



Università degli studi di Milano Bicocca

Syllabus

Course:	Econometrics - Time Series
Professors:	Andrea Ugolini and Daniele Valenti
Contact:	andrea.ugolini@unimib.it and daniele.valenti@feem.it

Course Description

This course introduces time series methods. In this course, students learn about time series, univariate autoregressive moving average models, various unit root tests, Vector AutoRegression models (VAR) and Structural Vector AutoRegression models (SVAR). Additionally, the course will examine ongoing research and recent developments in time series analysis.

Course Objectives

Course objectives include developing the skills necessary to conduct empirical research with time series data. Hence, the course enables students to understand how to choose, estimate, and assess time series models. Special attention will be placed on the limitations and pitfalls of different methods. Students who complete the course will have a wide range of time series methods available to them, which can be applied to several fields. Additionally, students will be able to critically evaluate and summarize the results of time series models. In addition to learning these research methods, students will also be introduced to the popular R programming language. Also, in the practical part of the course, students will be introduced to the programming language Matlab and apply it to structural models of the energy market and inflation.

Course Content

- Introduction
 - Stochastic Process
 - White noise
 - Correlation and Autocorrelation Function
- Univariate Time Series Models
 - AR Model
 - MA Model
 - ARMA Model
- Nonstationary and unit root tests
- Multivariate Time Series Models
 - Vector autoregressive models – VAR
 - Structural vector autoregressive models – SVAR

Assessment

Final exam with theoretical and practical questions (i.e. interpretation of empirical results)

References

- Aastveit, K. A., Bjørnland, H. C., & Cross, J. L. (2021). Inflation expectations and the pass-through of oil prices. *The Review of Economics and Statistics*, 1-26.
- Baumeister, C., & Hamilton, J. D. (2015). Sign restrictions, structural vector autoregressions, and useful prior information. *Econometrica*, 83(5), 1963-1999.
- Baumeister, C., & Hamilton, J. D. (2019). Structural interpretation of vector autoregressions with incomplete identification: Revisiting the role of oil supply and demand shocks. *American Economic Review*, 109(5), 1873-1910.
- Gonçalves, S., & Kilian, L. (2004). Bootstrapping autoregressions with conditional heteroskedasticity of unknown form. *Journal of econometrics*, 123(1), 89-120.
- Kilian, L. (2009). Not all oil price shocks are alike: Disentangling demand and supply shocks in the crude oil market. *American Economic Review*, 99(3), 1053-69.
- Tsay, R. S. (2005). *Analysis of financial time series*. John Wiley & Sons.
- Tsay, R. S. (2013). *Multivariate time series analysis: with R and financial applications*. John Wiley & Sons.