

# Econometrics I

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## 1 Objective

The objective of this course is for you to become knowledgeable users of the linear regression model. The topics include the estimation and specification of the linear regression model, principle of maximum likelihood estimation, imposition and testing of exact linear parameter restrictions, testing nonnested hypotheses, testing of nonlinear hypotheses, detection of structural change, an introduction to the general linear regression model, and feasible GLS estimation of autocorrelated and seemingly unrelated regression models.

## 2 Recommended Textbooks

Judge, Hill, Griffiths, Lutkepohl, Lee, *Introduction to the Theory and Practice of Econometrics*, John Wiley & Sons, 1988.

Kennedy, Peter, *A Guide to Econometrics* 4th edition, MIT Press.

Greene, William H., *Econometric Analysis*, 5th edition, Prentice Hall, 2003.

- A link to the authors web site can be found at:  
<http://pages.stern.nyu.edu/~wgreene/Text/econometricanalysis.htm>.  
This information is quite important due to the relatively large number of errors found in the text. Data sets can also be downloaded from this site. This site is also very useful since it is the source of all the data used for homeworks in this course.

## Other Resources

*SAS/IML User's Guide*, Version 6

*SAS/IML Software: Changes and Enhancements through Release 6.11*

*SAS/ETS User's Guide*, Version 6, Second Edition

Fomby, Hill, and Johnson, *Advanced Econometric Methods*, Springer Verlag, 1984. Second Printing, 1988.

Jan Kmenta, *The Elements of Econometrics*.

Judge et al., *The Theory and Practice of Econometrics*, 2nd Edition, Wiley, 1985.

Schmidt, Peter, *Econometrics*, Marcel Dekker, 1976.

## 3 Prerequisites

This course requires you to work with probability, statistics, calculus, matrix algebra, and to write computer programs (as well as learn econometrics). If you have any doubts about whether your experience is sufficient, please talk to me about it. At a minimum, I assume that you know the basics of differential calculus, matrix algebra, probability theory, and how to use a Windows based microcomputer. I suggest that you read through Chapter 2 and the matrix algebra appendix in *The Introduction to the Theory and Practice of Econometrics*. If you have any doubts about whether your experience is sufficient, please talk to me about it.

## 4 Course Outline

1. Introduction
2. PDFs and Mathematical Expectations (Chapter 2, ITPE II)
3. Statistical Inference: Estimation and Hypothesis Testing (Chapter 3, ITPE II)
4. Classical Linear Regression Model (Chapter 2, Greene; Chapters 5 & 6, ITPE II; Chapters 3 & 4, Kennedy)
  - (a) Assumptions
  - (b) Estimators
    - i. OLS estimator (Chapters 3 & 4, Greene)

- ii. IV Estimator (Chapter 5, Greene)
  - iii. Using OLS when Gauss–Markov assumptions are violated
  - (c) Hypothesis Testing and Confidence Intervals (Section 6.4, ITPE II and Section 4.7 and Chapter 6 Greene)
5. Using Prior Information in Regression (Chapter 12, Kennedy)
- (a) Restricted Least Squares (Section 6.2, ITPE II and Chapter 6, Greene)
  - (b) Specification Analysis (Chapter 8.2, Greene; Section 20.4, ITPE II; and Chapter 5, Kennedy)
  - (c) Biased Estimators and Pretests (Section 20.3, ITPE II)
6. Wrong Regressors, Nonlinearities, and Parameter Inconstancy (Chapter 6, Kennedy)
- (a) Testing Nonlinear Restrictions (Section 6.5, Greene)
  - (b) Dummy Variables (Section 7.2, Greene)
  - (c) Tests of Structural Change (Sections 7.4-7.5, Greene)
  - (d) RESET
  - (e) Nonnested Hypothesis Tests (Section 8.3, Greene)
  - (f) Model Selection (Section 8.4, Greene)
7. General Linear Regression Model (Sections 10.1-10.2, Greene)
- (a) Consequences for Least Squares
  - (b) Efficient Estimation: GLS (Section 10.5, Greene)
  - (c) Estimation when  $\Omega$  unknown
  - (d) Heteroscedasticity (Chapter 11, Greene)
  - (e) FGLS estimation: Autocorrelation (Chapter 12, Greene)
  - (f) FGLS estimation: Seemingly Unrelated Regression (Section 14.2, Greene)
  - (g) Maximum Likelihood Estimation (Chapter 17, Greene)

## 5 Computer Assignments

Early in the course you will begin to use the computer to do portions of your homework. You will be responsible for learning to use the SAS system. The specific SAS modules that we will be working with are IML (Interactive Matrix Language) and ETS. IML is a high level programming language that uses a syntax very similar to the matrix algebra notation commonly used in econometrics. Learning IML will improve your understanding of econometrics and give you

more power over the econometric problems you encounter. I will show you some of the basics on how to use this specific module.

GAUSS is a mathematical programming language that is similar to SAS IML. In fact GAUSS is superior to IML in many respects. E-Views, Stata, Limdep and SHAZAM are other software packages that contains preprogrammed regression routines. Although I will not require you to learn these software packages, I want you to feel free to experiment with them. They are very powerful in their respective specialties.

I will assign a number of homeworks during the course, I want you to turn them in in sets at the times I designate in class.

## 6 Grades

Your grade in this class will be based on your performance on 3 exams and on homework assignments.

### Grade Weights

Exam 1	27%
Exam 2	27%
Exam 3	27%
Homework	19%

Grades will be assigned based on the following scale.

### Grades

90%–100%	A
76%–90%	B
60%–75%	C
50%–60%	D
< 50%	F

All exams must be taken at the designated time. No make up exams will be given. If you miss an exam you will receive a grade of zero.

Unless you are specifically told otherwise by me, all homework must be turned in at the beginning of the class period on the date that it is due. Homework will not be accepted if late.

## **7 Attendance**

Regular attendance is expected. You are responsible for any material you miss because of absence. In general, I do not permit students to copy my notes. If you miss class and need a copy of the notes, please obtain them from one of your classmates.