



# UNIVERSITÀ DI PISA

## TIME SERIES ECONOMETRICS

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**GIUSEPPE RAGUSA**

|                 |           |
|-----------------|-----------|
| Anno accademico | 2018/19   |
| CdS             | ECONOMICS |
| Codice          | 247PP     |
| CFU             | 6         |

|                             |           |         |     |                 |
|-----------------------------|-----------|---------|-----|-----------------|
| Moduli                      | Settore/i | Tipo    | Ore | Docente/i       |
| TIME SERIES<br>ECONOMETRICS | SECS-P/05 | LEZIONI | 42  | GIUSEPPE RAGUSA |

### Obiettivi di apprendimento

#### Conoscenze

*Time Series Econometrics* is aimed at students who wish to gain a working knowledge of time series and forecasting methods as applied in economics, social sciences, and finance. The course introduces the theory and practice of time series analysis, with an emphasis on practical skills. More generally, students will gain an appreciation for the role of dependence in statistical modeling.

#### Prerequisiti (conoscenze iniziali)

Students need to be familiar with basic concepts in probability and statistics, linear algebra, and calculus.

#### Indicazioni metodologiche

It is expected that all students attend the lectures, be up to date with their readings and be prepared to participate fully in class. If you have problems mastering the material covered in class, please ask questions in class or during office hours.

#### Programma (contenuti dell'insegnamento)

1. From Cross-Section to Time Series: asymptotic theory under serial correlation
2. Stationary Process
  1. Linear processes
  2. The Wold decomposition
  3. ARMA processes
    1. Representation. Estimation. Forecasting. Applications.
3. Non-stationary Time Series Model
  1. ARIMA models for non-stationary time series
  2. Unit Roots
  3. Forecasting with ARIMA models
4. Multivariate Time Series
  1. Vector Auto-Regressions (VAR)
  2. Modeling and Forecasting with VAR
  3. Cointegration
  4. Structural vs Reduced Form VAR: identification
5. State-Space Models
  1. Linear State-Space models
  2. State-Space representation of ARIMA models
  3. The Kalman filter
  4. Parameter Estimation for State Space models

#### Bibliografia e materiale didattico

The main reference for this courses is:

- Brockwell, Peter J. and Richard A. Davis, *Introduction to Time Series and Forecasting*, Springer, 2002

However, especially for some of the topics, other references are going to be useful:

- Enders, Walter. *Applied econometric time series*. John Wiley & Sons, 2008
- James D. Hamilton, *Time Series Analysis*, Princeton University Press, 2005



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### Modalità d'esame

The final grade depends on their performances on two written in-class exams, a midterm and a comprehensive final, and a take-home exam. The take-home is made available to students two weeks prior to the end of the course and it is due back at the beginning of the last day of class. Midterm, comprehensive final and take-home exam are compulsory for successfully completing the course, and they will be valid until the second semester of the academic year 2019—2020. The final grade is calculated as a weighted average the three exams according to the following weighting scheme: Take-home: 30% Midterm: 20% Final: 50%

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