Année universitaire 2024/2025

Quantitative Economics - 1st year of master's degree

Crédits ECTS : 60

LES OBJECTIFS DE LA FORMATION

The first year of the Master in Quantitative Economics offers general training in economics. Entirely taught in English, the curriculum covers a broad range of economic issues, enabling you to reflect on the decision-making procedures of public and private stakeholders in a wide area of economic problems. The strong emphasis on quantitative methods will also allow you to become familiar with a variety of techniques for processing and analyzing data.

Skills acquired:

- Master fundamental concepts in economics (macroeconomics, microeconomics, game theory, industrial economics
- Learn how to model and solve the economic problems facing various sectors of the economy: Health, labor market, public policies, macroeconomics, finance, energy, development, …
- Get trained in various methods for processing and analyzing data to seek reliable, robust solutions to a given problem
- Acquire training in economic research and reflect on public and private stakeholders' decision-making procedures
- Report on economic, statistical and/or econometric results to different audiences, orally and in writing

The Master in Quantitative Economics allows interested students to engage in the PhD Research Track of the PSL Graduate Program in Economics.
The PhD Research Track is a 2-year training (M1 Quantitative Economics – Master 2 Quantitative Economic Analysis track) for students who plan to pursue their PhD studies. In addition to validating all the courses included in the M1 QE and then the M2 QEA, being enrolled in the PhD Research Track asks for a research internship in a research center attached to a university, an international organization, or an administration in M1 or M2. The objective is to allow interested students to have a first experience in a research environment as early as the Master's degree.

The fact of having followed the PhD Research Track will be considered as an asset by the PSL SDOSE Doctoral School's Admissions Committee when examining applications, in particular for a doctoral contract (3-year financing of a PhD thesis).

PRÉ-REQUIS OBLIGATOIRES

- Applicants should have obtained a bachelor's degree (Graduate degree equivalent to 180 ECTS) from a university, or a diploma from an IEP (Institute of Political Studies), Grande Ecole, or Grand Etablissement recognized as equivalent, in France or abroad.
- It is preferred but not required that students have an academic background in these fields: economics, mathematics applied to economics, and computer science applied to economics.
- B2-level mastery of English is required. This must be attested by a certificate of achievement from one of the following tests: TOEFL iBT (minimum score of 90), IELTS (minimum score of 6.5), GMAT (min score650) or GRE (GMAT equivalent min score of 650). English-native candidates or students who have followed an international training in English of at least one year over the last two years and who have passed the corresponding exams are exempted. Applicants whose studies for their undergraduate degree have been undertaken wholly or mainly at a university located outside the EU must supply GRE/GMAT General Test scores in all cases

PROGRAMME DE LA FORMATION

- Semester 1
  - Track Recherche PG Eco
    - Introduction to Matlab programming
    - Data Management and Programming
    - Macroeconometrics
  - Mandatory courses M1 Quantitative Economics
    - Macroeconomics I
    - Game theory
    - Microeconomics I
    - Mathematical and statistical tools
- Semester 2
  - Track recherche PG Eco
    - Microeconometrics
    - Microeconometrics : applications with Stata
  - Mandatory
    - Microeconomics II
    - Industrial Organization
  - Optional : Choose 1
    - Population Economics
    - Advanced Industrial Organisation
    - Measurement issues with applications to GDP, poverty and inequality
    - Macroeconomics II
  - Open your mind
    - Topics in advanced economic analysis

DESCRIPTION DE CHAQUE ENSEIGNEMENT

Advanced Industrial Organisation

ECTS : 3

Description du contenu de l'enseignement :

The course on Advanced Industrial Organization is the follow-up of the basic theories and models developed in the Industrial Organization class. We shall first explore the relationships among firms in the specific context of procurement and regulation. We will the introduce social regulation (economic evaluations that can be used in assessing environmental controls, health and safety). We shall then analyze dynamic aspects of competition that represent critical issues in high technology and information technology industries: innovation and persistence of market dominance, network externalities and two-sided markets.
In complement to the Course of Industrial Organization, this course aims at covering most models of imperfect competition among firms to propose an analysis of various pricing strategies, marketing strategies and other strategic manipulations that characterize firms' behavior when they try to gain or maintain market power.

Compétence à acquérir :

After attending the classes, the students will have acquired a deep understanding of the advanced methods of quantitative industrial organization and game theory, to study the strategic interaction between firms and regulators, and dynamic competition models.

Mode de contrôle des connaissances :

0.5

Bibliographie, lectures recommandées :

Economics of Regulation and Antitrust, Viscusi, Vernon Harrington. The Theory of Industrial Organization, Tirole.

Data Management and Programming

ECTS : 3

Description du contenu de l'enseignement :

This course provides an introduction to programming and to data management, with a data- oriented point of view. The course contains two parts. The data management part introduces the data life cycle in data oriented projects from data collection to data exploration. While the main focus of the course is tabular data, it contains also an introduction to entity-relationship models and to relational databases. The programming part of the course introduces the fundamental aspects of imperative programming and the use of the main Python data structures. The two aspects of the course are tightly integrated: each aspect of data management is illustrated by adapted programming constructs and uses specific data structures from Python. In addition, an introduction to computational complexity is provided and the scalability of all the methods presented in the course is assessed.

Compétence à acquérir :

The first objective of the course is to introduce students to data-driven projects, by presenting the first steps of such projects from data collection to data exploration. Acknowledging the strong limitations of integrated software that rely solely (or mostly) on graphical user interfaces, the second major objective of the course is to provide all the programming knowledge and tools needed to implement all those data management steps, relying on Python language.

After having attended the classes, the students will be able to:

- specify a data management chain adapted to a data-driven project;
- identify the potential data value increase at the different steps of the chain;
- implement those steps in Python: data cleaning, data storage, data aggregation and other requests, data exploration;
- more generally implement non-obvious data manipulation schemes in Python;
- assess the computational complexity of Python scripts

Mode de contrôle des connaissances :

The final grade will be made of two types of grading: A continuous assessment grade, made mostly of grades obtained to quizzes (approximately 50 % of the grade) and integrating oral participation during the class and regular attendance; A grade obtained on a full data-oriented project from data collection to data exploration (preferably done in groups of 2 students).

Bibliographie, lectures recommandées :

Python for Data Analysis, Wes McKinney, OReilly, 2017.

Game theory

ECTS : 6

Description du contenu de l'enseignement :

Chapter 1: Normal form games: pure and mixed strategy Nash equilibrium; weakly/strictly dominated strategies , iterated elimination of dominated strategies.

Chapter 2: Dynamic games: Backward induction, subgame perfect Nash equilibrium, repeated games.

Chapter 3: Incomplete information (in static games): Bayesian Nash equilibrium; introduction to some applications (auctions, finance...)

Compétence à acquérir :

The objective of the course is to give some fundamental background in interactive decision making and its applications. After having attended the classes, the students will be able to understand the basic tools of game theory and the importance of this field in economics and finance.

Mode de contrôle des connaissances :

A mid-term exam and a final exam

Industrial Organization

ECTS : 6

Description du contenu de l'enseignement :

The course will analyse the following topics: Static models of oligopoly, Quality and product differentiation ; Tacit collusion ;

Asymmetric information (Static competition, Communication, Limit pricing) ; Competition and Investment ; Welfare Standards in Competition Policy.
The objective of the course is to provide a presentation of modern industrial organization that blends formal models with real-world applications and derives implications for firm strategy and competition policy.

Compétence à acquérir :

After having attended the classes, the students will understand strategies chosen by firms with market power and how such firms adapt to different market environments.

Introduction to Matlab programming

ECTS : 0

Macroeconometrics

ECTS : 6

Description du contenu de l'enseignement :

This course will provide the fundamental tools in macroeconometrics. It starts providing the basic knowledge on the modelling of univariate time series, the concept of stationarity, the main tools to represent a univariate time series. Then, it will show some extensions to this basic framework (time varying parameters, selection of variables…). The course will also introduce to forecasting. We will then present the modelling of multivariate time series with VAR models, explain how structural VAR analysis is the natural set up to depart from a purely statistical description and provide economic interpretation. Finally, different extensions to this set up will be introduced: time-varying parameters, co-integration, expectations ….

Compétence à acquérir :

The objective of the course is to provide the student with the solid theoretical and practical knowledge of the methods used to analyse and model time series data. Practical skills will be acquired through the modelling of economic time series with econometric software (practical sessions under Matlab). After having attended the classes, the students will master the main tools of time series' modelling and be able to run an empirical work by themselves.

Mode de contrôle des connaissances :

Final Exam (50%) + Final Project in pairs (40%) + Participation (10%)

Bibliographie, lectures recommandées :

Hamilton, J.D. (1994). Time Series Analysis, Princeton University Press.
Johnston, J. and J.E. DiNardo (2007), Econometric Methods, Mac Graw-Hill Econometric series.

Macroeconomics I

ECTS : 6

Description du contenu de l'enseignement :

The course will cover the following topics.

1. Stylized facts about long run growth – Growth decomposition and the Solow residual
2. The impact of growth on economic welfare
3. The Solow model and conditional economic convergence
4. The Ramsey model
5. Externalities and the AK growth model; the role for tax policy
6. R&D, innovation and growth (Romer (1990) model)
7. Growth in creation / destruction models (Aghion – Howitt model)
8. Growth with directed technical change
9. Sustainable growth and energy transition analysis
10. Economic growth and declining population

Compétence à acquérir :

The course will provide students with sound knowledge and understanding of the basis of modern macroeconomic theory regarding long run economic growth. After attending the classes, the students will master the fundamental models of modern macroeconomics in view of analysing the key issues and policies relative to long run economic growth.

Mode de contrôle des connaissances :

60% of the final grade is based on a final exam (closed book exam).

40% is based on regular short quizzes.

Participation in class will be considered as bonus over this grade.

Bibliographie, lectures recommandées :

Reference book: Aghion, Philippe and Howitt, Peter "*The Economic of Growth*", MIT Press 2008

- Daron Acemoglu, 2002. "Directed Technical Change." *Review of Economic Studies* 69(4): 781–809.
- Daron Acemoglu, Philippe Aghion, Leonardo Bursztyn, and David Hemous, 2012,"The Environment and Directed Technical Chang", *American Economic Review 2012, 102(1): 131–166*
- Charles I. Jones and Peter J. Klenow (2016) "Beyond GDP? Welfare across Countries and Time", *American Economic Review*, 2016, 106(9): 2426-2457
- Charles Jones (2022) "The end of economic growth? Unintended consequences of a declining population, *American Economic Review, 2022, 112(11): 3489-3527*

Macroeconomics II

ECTS : 3

Description du contenu de l'enseignement :

After presenting the stylized facts about the business cycle, the course will study the canonical real business cycle model that focuses on the role of technological shocks as determinant of macroeconomic fluctuations. We will then consider the role of monetary policy. After presenting some empirical evidence on the role of money, we will study the classical monetary model. The third part of the course is dedicated to the basic new Keynesian model with monopolistic competition and nominal price rigidities. Within this framework, we will study the role of technological shocks as well as monetary policy shock and discuss their empirical relevance regarding business cycles features.

Compétence à acquérir :

The course will provide students with sound knowledge and understanding of the basis of modern macroeconomic theory of business cycles. After attending the classes, the students will master the fundamental RBC and New Keynesian models of business cycles. They will get familiar with the modelling of price rigidities to explore the role of monetary policy within New Keynesian models analytically as well as to assess their quantitative predictions in terms of business cycles features.

Mode de contrôle des connaissances :

The final grade will be based on two grades: a mid-term grade (30%) and a final exam grade (70%).

The final grade is based on a final written exam (closed-book exam). The mid-term grade is made on the grade obtained on a homework document. Ideally the homework is on an individual basis, but depending on the number of students to follow the course, the home-work document might be made by a team of max. 2 students. For this homework, the student(s) will have to provide a thoughtful analysis of a research paper (to be chosen within a given list). The student(s) will be assessed on her capacity to explain the paper's main research question, the modeling assumptions and the main results, as well as the underlying macroeconomic mechanisms. The student(s) will also be evaluated on their ability to have some critical eye on the model's performances.

Bibliographie, lectures recommandées :

- Gali, Jordi, Monetary Policy, Inflation and the Business Cycle: An Introduction to the New Keynesian Framework, Princeton University Press (2d edition)
- King, R., Plosser, C. & Rebelo, S. "Production, Growth and Business Cycles", *Journal of Monetary Economics*, 1988, vol. 21, pp. 195-232.
- Gali, J, "Technology, Employment and the Business Cycle: Do Technology Shocks explain aggregate fluctuations?" The *American Economic Review*, 1999, vol. 89, n.1, pp. 249-271

Other references will be provided along the course.

Mathematical and statistical tools

ECTS : 3

Measurement issues with applications to GDP, poverty and inequality

ECTS : 3

Description du contenu de l'enseignement :

Is GDP a suitable measure of economic and social progress? What makes a distribution of income more or less equal? How to quantify environmental damages?

This course aims at addressing these questions. It is a methodological course that discusses the measurement of economic and social outcomes. Policies are often designed based on indexes and quantitative objectives, while defining those indexes and outcomes is not always straightforward. In this course, we will discuss both the theoretical and empirical aspects of how to construct outcome variables: how are the conceptual choices made in terms of what is included or excluded from the computation of an indicator, and how each component is valued? Which data are used and do they allow to observe the entire phenomenon we want to measure? How do we translate the theoretical concepts into the data?

An introductory session will focus on what to be measured and how to measure it. In particular, it will discuss what the potential biases introduced by data choices (what is the source of the data, the size and representativeness of the sample, etc.). It will be followed by topic sessions on GDP, inequality, employment and unemployment, education, and the measurement of phenomenon that cannot be directly observed.

Compétence à acquérir :

This course will allow students to have a critical eye on how socioeconomic indicators are built. It will provide them with some statistical tools regarding the measurement of phenomenon and cover more specific measurement issues in a range of economic and social dimensions. This reflection will allow students to better understand some of the controversial questions that are discussed in the public debate, and to themselves build social and economic indicators.

This class will be useful to all students, and in particular those who intend to do a PhD dissertation in economics using empirical data, as well as students who plan to work in institutions that produce economic statistics, studies and policy recommendations.

Mode de contrôle des connaissances :

Assessment will be based on a presentation (30%), a project (65%) and participation in class (5%). The presentation will consist in presenting in class a research paper where measurement issues are central (30%). Regarding the project, students will be given a list of questions to choose from and will be asked to reflect on which indicator they could build to address this question.

Bibliographie, lectures recommandées :

A specific reading list with articles provided for each lecture

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Microeconometrics

ECTS : 6

Description du contenu de l'enseignement :

This course focuses on micro-econometrics techniques based on temporal data (cross-sectional and panel) and qualitative dependent variables. The first part will explore possible sources of OLS bias and discuss techniques and estimators to address those biases (micro-econometrics techniques for temporal data, such as first difference, random effects, fixed effects and difference-in-differences estimators). Non-linear models (Probit, Logit models), as well as selection models (Tobit, Heckman selection models) will be the focus of the second part of the course, as well as the instrumental variable estimator.
The main themes are presented under a theoretical perspective, accompanied by empirical applications on Stata.

Compétence à acquérir :

At the end of the course the students will master the main micro-econometrics techniques for probability models and temporal data and they will be able to critically analyze applied work that employs these types of estimators.

Mode de contrôle des connaissances :

Students will be evaluated in two steps. They will present in pairs a scientific paper among a list provided by the teacher. This will be the same paper to be replicated for the Database and Stata Programming course. The presentation will count for 30% of the final note. The rest of the note will be based on a final written exam scheduled in the exams' week.

Bibliographie, lectures recommandées :

List of scientific papers for students' presentations will be provided at the beginning of the course.
Selected chapters from:

1. Wooldridge, J. (2002) "Econometric analysis of cross-section and panel data", MIT Press, Cambridge.
2. A. Colin Cameron and Pravin K. Trivedi (2005), "Microeconometrics: Methods and Applications", Cambridge University Press

All slides, datasets, papers and other materials will be available on the MyCourse webpage.

Microeconometrics : applications with Stata

ECTS : 3

Description du contenu de l'enseignement :

The course presents the Stata coding language for applying micro-econometrics techniques. In the first part of the course, the main Stata features are explained by focusing on the estimation of econometric models with qualitative variables and selection models. In the second part of the course, students will learn how to analyse temporal and panel data with Stata and how to estimate temporal models, such as random effects, fixed effects and double differences. Moreover, the course will provide students with the appropriate knowledge for reproducing their econometric analyses in a professional format.

Compétence à acquérir :

The main objective of this course is to provide students with Stata coding skills for describing and analysing cross-sectional and panel data and for estimating probability and temporal econometric models.

After having attended the classes, the students will be able to describe and analyze phenomena of interest contained in cross-sectional and panel datasets by using Stata. They will be able to conduct econometric analysis concerning probability and temporal models with graphs and tables formatted in a professional manner.

Mode de contrôle des connaissances :

Critical analysis and replication of a research paper's results in a short dissertation format.

Bibliographie, lectures recommandées :

1. Cameron, Adrian Colin, and Pravin K. Trivedi. *Microeconometrics using stata*. Vol. 2. College Station, TX: Stata press, 2010.

2. Gentzkow and Shapiro (2014) "Code and Data for the Social Sciences: A Practitioner's Guide."

Internet resources:

1. Stata video tutorials: https://www.stata.com/links/video-tutorials/

2. UCLA tips: http://www.ats.ucla.edu/stata/

Microeconomics I

ECTS : 6

Description du contenu de l'enseignement :

The objective of the course is to provide a comprehensive exposition of the way consumers and firms make their consumption and production decisions in a competitive economy and on how prices are determined in the market (partial equilibrium). The consideration of other market structures like monopoly or oligopoly will give an understanding of how market power affects firms' behavior and the formation of prices.

Planning / Course Schedule

Producers, Consumers, and Competitive Markets

Consumer Behavior

Individual and Market Demand

Duality

Production

The Cost of Production

Profit Maximization and Competitive Supply

The Analysis of Competitive Markets

Market Structure and Competitive Strategy

Market Power: Monopoly and Monopsony

Pricing with Market Power

Monopolistic Competition and Oligopoly

Compétence à acquérir :

This course will provide a formalized exposition of the optimal consumption and production decisions by consumers and firms,

which determine the allocation of scarce resources in a competitive economy, where agents are assumed to be price takers. The analysis will provide an understanding of how prices are determined by the interaction of the decisions of consumers and firms. The course will then examine the behaviour of individuals in economies with other institutional frameworks (different market structures).

Students will be provided an intuitive understanding of the economic content of the models, and of their purpose and nature, as well as a clear account of their mathematics.

Mode de contrôle des connaissances :

50%(continuous assessment)+50% final exam result.

Continuous assessment: overall attendance and participation in class and effort to solve exercises on a weekly basis+ Midterm test.

Bibliographie, lectures recommandées :

Main textbooks:

· Robert S. Pindyck, Daniel L. Rubinfeld, “Microeconomics “, Pearson, 2018.

· David Besanko and Ronald R. Braeutigam, “Microeconomics”, 3rd edition, John Wiley & Sons

· Hugh Gravelle and Ray Rees, “Microeconomics”, 2004, 3rd Edition, FT Prentice Hall

· H. Varian, “Microeconomic Analysis”, Norton & Company, Inc., 3rd edition, 1992

Microeconomics II

ECTS : 6

Description du contenu de l'enseignement :

The aim of the course is to present the basic principles of public economics, showing the link between theoretical analysis and public policy applications in practice. The course will provide:

· An overview the main tools of public economic analysis,

· A presentation of the main market failures and a discussion of government intervention,

· An introduction to taxation

· A presentation of social insurance and redistribution programs

Theoretical concepts will be presented along with empirical evidence. Particular emphasis will be put on the recent empirical advances in public policy analysis.

Compétence à acquérir :

After having attended the classes, the students should master the analytical tools and empirical methods to analyze the main market failures and the policies implemented to address them. They should also understand the fundamental trade-off between redistribution and efficiency and the challenges posed by the design of a tax/benefit system.

Population Economics

ECTS : 3

Description du contenu de l'enseignement :

Population economics applies an economic perspective to demography or the analysis of human populations. This course will provide an introduction to selected fields and research areas that are relevant for the economic analysis of populations, incl. family economics, migration economics, health economics and the economics of ageing. We will discuss theoretical models that help to explain, e.g., the relevance of economic factors for marriage and divorce, how income and education affect the number of children born in a family and investment in these children, or how pension policies affect younger generations. We will consider relevant empirical studies that test hypotheses derived from these models and discuss how economic insights might help to address some of the major challenges of the 21st century, such as population growth in low-income countries, international migration and population ageing in high-income countries.

Schedule:

1 Family Economics: Partnership formation and dissolution, intrahousehold decision-making

2 Family Economics: Fertility, Intergenerational links

3 Economics of migration: Determinants of migration, internal and international migration, characteristics of migrants

4 Economics of migration: Migrant's health, family and labour market outcomes

5 Health Economics: Demand for health, health production and healthcare supply

6 Health Economics: Healthcare spending and health insurance

7 Economics of ageing: Older workers, retirement and pensions

8 Economics of ageing: Healthy ageing and long-term care

Compétence à acquérir :

After completing the course, students will have an overview of some of the most important theories in population economics and the empirical evidence supporting or contradicting these theories. They will be able to discuss economic aspects of family formation, fertility, migration, health and ageing. Students will be able to read and critically assess empirical papers on these topics. The course will provide students with the required background for a specialization in health economics, family economics or the economics of ageing for the Master 2 or a Master thesis project in these research areas.

Mode de contrôle des connaissances :

- Presentation of a research paper (30% of the final grade)

- Written final exam (70% of the final grade)

Topics in advanced economic analysis

ECTS : 3