

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
DEPARTMENT OF ECONOMICS
MASTER OF SCIENCE AND POLICY ECONOMICS

ECON 504
TIME SERIES ANALYSIS IN ECONOMICS
SUMMER IIA 2022

M – Th, 10:30 – 11:20 and 12:30 – 13:50 in 317 DKH

SYLLABUS

Instructor Information:

Visiting Professor: Christos Agiakloglou

Office: 216 DKH

Office Hours: M through F 2:00 - 3:00 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.

RECOMMENDED 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 11th 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 TECHNIQUES

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. Extensions 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 ANALYSIS

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

VI. VAR ANALYSIS

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