Macroeconometrics
(239.142)

1 Course Objectives

The aim of this Master-level course is to make students familiar with the concept of *time series* and their applications in empirical macroeconomics and finance. If necessary, we start with a refresher of the theory and solution of first- and second-order difference equations, before introducing the concept of a likelihood function and *Maximum Likelihood estimation* (MLE). In what follows, the course covers the specification and estimation of *stationary* and *nonstationary univariate* time series models with *homoskedastic* and *heteroskedastic* error terms. We then introduce *multivariate* time series models such as vector-autoregression (VAR) models, for example, and the concept of *co-integration*.

This course is "applied" in the sense that students must solve practical homework assignments that involve coding your own statistical tests and estimation routines in MATLAB or R. The course is intended for students in the Master program *Economics* and students in the Master program *Management and Applied Economics* with an interest in applied econometrics. Other master students with a specialization in finance, statistics, or related fields are very welcome. The course is *not* intended for students at the Bachelor level.

2 Prerequisites

Participants are expected to have some background in multiple regression analysis, be familiar with simple statistical concepts, such as correlation and covariation, and know how to use OLS estimation and fundamental statistical testing procedures such as t- and F-tests, for example.

3 Course Content

  I. Introduction and Background

    1. The Concept of Time Series

    2. Difference Equations and their Solution (Self-Study)

    3. Maximum Likelihood Estimation

  II. Univariate Time Series Models

    4. Stationary Time Series Models

    5. Deterministic and Stochastic Trends

    6. Modeling Time-Varying Volatility

  III. Multivariate Time Series Models

    7. Vector-Autoregression (VAR) Models

    8. Co-integration and Vector Error-Correction (VEC) Models

4 Literature

The content of this course largely draws on selected chapters from

- Enders, Walter (2010). *Applied Econometric Time Series.* 3rd edition. John Wiley & Sons.

1. Other References for Macroeconometrics:

   - Favero, Carlo A. (2001). *Applied Macroeconometrics.* Oxford University Press.
   - Hamilton, James D. (1994). *Time Series Analysis.* Princeton University Press.
   - Lütkepohl, Helmut and Markus Krätzig (2004). *Applied Time Series Econometrics.* Cambridge University Press.
   - Lütkepohl, Helmut (2005). *New Introduction to Multiple Time Series Analysis.* Springer.

2. References for Dynamic Mathematics:

   - Chiang, Alpha C. and Kevin Wainwright (2005). *Fundamental Methods of Mathematical Economics.* 4th edition. McGraw Hill.
   - Sydsæter, Knut, Peter Hammond, Atle Seierstad, and Arne Strøm (2005). *Further Mathematics for Economic Analysis.* Pearson Education Limited.

3. General Econometrics References:

   - Brooks, Chris (2008). *Introductory Econometrics for Finance.* 2nd edition. Cambridge University Press.
   - Davidson, Russell and James G. MacKinnon (1993). *Estimation and Inference in Econometrics.* Oxford University Press.
   - Greene, William H. (2008). *Econometric Analysis.* 6th edition. Pearson Prentice Hall.
   - Wooldridge, Jeffrey M. (2013). *Introducing Econometrics: A Modern Approach.* 5th edition. South-Western Cengage Learning.

5 Course Organization

There will be a two-hour (90 minute) lecture every week, except during Easter Break (April 15 – April 28) and on Labor Day (May 1). Part of the lecture time will be used to illustrate practical problems and applications. Course materials such as slides, data, and MATLAB code will be made available online through KUSSS.

6 Time and Location

Wednesday, 10:15–11:45 (1st class on March 6)
Room: MZ 005A (Management Center)

7 Grading

This course has **4 ECTS points** (= 100 hours). Students are expected to prepare the relevant chapters in Enders (2010) *before* the topics are discussed in class in greater detail. Students are required to solve regular homework assignments that contain both paper-and-pencil derivations and applications for actual or simulated time series (e.g. from Enders, 2010). Your final grade will be based on the homework assignments (40%) and a written final exam (60%).

8 Language

The lecture, the assignments, and the final exam will all be *in English*.

9 Lecturer

Jochen Güntner
Email: jochen.guentner@jku.at
Homepage: http://www.econ.jku.at/2653/
Office: K 124A (Kepler Building, First Floor)
Consultation upon **email appointment**

10 Software and Data Links

Please note that I will be able to provide **sample solutions and code for MATLAB only!**

- You can buy an *unbundled* (i.e. without toolboxes) MATLAB Student Version starting at €35.

- A *free alternative* to MATLAB is the The R Project for Statistical Computing. Also check out the page r-econometrics maintained by Franz Mohr, a former student of JKU Linz.

- Data and supplementary material for the Second Edition, Third Edition, and the Fourth Edition of Walter Enders' textbook are available online free of charge.