

# Doctoral Program in Economics



Academic year 2024/25

## TIME SERIES

### Period:

VI term

### Course hours:

20

### Teachers:

Alessandro Palandri, Emilija Dzuverovic

### Exam method:

First part: A take-home exam, consisting of an empirical analysis complemented by some theoretical questions.

Second part: A list of exercises, due after 14 days, is assigned at the end of the lessons that counts for 80% of the grade for the second part of the course. The remaining 20% of the corresponding grade is associated with the class activity.

### Prerequisites:

Passing grade in Econometrics I, Panel Data.

### Program

The first part of the course introduces key features of time series data, with a focus on stationarity. In the stationary setting, students study static linear regressions and dynamic models such as ARIMA and ADL, along with lag operators, model selection, and forecasting. The course then addresses non-stationary processes, covering autoregressive unit-root models and unit-root testing. Concepts of economic equilibrium and error correction motivate the study of cointegration, leading to the Engle-Granger two-step method and the analysis of dynamic adjustments.

The second part of the course covers the following:

- Review of estimation methods (OLS, MLE) and ARMA processes
- ARCH and GARCH models
- Realized Volatility: Measures and Models
- Generalized Autoregressive Score (GAS) models and their applications

Econometric software used throughout the course include gretl (first part), MATLAB (second part), and R (second part).

### Educational objectives

The course covers fundamental topics in time series and financial econometrics. It will deliver a general overview of a comprehensive list of empirical methods that allow researchers to analyse time series data. Such tools are essential for PhD students who aspire to conduct state-of-the-art empirical research. In addition, the course will provide general guidance on formulating and executing (empirical) research ideas.

### Bibliographical references

1. "A Guide to Modern Econometrics" Marno Verbeek, Wiley, 2017
2. "Time Series Analysis" James D. Hamilton, Princeton University Press 1994
3. "Econometric Analysis" William H. Green, Prentice Hall, 7th Ed.