Applied Time Series Analysis

Undergraduate course syllabus by Aaron Medlin

Course description

This course deals with econometric methods and problems that arise when data consists of observations on one or several variables over time. Students will learn to model and forecast economic and financial time series data using modern econometric techniques. The primary text is "Applied Econometrics" (Fourth Edition) by Asteriou and Hall, supplemented by additional texts and academic articles. Topics include autocorrelation, stationarity, distributed lag and autoregressive models, ARIMA models, vector autoregression models, co-integration, and vector error correction models.

Course objectives

Upon completion of this course, students will be able to:

1. Understand the fundamental concepts of time series analysis in econometrics.
2. Develop skills in modeling, estimating, and forecasting using time series data.
3. Apply various time series econometric techniques to real-world economic and financial data.
4. Critically evaluate time series models in empirical research.
5. Use statistical software R or Stata for time series analysis.

Main text

- Asteriou, D., & Hall, S. G. (2021). Applied Econometrics (4th ed.). Palgrave Macmillan.

Additional texts

- Levendis, J. D. (2018). Time-Series Econometrics: Learning Through Replication. Springer.
- Enders, W. (2014). Applied Econometric Time Series (4th ed.). Wiley.
- Kilian, L., & Lütkepohl, H. (2017). Structural Vector Autoregressive Analysis
- Additional readings, including journal articles, will be provided throughout the course.

Course outline

I. Introduction to Time Series Econometrics

- Overview of Time Series Concepts
- Review of Basic Econometric Principles

  Reading: Asteriou and Hall, Chapters 1-2

II. Stationarity and Unit Roots

- Concepts of Stationarity

- Unit Root Testing

  Reading: Asteriou and Hall, Chapter 3; Levendis, Chapter

III. ARIMA Models

- Autoregressive Integrated Moving Average (ARIMA) Models
- Model Identification and Estimation

  Reading: Asteriou and Hall, Chapter 4; Levendis, Chapter 2, 3

IV. Volatility Models

- ARCH and GARCH Models
- Structural Breaks
- Applications in Financial Econometrics

  Reading: Asteriou and Hall, Chapter 7; Levendis, Chapter 8-9

IV. Cointegration and Error Correction Models

- Long-run Relationships and Cointegration
- Error Correction Models

  Reading: Asteriou and Hall, Chapter 5

- Forecasting with Time Series Models
- Forecasting Techniques
- Evaluation of Forecasting Models

  Reading: Asteriou and Hall, Chapter 6

V. Vector Autoregression Models

- Introduction to VAR
- Casuality Tests
- Generating and Interpreting Impulse Response Functions
- Structural VAR
- SVAR: Short run identification
- SVAR: Long run identification

  Readings: Asteriou and Hall, Chapter 15; Levendis, Chapter 10-11

VI. Vector Error Correction Models

- Cointegration
- Testing for cointegration
- Error correction mechanism
- Estimation of VECM

Readings: Levendis, Chapter 12