

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
DEPARTMENT OF ECONOMICS

ECON 503
ECONOMETRICS
SPRING 2022

SECTION M1: Tu – Th, 09:30 – 10:50 in 302 Architecture Bldg

SECTION M2: Tu – Th, 11:00 – 12:20 in 302 Architecture Bldg

SYLLABUS

Instructor Information:

Visiting Professor: Agiakloglou, Christos
Office: 126 DKH
Office Hours: Tu & Th 14:00 - 15:00 am or by appointment
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Teaching Assistants:

Squarize Chagas, Lucas
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Course Description

The current course will provide a thorough presentation of Econometrics, the branch of Economics that deals with estimation and evaluation of theoretical issues. The goal of the course is to help students understand how quantitative analysis works in Economics by presenting the underlying theory and having them to work on real data. The tools you will learn in this course will allow you to analyze the behavior of many Economic phenomena and derive policy conclusions.

The course consists of four parts. The first part will introduce concepts and methods from probability theory and statistical inference. The second part will present correlation analysis and regression analysis using the simple two variable regression model. The third part will examine the multiple regression model along with all problems that typically arise in regression analysis. The fourth part will discuss some of the issues that appear in regression analysis.

Course Prerequisites

The course will be taught in a self-contained way and therefore all materials needed for a good understanding of the concepts of this course will be presented in class. Students do not need to worry about their background in statistics and/or in econometrics. Brief reviews and proofs of basic concepts will be provided when needed.

Textbooks

- Pindyck, S. R. and Rubinfeld, L. D., *Econometric Models and Economic Forecasts*, 4th edition, McGraw Hill, 2001.
- Stock, H. J. and Watson, H. M., *Introduction to Econometrics*, 3rd edition, 2010, Pearson Addison Wesley.

Other useful Textbooks

- ⇒ Enders, W., *Applied Econometric Time Series*, John Wiley & Sons, Inc., 2009.
- ⇒ Granger, C. W. J. and Newbold, P., *Forecasting Economic Time Series*, Second Edition, Academic Press, Inc., San Diego, 1986.
- ⇒ Greene, W. H., *Econometric Analysis*, 5th edition, Prentice Hall, New Jersey, 2008.
- ⇒ Johnston, J. and Dinardo, J., *Econometric Methods*, 4th edition, McGraw Hill, New York, 2001.
- ⇒ Mills, T. and Markellos R., *The Econometric Modeling of Financial Time Series*, 3rd edition, Cambridge University Press, 2008.
- ⇒ Wooldridge, J. M., *Introductory Econometrics: A modern Approach*, South Western College Publishing, 2009.
- ⇒ Maddala, G.S. *Introduction to Econometrics*, Wiley, 2001.
- ⇒ Gujarati, D. *Basic Econometrics*, McGraw Hill, 1978.

Software Package

The first part of the course will rely primarily on the use of Excel. Excel is a very powerful and friendly to use software that will give students the chance to apply statistical techniques very easily. The second part, which requires more advanced software for econometric analysis, will rely on the STATA and R software package. For this purpose, there will be several tutorial sessions with applications using real data so that students will learn STATA and R.

Tutorial Classes

Additional tutorial classes will be offered on a weekly basis and they will take place in room 317 DKH. Students must attend the tutorial sessions every Friday according to the following schedule:

Section M1: 09:30 - 10:50

Section M2: 11:00 - 12:20

Tutorials will provide a mixture of additional applications and review of the material covered in the lectures. These sessions will be conducted by both Teaching Assistants and they will include applications using Excel, STATA and R software.

Grading

There will be 1000 total points for this course, with the following breakdown:

- *300 points for Exam I (Sections I – III). The date will be announced in class.*
- *300 points for Exam II (Sections IV – VI). The date will be announced in class.*
- *150 points for the three Problem Sets*
- *250 points for the Research Paper*

There will be three problem sets covering sections II and III (50 points each). In each problem set you will be asked to gather real data and analyze them using the appropriate technique required for each assignment: a) Statistical inference for the mean and the variance, b) Compute the sample correlation coefficient of two variables and test for its significance and c) Estimate a simple regression model and make statistical inference for the parameters, as well as forecast. More details on how to work on each problem set will be given to you as the course progresses. The problem sets are meant to be a short application of the material covered in class and the due date of each one will be announced in class.

The Research paper will be an applied work on a multiple regression model with at least two independent variables based on sections IV to VI. The paper should be at most 10 pages long and should include an attachment with your data and computer programs. **The research paper is due by May the 2nd until 10 am at 110 DKH or 203 DKH mail box.**

Course Outline

This outline represents the order of topics that will be covered in this course. However, some topics than others will receive more attention in lectures.

I. INTRODUCTION

1. What is Econometrics?
2. Economic versus Econometric Model
3. How Econometrics Works

II. STATISTICS

1. Random Variables (Discrete – Continuous)
2. Moments – Properties
3. Distributions of Random Variables
4. Parameter vs. Estimator – Properties of Estimators
5. Sample Mean and Sample Variance
6. Statistical Inference I (Confidence Interval)
7. Statistical Inference II (Hypothesis Testing)
8. Test for Normality

III. THE SIMPLE LINEAR REGRESSION MODEL

1. Correlation Coefficient – Properties
2. Sample Correlation Coefficient – Hypothesis Testing
3. The Simple Linear Regression Model – Presentation
4. Regression vs. Correlation
5. OLS Estimation
6. Coefficient of Determination
7. Properties of OLS Estimators
8. The unbiased estimator of σ^2
9. Statistical Inference for the regression parameters
10. Maximum Likelihood Estimation
11. Forecast

IV. THE MULTIPLE LINEAR REGRESSION MODEL

1. The Multiple Linear Regression Model – Presentation

2. OLS estimation
3. Matrix notation
4. Coefficient of Determination – Adjusted – Information Criteria
5. Partial Correlation Coefficient
6. Gauss-Markov Theorem
7. Statistical Inference for the regression parameters
8. Analysis of Variance
9. Joint tests for linear restrictions of the regression coefficients
10. Forecast

V. PROBLEMS IN REGRESSION ANALYSIS

1. Multicollinearity
2. Heteroscedasticity
3. Autocorrelation
4. No normality
5. Omitted variables

VI. ISSUES IN REGRESSION ANALYSIS

1. ARCH models
2. Dummy variables
3. Linear Probability model
4. Distributed lag models
5. Errors in variables (Expectations - Proxy variables - Instrumental variables)
6. Non-linear models
7. Estimating Demand Elasticities
8. Granger Causality - Co-integration