

# Data Science for Economics

**MASTER'S DEGREE IN ECONOMICS AND FINANCE**

***UNIVERSIDAD INTERNACIONAL MENÉNDEZ PELAYO***

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## GENERAL DATA

### Name

Data Science for Economics

### Code

102685

### Academic year

2024-25

### Degree

[MASTER'S DEGREE IN ECONOMICS AND FINANCE](#)

### ECTS Credits

6

### Type

ELECTIVE

### Duration

Cuatrimestral

### Language

English

# CONTENTS

## Contents

The Data Science in Economics course is where the dynamic fields of econometrics and machine learning converge. The course delves into the art and science of predictive modeling, with a special focus on leveraging the power of Natural Language Processing (NLP) through Python.

# COMPETENCES

## General competences

- G1 - Demonstrate solid knowledge of economic theory, and the relevant economic, econometric and computational techniques.
- G2 - Know how to apply the knowledge acquired and be able to use problem-solving abilities in new or relatively unknown settings within wider or multidisciplinary contexts related to economics and finance.
- G3 - Integrate knowledge and tackle the complexity involved with making judgements based on incomplete or limited information, and which includes reflections on the social and ethical responsibilities tied to the application of one's knowledge and judgement.
- G4 - Critically analyse, assess and summarise new and complex ideas related to empirical theories and methodologies in the field of economics.
- G5 - Design and carry out an advanced academic research project, formulating reasonable hypotheses in the field of economics.
- G6 - Give clear and unambiguous oral presentations of scientific and technical work on economics to specialised and non-specialised audiences.
- G7 - Produce suitable written compositions, as well as work projects or scientific articles.
- G8 - Organise and plan one's own work, fostering initiative and an entrepreneurial spirit.
- G9 - Become part of work groups dedicated to economic research projects.
- G10 - Demonstrate sufficient independence, and study and summary skills so that after the master's programme, students are able to undertake a PhD in the field of economics.

## Specific competences

- EO1 - Be aware of the theory of the firm and the main industrial economics models, as well as their main applications.
- EO2 - Be aware of the main job market models and available empirical evidence.
- EO3 - Master the analytical tools explained on the course in industrial economics, in order to analyse market failures and the corresponding competition regulation and promotion policies.
- EO4 - Be aware of the main models and empirical evidence about economic development, specifically with regard to agriculture, and market and institutional failures.
- EO5 - Be aware of the theory of optimal taxation, and empirical models and results regarding the effects of taxation on how households and businesses behave, as well as public spending theory and welfare programmes.
- EO6 - Be aware of the economic theory on how land and housing markets, local governmental and territorial development operate.
- EO7 - Be aware of advanced theories and models on modern macroeconomics.
- EO8 - Be aware of the main open economy models, specifically relating to the interaction between fiscal and monetary policies, and exchange rate policy.
- EO9 - Be familiar with the main macroeconomic phenomena, how they are measured through national and international statistical resources, and forecasting through advanced statistical techniques.
- EO10 - Use modern macroeconomic quantitative techniques to assess the impact of different economic policies on the principal macroeconomic aggregates, and income and wealth distribution.
- EO11 - Be aware of modern applied econometric methods, specifically autoregressive and dynamic general equilibrium models, with a particular focus on Bayesian econometric models.

EO12 - Be aware of the appropriate econometric models to describe and forecast different economic time series, as well as analyse the relationships between them suggested by economic theory.

EO13 - Be aware of the suitable econometric techniques to model behaviour of individual economic agents at theoretical and applied level, with a view to understanding the interaction between models, data and methods.

EO14 - Possess knowledge regarding the interaction between theoretical models, data and econometric methods outlined by applied work, analysing representative articles on different ways to approach empirical work in micro- and macroeconomics.

EO15 - Possess in-depth knowledge on the methods used in estimating models for financial markets.

EO16 - Be aware of the main risk assessment models and their use in different financial instruments.

EO17 - Master advanced asset valuation models for both fixed income and equity, and derivatives, with a particular focus on methods based on arbitrage valuation, stochastic calculus and changing probability measures.

EO18 - Be familiar with analysing business finance decisions and other aspects of their relationship with capital markets, especially information problem-based theories.

EO19 - Be aware of the most characteristic features of micro- and macroeconomics, and the operation and regulation of banking activities from a perspective of modern financial intermediation theories.

EO20 - Master interest rate and exchange rate risk analysis, and well as those risks arising from an equity portfolio, using derivative assets for hedging.

# LEARNING PLAN

## Training activities

Type of activity	Hours	%In person
Theory classes		100
Practical classes		100
Study of the theory content of the course		0
Solve practical exercises		0
Prepare class presentations		40

## Teaching methods

Theory classes  
 Exercises  
 Essay writing  
 Class discussion on work submitted by students

## Learning outcomes

- Be aware of the theory of the firm and the main industrial economics models, as well as their main applications.
- Be aware of the main job market models and available empirical evidence.
- Master the analytical tools explained on the course in industrial economics, in order to analyse market failures and the corresponding competition regulation and promotion policies.
- Be aware of the main models and empirical evidence about economic development, specifically with regard to agriculture, and market and institutional failures.
- Be aware of the theory of optimal taxation, and empirical models and results regarding the effects of taxation on how households and businesses behave, as well as public spending theory and welfare programmes.
- Be aware of the economic theory on how land and housing markets, local governmental and territorial development operate.
- Be aware of advanced theories and models on modern macroeconomics.
- Be aware of the main open economy models, specifically relating to the interaction between fiscal and monetary policies, and exchange rate policy.
- Be familiar with the main macroeconomic phenomena, how they are measured through national and international statistical resources, and forecasting through advanced statistical techniques.
- Use modern macroeconomic quantitative techniques to assess the impact of different economic policies on the principal macroeconomic aggregates, and income and wealth distribution.
- Be aware of modern applied econometric methods, specifically autoregressive and dynamic general equilibrium models, with a particular focus on Bayesian econometric models.

- Be aware of the appropriate econometric models to describe and forecast different economic time series, as well as analyse the relationships between them suggested by economic theory.
- Be aware of the suitable econometric techniques to model behaviour of individual economic agents at theoretical and applied level, with a view to understanding the interaction between models, data and methods.
- Possess knowledge regarding the interaction between theoretical models, data and econometric methods outlined by applied work, analysing representative articles on different ways to approach empirical work in micro- and macroeconomics.
- Possess in-depth knowledge on the methods used in estimating models for financial markets.
- Be aware of the appropriate econometric models to describe and forecast different economic time series, as well as analyse the relationships between them suggested by economic theory.
- Master advanced asset valuation models for both fixed income and equity, and derivatives, with a particular focus on methods based on arbitrage valuation, stochastic calculus and changing probability measures.
- Be familiar with analysing business finance decisions and other aspects of their relationship with capital markets, especially information problem-based theories.
- Be aware of the most characteristic features of micro- and macroeconomics, and the operation and regulation of banking activities from a perspective of modern financial intermediation theories.
- Master interest rate and exchange rate risk analysis, and well as those risks arising from an equity portfolio, using derivative assets for hedging.

# EVALUATION

## Evaluation system

Type	Minimum score	Maximum score
Exercises	0.05	0.3
Presentations	0.05	0.15
Exams	0.7	0.95



## **FACULTY**

### **Coordinator/s**

**Caruana Húder, Guillermo**

*Catedrático de Economía, Boston University*  
*Profesor de Economía*  
*Centro de Estudios Monetarios y Financieros (CEMFI)*

### **Lecturers**

**Rauh , Christopher**

*University of Cambridge*