approval request will consist of a single typed page indicating the topic, the economic hypotheses you plan to test, at least one previous study of this hypothesis, and the data set you will be using.

Your term paper should consist of three parts:

a. An introduction explaining the major studies in the area you have selected. We call this a review of the literature.

b. An explanation of the methodology you will use. Normally this will consist of the mathematical formulation of the theory you wish to test or empirical relationships you wish to investigate. It also includes a discussion and justification of the statistical tools you intend to use, and of your data.

c. Report and discuss the meaning of your empirical results. If you have updated or extended the results of a published article explain how your results are the same or different from the original.

Your goal in this paper is to demonstrate your mastery of the tools of Econometric analysis and your capacity to complete a project on a timely basis. A deduction of half a letter grade (5 points) for each day beyond the second Friday in April will be made for late submissions.

# **ECONOMETRICS**

## **DISCUSSION TOPICS & ASSIGNMENTS**

R.A. Kelly

Spring 2005

### **A. INTRODUCTION**

1. Introduction to Econometrics Ch.1
2. Introduction to the Regression Model Ch.2 & EXCEL
3. Building a Spreadsheet STATPAK

### **B. THE LINEAR REGRESSION MODEL AND ITS INTERPRETATION**

1. Two-Variable Ordinary Least Squares
2. Assumptions Behind the Classical Regression Model
3. The Coefficient of Determination
4. Variances of OLS Estimators
5. Evaluating OLS Results
6. What We to Know About EVIEWS output

### **C. MULTIPLE REGRESSION AND ITS INTERPRETATION**

1. Multiple Linear Regression Ch.3
2. Correlation and  $R^2$  Revisited
3. Mis-specified Models
4. Statistical Inference Ch.4
5. Restricted v. Unrestricted OLS
6. Properties of Estimators Ch.5

### **D. PROBLEMS WITH THE LINEAR REGRESSION MODEL**

1. Data Scaling Ch.6
2. Standardized Beta Coefficients
3. Functional Forms: Non-Linear Models
4. Residual Analysis
5. Dummy Variables Ch.7
6. Multicollinearity Ch.2 pp94-97
7. Heteroscedasticity Ch.8
8. Generalized Least Squares
9. Autocorrelation Ch.10

### **COURSE REQUIREMENTS**

Your final grade will be determined as follows:

2 tests	20 percent each
1 paper	10 "
Class participation	10 "
Final exam	40 "

At your option, you may skip a test and raise the final's weight.

**Directions to RACK's Home Page:** Go to the **StagWeb** or to  
**<http://www.faculty.fairfield.edu/faculty/rakelly>**

Alternate path: Go to **Fairfield's home page** and choose the following links:

Academics → School of Arts & Science → Departments  
→ Social Science → Economics → Faculty → R.A. Kelly

Please open (and check regularly) a Fairfield U. StagWeb account. If

you have not already done so, apply at first floor Bannow Hall.

Articles & Books

Johnston, Jack. Statistical Cost Analysis. NY. McGraw-Hill. 1960. Empirical work casting doubt on the U-shaped cost function.

# NOTES OUTLINE

## CH. 1 INTRODUCTION TO ECONOMETRICS

*The future is just one dammed thing after another*

Winston Churchill

- A. Introduction
- B. Methodology

### CHAPTER 2 (W)

## OLS: THE PROBLEM OF ESTIMATION

- A. THE METHOD OF OLS
- B. UNDERLYING ASSUMPTIONS
- C. GOODNESS OF FIT
- D. RESIDUAL ANALYSIS

### Chapter 3 (w)

## MULTIPLE REGRESSION

- A. The Model: Assumptions (3.1)
- B. MLS Calculation (3.2)
- C. Interpretation (3.2)
- D. Test Statistics:  $R\text{-bar}^2$ , F-Stat (3.2,4)
- E. Assumptions Behind MOLS (3.3,4)  
Model Misspecification
- F. The Problem of Multicollinearity
- G. Detecting Multicollinearity (3.4)
- H. Remedial Measures for Multicollinearity

---

### CHAPTER 4 (W)

## MLS: STATISTICAL INFERENCE

---

A. The Assumption of Normality	(4.1)
B. *Probability Distributions	
C. Hypothesis Testing: t-Test	(4.2)
D. Confidence Intervals	(4.3)
E. Significance of Combined RV's	(4.4)
F. Comparing Models: F-Test	(4.5)

### Chapter 5 (W)

## OLS ASYMPTOTICS

A. Desirable Properties of Point Estimators	5.1
B. Normality and Large Sample Inference	5.2
C. The LM Statistic: Model Test	5.2
D. *Testing for Normality	

## CH 6 (W)

## OLS EXTENSIONS

A. DATA TRANSFORMATIONS	6.1
B. POLYNOMIAL MODELS	6.2
C. NON-LINEAR MODELS	6.2
D. R-Bar <sup>2</sup>	6.3
E. PREDICTION INTERVALS	6.4
F. RESIDUAL ANALYSIS	6.4

## CH.9 (W)

## SPECIFICATION PROBLEMS

A. MODEL MISSPECIFICATION	9.1
B. *COMPARING MODELS: EVIEWS, AIC & SIC	
C. PROXY VARIABLES	9.2
D. OLS & MEASUREMENT ERROR	9.3

## CH.10 (W)

# TIME SERIES

A. INTRODUCTION	10.2
B. OLS ASSUMPTIONS	10.3
C. WHAT WORKS: EXTENSIONS	10.4
D. TRENDING	10.5
E. SEASONALITY	10.5
F. MULTICOLLINEARITY	CH.3

## CH 11

# TIME SERIES ISSUES

A. Intro	
B. Time Series Concepts	11.1
C. Highly Persistent Time Series	11.3
D. Dynamically Complete Models	11.4
E. Time Series & Homoscedasticity	11.5
*F. The Analysis of Lags	

## CH 12 (W)

# AUTOCORRELATION

A. Introduction	
B. Consequences	12.1
C. Detecting	12.2
D. Curing	12.3-5
E. ARCH Model	12.6
F. Distributed Lags	

## CH.13 (W)

# PANEL DATA METHODS

- A. Intro
- B. Pooling Independent Cross Sections 13.1&2
- C. Two-Period Panel Data 13.3
- D. Policy Analysis W/Panel Data 13.4

**IN PROGRESS**



## The Job Interview

-Assess your strengths, have concrete examples, and be prepared to discuss them.

-Be prepared to talk briefly about your education & hobbies.

-Wear conservative clothing.

-Expect assessment (e.g., personality) tests.

-Regard a job search as a full-time job.

-Remember that there is no perfect answer to interviewers' questions.

-Don't talk too much during the interview.

-Do ask questions; it shows your interest in the company.

-Write thank-you notes.

# **TOOLKIT**

## **SKILLS YOU WILL NEED FOR THE FINAL EXAM**

1. Estimating OLS using both spreadsheets and EViews.
2. Knowing how to evaluate OLS output.
3. Reading data from one medium to another. e.g., From Excel to EViews.
4. Using OLS to make a forecast.
5. Calculating mean and individual prediction intervals.
6. Using OLS output to estimate elasticities.
7. Comparing different OLS models.
8. Identifying and correcting multicollinearity.
9. Identifying and correcting heteroscedasticity.
10. Identifying and correcting autocorrelation.
11. How to incorporate qualitative variable in OLS
12. How to estimate non-linear models

## **EC380 PRESENTATION**

(10-15 Minutes)

1. Identify the article (citation).
2. Why did you choose it? What recognizable concept of micro or macro theory does it relate to? E.g., Demand, production function, consumption, etc.,
3. The Data. Is the data cross section or time series? What was source of the data? (Survey, BLS, etc.,) What are the data problems, if any? What "creative" things did the author do to get around the data problems?
4. What recognizable or new econometric techniques/tests were employed? Explain briefly. **What pages should be read in our text?**
5. The Story. What was the **primary** hypothesis tested? N.b., If your author evaluated 25 or 50 regressions, spare us, please. Did the econometric analysis support the hypothesis. Show the main equation. What coefficient or test served to validate the author's hypothesis?

# ASSIGNMENTS

## PART I

### Ch.1 OLS Basics

1. Use the data from Table 1.1 to duplicate the calculations in Table 1.2. Create a spreadsheet file. Call it STATPAK.
2. Rules of Summation. Complete PS1-A1
3. Use/expand your 'STATPAK' model to complete P&R chapter end exercise Ex.1.1

### Ch.2 Statistics Review

1. Duplicate chapter exercise EX.2.1 with a spreadsheet.
2. Learn the desirable properties of estimators
3. Know the purpose of the most common probability distributions. Sec.2.4
4. Review confidence interval and hypothesis testing.
5. Descriptive Statistics. Moments  
Do chapter end exercise Ex.2.16 on a spreadsheet.  
n.b., Include the Jarque-Bera statistic in your calculations.

### Ch.3 OLS

1. Add the calculations for Table 3.1 to your STATPAK
2. Using the formulas introduced in the chapter add the following equations to your STATPAK:

Var(Beta_hat)	3.7
Var(alpha_hat)	3.9
SER = $S^2$	3.14
Std Error (Beta_hat)	Sq.Root 3.15
Std Error (Alpha_hat)	Sq.Root 3.16
COV(Alpha_hat,Beta_hat)	3.17
3. Duplicate chapter exercise EX.3.1
4. Add  $R^2$  (EQ. 3.27) to your STATPAK. n.b., Use EQ.3.26 as the basis for your calculations.
5. Add the F-Stat to your STATPAK. Formula is on p.75

### Ch.4 Multiple OLS

1. Duplicate chapter exercise EX.4.1 Auto Sales
2. Duplicate chapter exercise EX.4.2 Interest Rates
3. Duplicate chapter exercise EX.4.3 Consumption Function

4. Duplicate chapter exercise EX.4.5 Durable Good

QUIZZES: 1<sup>st</sup> part: Definition & essay. Blue book  
2<sup>nd</sup> part: Computer problem sets. Open book