UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

DEPARTMENT OF ECONOMICS

MASTER OF SCIENCE AND POLICY ECONOMICS

ECON 504

TIME SERIES ANALYSIS IN ECONOMICS

SUMMER IIA 2023

M – Th, 11:00 – 12:20 and 13:30 – 14:50 in 317 DKH

SYLLABUS

***Instructor Information*:**

Visiting Professor: Christos Agiakloglou
Office: 216 DKH
Office Hours: M through F 3:00 - 4:00 pm or by appointment
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The current course will provide a thorough presentation of Time Series Econometrics, the branch of Economics that deals with estimation and evaluation of theoretical results based on time series data. The goal of the course is to help you understand how Time Series Analysis works alone and/or in collaboration with Econometric Analysis by having you work on real data, rather than forcing you to memorize proofs of several theorems. The tools you will learn in this course will allow you to analyze time series data and derive policy conclusions.

RECOMMENENDED TEXTBOOKS

- Walter Enders, *Applied Econometric Time Series*, John Wiley & Sons, Inc., 2014.
- Mills, T. and Markellos R., *The Econometric Modeling of Financial Time Series*, Third Edition, Cambridge University Press, 2008.

OTHER USEFUL TEXTBOOKS

- Box, G. E. P. and G. M. Jenkins, *Time Series Analysis Forecasting and Control*, Holden-Day, Oakland, 1976.
- Estrada, Javier, *Finance in a Nutshell*, Prentice Hall, 2005.
- Fuller, W. A., *Introduction to Statistical Time Series*, Second Edition, John Wiley & Sons, Inc., New York, 1996.
- Granger, C. W. J. and Newbold, P., *Forecasting Economic Time Series*, Second Edition, Academic Press, Inc., San Diego, 1986.
- Hamilton, J. D., *Time Series Analysis*, Princeton University Press, Princeton, 1994.
- Maddala, G. S. and In-Moo Kim, Unit Roots, Cointegration, and Structural Change, Cambridge University Press, Cambridge, 1998.
- Mills, T., The Econometric Modeling of Financial Time Series, Second Edition, Cambridge University Press, Cambridge, 1999.

GRADING

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

300 *Exam I – The date will be announced in class.*
300 *Exam II – The date will be announced in class.*
200 Problem Sets (Section IV)
200 Research Paper

There will be three problem sets that will cover the three parts of section IV (120 (2x60) points for parts A and B and 80 points for part C). In each problem set you will be asked to gather time series data and analyze them using the appropriate techniques taught in each part of section IV. I will give you more details on how to work on the problem sets as the course progresses. However, the problem sets are meant to be a short application of the material covered in the class.

The Research paper can be either a review of the theoretical techniques or an applied application based on the material covered in sections V and VI. The paper should be at most 10 to 15 pages long and should include an attachment with your data and computer programs. Students are encouraged to work in groups of two in the paper. **The research paper is due by Monday July 7th until 10 am.**

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

I. INTRODUCTION

1. Economic Theory
2. Economic versus Econometric Model
3. Decision Analysis

II. STATISTICS

1. A review in Statistics
2. Estimation and Forecasting

III. ECONOMETRICS

1. A review in Econometrics
2. Problem in Estimation
3. Special Issues
   Log Linear versus Linear Models
   Lagged Values
   Expectations
   Proxy Variables
   Partial Correlation Coefficients
   Trends
   Unit Root Test
   Lagged Dependent Variables
   Difference Equations

IV. TIME SERIES ANALYSIS

A. SMOOTHING TECNIIQUES

1. Simple Moving Average
2. Simple Exponential Smoothing
3. Holt's - Winters' Model

B. TIME SERIES DECOMPOSITION

Seasonal – Trend – Cyclical and Irregular components

C. BOX & JENKINS OR ARIMA (p, d, q) ANALYSIS

1. Stationarity
2. Autocovariances - Autocorrelations
3. Autoregressive Processes
4. Moving Average Processes
5. ARMA(p, q) Processes
6. Extentions of ARMA(p, q) Processes
   - Integrated Processes – ARIMA(p, d, q)
   - Seasonal Models
   - Fractionally Integrated ARMA(p, q) Processes – ARFIMA(p, d, q)
7. Model Building
   - Identification Stage
   - Parameter Estimation Stage
   - Model Checking Stage
8. Forecasts

V. ISSUES IN TIME SERIES ANALYIS

1. Testing for a unit aurotegressive root
2. Difference versus Trend Stationary Processes
3. Co-integration (Single Equation Method – Engle & Granger procedure)

VI. VAR ANALYIS

1. Introduction to VAR
2. Impulse response Function
3. Variance Decomposition
4. Hypothesis testing
5. Granger Causality
6. Cointegration - Johansen