M2 RECHERCHE EN FINANCE
M2 RESEARCH IN FINANCE

Cours spécifiques à l'option Magistère Economie, Data Science et Finance

Dernière mise à jour / last update: juin 2025.

Data Visualisation for Economic Analysis (non MAG)
Visualisation des données pour l'analyse économique (non MAG)

COURSE LANGUAGE
English

TEACHER
Ségal LE GUERN-HERRY – segal.le-guern-herry@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
The idea of this course is to provide students with a set of tools for data wrangling and data visualization. One of the goal is to learn how to choose the right data visualization in various contexts. The coding part is conducted on R.

COURSE OUTLINE
- Theory of data visualization
- Starting with R
- Data wrangling
- Making a plot
- Polishing and presenting plots
- Exploratory data analysis
- Making maps
- Data scraping

KEY PROFESSIONAL SKILLS UPON GRADUATION
Data wrangling: Importing, cleaning, manipulating, pivoting data
Data visualization: from simple to complex graphs, dealing with spatial data.
Introduction to data scraping

ORGANIZATION
Semester: S1
Teaching Hours: 24 h of tutorials, in 8 sessions of 3 hours each
Examination Method: 3 assessments throughout the semester

BIBLIOGRAPHY AND TEXTBOOKS
Kieran Healy, « Data Visualization, A Practical Introduction", 2018
Jonathan Schwabish, « An Economist's Guide to Visualizing Data", Journal of Economic Perspectives, 2014
Carl. T. Bergstrom and Jevin D. West, "Calling Bullshit, The Art of Skepticism in a Data- Driven World", 2020
Dacley Wickhman & Garett Grolemund, "R for Data Science", 2017, O'Reilly Media.

RECOMMENDED PREREQUISITES
Highly recommended to have some notions in R.

KEYWORDS
Coding, data, visualization

Dernière mise à jour / last update: juin 2025.

Advanced Econometrics
Econométrie approfondie

COURSE LANGUAGE
English

TEACHER
Emmanuel FLACHAIRE – emmanuel.flachaire@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
The goal of this course is to present advanced methods in econometrics for distributional analysis, regression and classification models. The course will present theoretical foundations and underlying intuition of each method, as well as several empirical examples.

COURSE OUTLINE
1. Resampling Methods
   - Pseudo-random generator
   - Monte Carlo experiments
   - Bootstrap and permutation tests
2. Nonparametric Econometrics
   - Density estimation
   - Regression splines
   - Finite mixture models
3. Econometrics and Machine Learning
   - Philosophy and general principle
   - Resampling-based methods and algorithms
   - Misspecification detection

ORGANIZATION
Semester: S1
Teaching Hours: 24 h of lectures

BIBLIOGRAPHY AND TEXTBOOKS
Ahamada et Flachaire (2011) Non-Parametric Econometrics, Oxford University Press.
Efron et Hastie (2016) Computer Age Statistical Inference, Cambridge University Press.

Dernière mise à jour / last update: juin 2025.

Economics of Networks
Economie des réseaux

COURSE LANGUAGE
English

TEACHER
Romain FERRALI – romain.ferrali@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
This course introduces a fast-growing field of research: the economics of social networks, from both theoretical and empirical perspectives. The course covers three main themes: network description, network formation, and behavior on networks. The approach combines theoretical rigor with empirical applications.

COURSE OUTLINE
Describing networks (theory and empirics)
Network formation (theory and empirics)
Behaviour on networks (diffusion, network games, learning)

KEY PROFESSIONAL SKILLS UPON GRADUATION
Formally describe networks
Understand key questions in network economics
Solve standard theoretical network models
Identify statistical challenges in network analysis and appropriate techniques

ORGANIZATION
Semester: S1
Teaching Hours: 24 h of lectures
Examination Method: Final exam + Written essay

BIBLIOGRAPHY AND TEXTBOOKS
Jackson, Matthew O. 2008. *Social and Economic Networks*. Princeton University Press
Newman, Mark. 2018. *Networks*. Oxford University Press
Bramoullé, Yann; Galeotti, Andrea; Rogers, Brian (eds.). *The Oxford Handbook of the Economics of Networks*. Oxford University Press
Watts, Duncan. 2004. *Six Degrees: The Science of a Connected Age*. W. W. Norton & Company

MANDATORY PREREQUISITES
Basic mathematical tools
Microeconomics knowledge

RECOMMENDED PREREQUISITES
Familiarity with formal economic models
Basic statistics

KEYWORDS
Social networks, network economics, graph theory, diffusion, learning

Dernière mise à jour / last update: juin 2025.

Advanced Macroeconomics
Macroéconomie approfondie

COURSE LANGUAGE
English

TEACHER
Cécilia GARCIA PEÑALOSA – cecilia.garcia-penalosa@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
The aim of the course is to explore the branch of macroeconomics concerned with economic growth and development. The course seeks to make students acquire two types of skills. First, we will examine in detail the core models and learn to solve macro-models that address development questions. Second, the course will attempt to answer a number of questions on growth by discussing the literature that addresses a particular question.
The course consists of two sections. The first part will examine the seminal work in the field. We will study the various mechanisms that will result in sustained long-run growth -learning-by-doing, investments in infrastructure, education, and firms' R&D decisions– and analyse the role played by externalities and increasing returns to scale. We will see that a crucial implication of these growth models is that the equilibrium growth rate is not socially optimal, and that a laissez-faire economy can grow either too slowly or too fast. We will also examine the causes of economic development, and why poverty traps may emerge. The explanations proposed include the theory of "the big push", whereby increasing returns to scale can result in poverty traps and hence explain why certain economies remain underdeveloped. We will then address the role of "threshold effects" in education, their implications for development, and the importance of the distribution of wealth.
The second part of the course will examine several topics to provide an overview of the literature covering them.
There will also be three problem sessions.

COURSE OUTLINE
Part I
- Towards endogenous growth
- Poverty Traps
- The Big Push
- Threshold Effects
- Income Distribution and Macroeconomics
- Technological change
- Expanding product variety
- Quality ladders
- General purpose technologies

Part II
- The new growth evidence
- Trade and Growth
- Institutions and development
- Competition and Growth

KEY PROFESSIONAL SKILLS UPON GRADUATION
Develop modelling skills in macroeconomics, understanding the causes of long-term growth and of why some countries remain in poverty traps.

BIBLIOGRAPHY AND TEXTBOOKS
Barro, R. and X. Sala-i-Martín, *Economic Growth*, 2004.
Aghion, P. and P. Howitt, *Endogenous Growth Theory*, MIT Press 1998.
Aghion, P. and P. Howitt, *The Economics of Growth* , MIT Press 2008.
Aghion, P. and S. Durlauf (eds.) *Handbook of Economic Growth,* North Holland 2005.

ORGANIZATION
Semester: S1
Teaching Hours: 24 h of lectures
Comment: Lecture notes and other material are available on AMeTICE.
Examination Method: Problem sets + Final written exam

Dernière mise à jour / last update: juin 2025.

Advanced Microeconomics
Microéconomie approfondie

COURSE LANGUAGE
English

TEACHER
Renaud BOURLES – renaud.bourles@centrale-med.fr
Frédéric DEROIAN – frederic.deroian@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
The theory of incentives primarily addresses situations of asymmetric (or decentralized) information in economic interactions, particularly when the objectives of the parties involved are conflicting. It provides tools to tackle regulatory issues typically absent from general equilibrium models and to analyse the inner workings of firms in greater detail. Examples include the provision of public goods (when the government lacks complete information about preferences) and task delegation, whether by a manager to a worker or by a government to a firm managing a natural monopoly. In such cases, unobserved actions or private information about costs or valuations cause deviations from classical models, often invalidating welfare theorems and preventing efficiency. This inefficiency arises from the need to offer "informational rents" to the party holding the private information.

Other prominent applications of incentive theory include optimal taxation, price discrimination, auctions, and insurance. Asymmetric information typically falls into two categories: hidden information and hidden action. In the first case, one party has incomplete knowledge about certain characteristics of the relationship, such as production costs, consumer willingness to pay, or risk levels. These scenarios are modelled as adverse selection, where failing to distinguish between different "types" often leaves the uninformed party dealing with the least desirable ones. In the case of hidden action, the asymmetry concerns a choice—commonly referred to as effort—made by the informed party. Here, the challenge is to design incentives that align the effort of the informed party with the objectives of the uninformed party, a situation known as moral hazard.

In this course, we focus on the Principal-Agent framework, which assumes (i) two parties: one informed and one uninformed, and (ii) that the Principal makes a take-it-or-leave-it offer to the Agent. We abstract away issues of bargaining (game-theoretic considerations) and contract enforceability, assuming all agreements are binding. The course covers the basic models of adverse selection and moral hazard, their main applications, and key extensions. It concludes with an exploration of the limits of incentive theory, including countervailing incentives and behavioural considerations.

COURSE OUTLINE
I. Hidden information: screening and signalling
   1. A classic example: recall on second degree price discrimination
   2. Mechanism design and revelation principle
   3. A more general model of adverse selection
   4. Applications and extensions
      i. Credit rationing
      ii. Regulation of natural monopolies
      iii. Delegation and audit
   5. Signalling models
      iv. The basic problem: market for lemons
      v. Education as a Signal
      vi. Application to corporate finance
   6. Dynamic aspects: renegotiation and commitment

II. Hidden action: The issue of moral hazard
   1. Core model - basic insights
      i. First and second best
      ii. Risk neutrality
      iii. Limited liability
   2. Extending the core-model
      i. more than two outcomes
      ii. more than two levels of effort
      iii. a kick look at continuous outcomes
   3. Applications
      i. Financial contracts
      ii. Sharecropping
      iii. Efficiency wages

iv. Insurance markets

4. Extensions
   i. Does payment scheme destroy intrinsic motivation?
   ii. Relational contracts

BIBLIOGRAPHY AND TEXTBOOKS

Bolton, P. and Dewatripont, M., *Contract Theory*, MIT Press.
Laffont, J.-J. and D. Martimort, D., *The Theory of Incentives -- The Principal-Agent Model*, Princeton University Press.
Salanié, B., *The Economics of Contracts: A Primer*, MIT Press.

ORGANIZATION

Semester: S1
Teaching Hours: 24 h of lectures
Comment: 12 h with R. Bourlès Bourlès (http://renaud.bourles.perso.centrale-marseille.fr) and 12 h with F. Deroïan (https://sites.google.com/view/fredericderoian). Handouts are available on AMeTICE.
Examination Method: Mid-term exam (1/3 of the grade): comment a paper related to the empirics of incentives + Final written exam (2/3 of the grade)

Dernière mise à jour / last update: juin 2025.

Game Theory II
Théorie des jeux II

COURSE LANGUAGE
English

TEACHER
Gaëtan FOURNIER – gaetan.fournier@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
The aim of this course is to provide you with an overview of the use of game theory in economic research. This course is not an advanced technical course in game theory but rather a survey of key concepts, moving beyond the (perhaps overly) conventional "Nash equilibrium." Throughout the course, these concepts will be explored from both a theoretical and practical perspective, with the presentation of a research paper applying these concepts in various economic fields.
You will have the opportunity to participate by presenting an economic issue of your interest, suitable for the application of one of the concepts discussed.

COURSE OUTLINE
We will cover at least the following six concepts. The course content can be marginally adjusted to accommodate the specific interests of students.

Topic 1: Cooperation or competition
Topic 2: Sequential Games
Topic 3: Efficiency of Equilibrium
Topic 4: Voting
Topic 5: Games on Network
Topic 6: Matching

ORGANIZATION
Semester: S1
Teaching Hours: 24 h of lectures
Comment: Elective.
Examination Method: Final written exam

Dernière mise à jour / last update: juin 2025.

Public Decision
Décision publique

COURSE LANGUAGE
English

TEACHER
Nicolas GRAVEL – nicolas.gravel@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
The course presents some of the methods used by economists for evaluating policies based on their performance in allocating various attributes (incomes, health, well-being, opportunities, etc.) among their members. It focuses both on the theoretical foundations of the methods - by connecting them to modern theories of justice - and on their empirical tractability. A particular emphasis is devoted to robust dominance methods that are consistent with a wide range of ethical beliefs.

COURSE OUTLINE
a) Introduction, motivations and examples
b) Modern theories of distributive justice
   1. Arrovian social choice theory and its pessimism
   2. welfarist escape from Arrow's theorem.
   3. non-welfarist escape from Arrow's theorem
c) Comparing distributions of one attribute
   1. Efficiency criteria: Suppes' dominance, Pareto dominance, headcount poverty, increments, headcount poverty, welfarist or non-welfarist dominance
   2. Efficiency measures.
   3. Equality criteria: Pigou-Dalton transfers, Composite transfers, Poverty gap, Lorenz curves, welfarist or non-welfarist dominance
   4. Inequality indices
   5. Combining efficiency and equality: robust dominance criteria.
   6. Empirical applications
d) Comparing distributions of several attributes
   1. Statistical dominance
   2. Poverty dominance
   3. Welfarist dominance
   4. Elementary transformations
   5. Empirical applications

KEY PROFESSIONAL SKILLS UPON GRADUATION
A good working knowledge of the main methods for comparing distributions of attributes among individuals used in economics (Inequality indices, Lorenz and Poverty curves, etc.) and their links to modern theories of social justice.

ORGANIZATION
Semester: S1
Teaching Hours: 24 h of lectures, in 8 sessions of 3 hours each
Comment: Elective.
Examination Method: Written final exam on the course material + Short essay summarizing two published research papers. The two evaluative devices (exam and essay) carry equal weight. The students can prepare themselves to the exam by performing exercises on the AMETICE page of the course.

BIBLIOGRAPHY AND TEXTBOOKS
The detailed slides are available on AMeTICE. A detailed list of references is given on AMETICE. The student can also consult/read:

K. J. Arrow*, Social choice and individual values,* 2nd edition,Cowles foundation monographs, Yale, 1963
A. Atkinson and F.Bourguignon*, Handbook of income distribution, Elsevier*, North Holland, 1999.
C. Blacklorby, W. Bossert and D. Donaldson *"Population Issues in Social Choice Theory, welfare economics and ethics,* Cambridge University Press, 2005.
F. Cowell "*Measuring Inequalities*", 3rd Edition, Oxford University Press, 2015.
M. Fleurbaey, *Théories Economiques de la Justice*, Economica, Paris, 1995

P. J. Lambert, *The Distribution and Redistribution of Income: A Mathematical Analysis*, Oxford, Basil Blackwell
J. Roemer, *Theories of Distributive Justice*, Harvard University Press, 1996
A. Sen, *Collective Choice and Social Welfare*, Holden Day, 1970.

Dernière mise à jour / last update: septembre 2024.

Advanced Corporate Finance
Finance d'entreprise approfondie

COURSE LANGUAGE
English

TEACHER
Practitioner

COURSE DESCRIPTION AND OBJECTIVES
The aim of this course is to provide the fundamentals of empirical research in corporate finance, so that students can move into the full range of research areas within corporate finance.

PLAN DU COURS / COURSE OUTLINE
The course will cover the following topics:
- tools and databases used in empirical corporate finance
- research in corporate finance (classical topics such as : financing and payout policies, M&A and takeover defenses, corporate ownership and governance structures)
- research in entrepreneurial finance and private equity
- research in behavioral corporate finance

ORGANIZATION
Semester: S1
Teaching Hours: 24 h of lectures
Comment: Elective.

BIBLIOGRAPHY AND TEXTBOOKS
Denis, D. J. (2024). Handbook of Corporate Finance. Edward Elgar Publishing Ltd.
Eckbo, B. E. (2007). Handbook Of Corporate Finance. North-Holland.
Eckbo, B. E., Phillips, G. M., & Sorensen, M. (2023). Handbook of the Economics of Corporate Finance: Private Equity and Entrepreneurial Finance. North-Holland.
Malmendier, U. (2018). Behavioral Corporate Finance✶. In B. D. Bernheim, S. DellaVigna, & D. Laibson (Eds.), Handbook of Behavioral Economics: Applications and Foundations 1 (Vol. 1, pp. 277–379). North-Holland. https://doi.org/10.1016/bs.hesbe.2018.08.001

Dernière mise à jour / last update: septembre 2024.

Stochastic Process and Application
Processus Stochastique et Application

COURSE LANGUAGE
English

TEACHER
Practitioner

COURSE DESCRIPTION AND OBJECTIVES
The course aims at presenting stochastic processes and their application to economics and finance.

COURSE OUTLINE
1. Introduction: conditional expectation and integral theory
2. Stochastic processes (incl. martingales)
3. Discrete martingales and applications (incl. Cox-Ross-Rubinstein model)
4. Continuous martingales and Brownian motion
5. Application to finance: the Black and Scholes model
6. Application to economics: dynamics of natural resources

KEY PROFESSIONAL SKILLS UPON GRADUATION
Understand the definition and basic properties of stochastic processes
Know how to apply them to model economic and financial phenomena.

ORGANIZATION
Semester: S1
Teaching Hours: 24 h of lectures
Comment: Elective.

BIBLIOGRAPHY AND TEXTBOOKS
Steven Shreve, Stochastic Calculus for Finance I: The Binomial Asset Pricing Model, 2005.
Steven Shreve, Stochastic Calculus for Finance II: Continuous-Time Models , 2005.
Steven Roman, Introduction to the Mathematics of Finance: From Risk Management to Options Pricing, 2004.

Dernière mise à jour / last update: juin 2025.

Automatic Model Selection Methods
Modèles de réduction de l'information

COURSE LANGUAGE
English

TEACHER
Sullivan HUE – sullivan.hue@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
The objective of this course is to introduce quantitative methods allowing to reduce information. These methods cover different fields of statistics and are based on classical econometric methods (OLS, MLE) or classificatory or principal component methods. The goal is to study methods to do automatic variable selection in large-scale problems and to apply them to real data.

COURSE OUTLINE
- Classification methods
- Statistical factor models
- Lasso methods
- The so-called « General to Specific » method (Hendry, Gets or Autometrics Methodology)

KEY PROFESSIONAL SKILLS UPON GRADUATION
Understanding new methods
Application on real data
Learning new tools or econometric softwares dedicated to the reduction of information

ORGANIZATION
Semester: S1
Teaching Hours: 24 h of lectures

BIBLIOGRAPHY AND TEXTBOOKS
Doornik, J.A. and Hendry, D.F. (2015). Statistical model selection with "Big Data", Cogent Economics & Finance, vol 3, n°1, 1-15.
Hendry, D.F. and Doornik, J.A. (2014). Empirical Model Discovery and Theory Evaluation. Automatic Selection Methods in Econometrics. The MIT Press.
Richard A. Johnson and Dean W. Wichern, Applied Multivariate Statistical Analysis, Pearson.

Dernière mise à jour / last update: juin 2025.

Time Series
Séries temporelles

COURSE LANGUAGE
English

TEACHER
Gilles DUFRENOT – gilles.dufrenot@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
The objective of this course is to provide the students with some tools that are necessary for those who will be confronted in their future careers with functions requiring knowledge in quantitative finance and quantitative economics analysis. The course includes theoretical and applied aspects using R software.

COURSE OUTLINE
1.- Extreme distributions and copula analysis
2.- Regime-switching non-linear models: Markov-switching and STAR models
3.- Long-memory models

KEY PROFESSIONAL SKILLS UPON GRADUATION
Acquire complex tools for analyzing time series
Learn how to use the R programming language to estimate nonlinear models
Learn how to identify unusual behavior in series: regime shifts, hysteresis, extreme events.

ORGANIZATION
Semester: S1
Teaching Hours: 24
Examination Method: Final Exam + Work in group

BIBLIOGRAPHY AND TEXTBOOKS
G. Dufrénot and T. Matsuki (eds), 2021, Recent Econometric Techniques for Macroeconomics and Financial Data, Springer Verlag (see the chapter written by Aditi Chaubal).
Elements of copula Modelling with R (https://copula.r-forge.r-project.org/book/)
P. Robinson (ed), 2023, Time series with long-memory, Oxford University Press (https://academic.oup.com/book/51958)

MANDATORY PREREQUISITES
Students must have basic knowledge of time series: dynamic modelling, ARIMA models, stochastic and deterministic stationarity. In addition, knowledge of programming in R is required. Familiarity with elementary probability distributions and laws is also essential.

RECOMMENDED PREREQUISITES
Knowledge of spectral analysis is recommended for analysing time series in the frequency domain (spectral density, power spectrum, spectral windows).

KEYWORDS
Markov-switching, Copula, ARFIMA, Long-Memory, nonlinearity

Dernière mise à jour / last update: septembre 2024.

Research Questions
Questions de recherche

COURSE LANGUAGE

English

TEACHER

Practitioners

COURSE DESCRIPTION AND OBJECTIVES

This course is organized as a series of 12 lectures of 2 hours each during which faculty members will introduce students to a series of modern research topics.

ORGANIZATION

Semester: S1
Teaching Hours: 24 h of lectures

Dernière mise à jour / last update: juin 2025.

Professionalisation Workshops
Ateliers de professionnalisation

COURSE LANGUAGE
English

COURSE DESCRIPTION AND OBJECTIVES
This workshop is designed to guide students in their transition from academic training to the job market. **Participation in all activities is mandatory.**
It combines several complementary components:

- **Afterworks** (on campus or online), where companies and institutions introduce themselves to students, share insights into their missions, and discuss opportunities for collaboration.
- A **Career Day**, organized in two parts: first, recent graduates present their career paths, current positions, and how their training helped them enter the job market; second, a large recruitment fair brings together around 50 local, national, and international companies and institutions to offer internships and job opportunities.
- A course entitled *"Building a Strong Application"*, providing practical tools and strategies for professional integration.
  It is divided into three parts:
  - First part (lecture): Preparing for interviews (best practices, preparation methods, and self-presentation); searching for an internship or a job abroad (application strategies, networks, and resources); negotiating salaries (key principles for successful negotiation).
  - Second part (workshops): Small-group sessions offered to M2 students, focusing on CV writing and mock interview practice.
  - **Third part (AMF):** Students will be supported for preparing the AMF (French Financial Market Authority) certification through lectures and on-line preparation.

Together, these activities give students concrete experience, direct contact with employers, and essential skills to confidently approach their future careers.

KEY PROFESSIONAL SKILLS UPON GRADUATION
By the end of the workshop, students will possess the essential skills to approach the job market with confidence. They will know how to present themselves effectively, understand recruiters' expectations in France and abroad, and activate a professional network. Through lectures and practical workshops, they will be able to prepare strong applications, succeed in interviews, and conduct salary negotiations with assurance. They will lastly be able to pass a certification allowing to work within the French financial market.

ORGANIZATION
Semester: S1
Teaching Hours: 10 h of tutorials
Comment: Students will do the AMF certification.

Dernière mise à jour / last update: juin 2025.

Dynamic Macroeconomics
Macroéconomie dynamique

COURSE LANGUAGE
English

TEACHER
Thomas SEEGMULLER – thomas.seegmuller@univ-amu.fr
Alain VENDITTI – alain.venditti@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
The last two decades have shown the importance of interactions between the financial and real spheres at the macroeconomic level. Following the development of network theory, a new emphasis on multisector growth models has also been proposed, focusing on medium run macroeconomic fluctuations. The aim of this course is precisely to study certain aspects of these interactions. We will focus on questions that have undergone recent empirical and theoretical developments: the link between economic activity and speculative bubbles, the link between medium run cycles and multisector optimal growth models, and the link between growth, macroeconomic volatility and public debt.

COURSE OUTLINE
1. Macroeconomics with rational bubbles
   - 1.1. Rational bubbles, definition and existence in a growth model
   - 1.2. Crowding-in effect: the liquidity and collateral roles of bubbles
   - 1.3. Entrepreneurship, growth and productivity with bubbles
   - 1.4. Rational bubbles on assets with a fundamental value
2. Macroeconomic fluctuations
   - 2.1. Endogenous fluctuations in two-sector models
   - 2.2. Consumer durables and business cycles fluctuations
   - 2.3. Growth, macroeconomic instability and public debt
   - 2.4. Growth and instability in a small open economy with debt

KEY PROFESSIONAL SKILLS UPON GRADUATION
Dynamic analysis, understanding mechanisms explaining macroeconomic fluctuations, understanding the link between the real and financial spheres of the economy

BIBLIOGRAPHY AND TEXTBOOKS
Part 1

Clain-Chamosset-Yvrard, L. Raurich, X. and T. Seegmuller (2023), « Are the liquidity and collateral roles of asset bubbles different? », Journal of Money Credit and Banking 55, 1443-1473.

Clain-Chamosset-Yvrard, L. Raurich, X. and T. Seegmuller (2024), "Entrepreneurship, growth and productivity with bubbles", Journal of Macroeconomics 81, 103622.

Clain-Chamosset-Yvrard, L. Raurich, X. and T. Seegmuller (2024), " Rational bubbles on assets with a fundamental value", AMSE WP 2024-08.

Grossman, G. and N. Yanagawa (1993), « Asset bubbles and endogenous growth » Journal of Monetary Economics 31, 3-19.

Hirano, T. and A.A. Toda (2024), ``Bubble economics'', Journal of Mathematical Economics 111, 102944.

Kamihigashi T. (2008), ``The spirit of capitalism, stock market bubbles and output fluctuations'', International Journal of Economic Theory 4, 3-28.

Tirole J. (1985), ``Asset bubbles and overlapping generations'', Econometrica 53, 1499-1528.

Part 2

Beaudry, P., D. Galizia and F. Portier (2020): ``Putting the Cycle Back into Business Cycle Analysis'', American Economic Review, 110(1), 1-47.

Benhabib, J. and K. Nishimura (1979): ``The Hopf Bifurcation and the Existence and Stability of Closed Orbits in Multisector Models of Optimal Economic Growth'', Journal of Economic Theory, 21, 421-444.

Benhabib and Nishimura (1985): ``Competitive Equilibrium Cycles'', Journal of Economic Theory, 35, 284-306.

Chéron, A., K. Nishimura, C. Nourry, T. Seegmuller and A. Venditti (2019): "Growth and public debt: what are the relevant trade-offs?", Journal of Money, Credit and Banking, 51, 655-682.

Modesto, L., C. Nourry, T. Seegmuller and A.Venditti (2021): ``Growth and Instability in a Small Open Economy with Debt,'' Mathematical Social Sciences, 112, 26–37.

Nishimura, K., F. Pelgrin and A. Venditti (2025): ``Business Cycles Fluctuations in Three-Sector Intertemporal Equilibrium Models'', Journal of Economic Theory, 226, 106010.

ORGANIZATION

Semester: S2
Teaching Hours: 24 h of lectures
Comment: Elective.
Examination Method: File + Oral Presentation

MANDATORY PREREQUISITES

First year of Master in Economics.

RECOMMENDED PREREQUISITES

Good understanding of macroeconomic courses

KEYWORDS

Dynamic analysis, life-cycle models, growth, financial assets, rational bubbles, expectation-driven fluctuations

Dernière mise à jour / last update: juin 2025.

Macroeconomics Cycles
Cycles macroéconomiques

COURSE LANGUAGE
English

TEACHER
Frédéric DUFOURT – frederic.dufourt@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
The purpose of the course is to acquire relevant knowledge to analyze (both theoretically and numerically) discrete-time dynamic rational-expectation models in economics. Applications in the field of Dynamic Stochastic General Equilibrium (DSGE) and endogenous fluctuation models will be presented during computer sessions using Matlab software

COURSE OUTLINE
Chap 1: Introduction to dynamic macroeconomic models
Chap 2a: Univariate linear rational expectation models
1. A simple asset-pricing equation
2. Solution under adaptative expectations
3. Solution under perfect foresight
4. Solution under rational expectations: stability conditions, uniqueness/multiplicity of solutions, solutions with bubbles and/or self-fulfilling prophecies.

Chap 2b: Multivariate rational expectation models
1. The deterministic case: set of solutions, uniqueness/multiplicity, Blanchard-Kahn conditions, etc.
2. The stochastic case
3. Non-linear rational expectation models

Chap 3: Solving standard DSGE models – Application to the RBC model
1. The canonical RBC model
2. Solving the model
3. Quantitative evaluation
4. Computer session 1

Chap 4: The RBC model – Early criticisms and early extensions
1. Early criticisms
2. Labor market extensions
3. Variable utilization rates
4. Combination of shocks
5. Computer session 2

Chap 5: Endogenous fluctuations models
1. The Benhabib-Farmer (1994) model
2. Solving endogenous fluctuation models: sunspot shocks (self-fulfilling prophecies)

KEY PROFESSIONAL SKILLS UPON GRADUATION
To acquire relevant knowledge and techniques to solve and analyze dynamic rational-expectation models (RBC and DSGE models, models with endogenous fluctuations and self-fulfilling prophecies)

ORGANIZATION
Semester: S2
Teaching hours: 24 h of lectures
Comment: Elective.

BIBLIOGRAPHY AND TEXTBOOKS
R. Farmer, *Macroeconomics of Self-Fulfilling Prophecies,* 2nd edition, MIT Press, 1999.
King, R. and S. Rebelo, "Resuscitating real business cycles", *Handbook of Macroeconomics*, 1999, vol. 1, Part B, pp 927-1007.
Dejong, D. and C. Dave, *Structural Macroeconometrics*, 2nd edition, Princeton University Press, 2011.
Canova, F., M*ethods for applied Macroeconometric Research,* Princeton University Press, 2007.

RECOMMENDED PREREQUISITES

Standard knowledge in economics and mathematics for Economics students at M1 level (theory of intertemporal choices, optimization, etc.)

KEYWORDS
Dynamic rational expectation models, DSGE models, numerical techniques.

Dernière mise à jour / last update: septembre 2024.

Empirical Portfolio Management
Gestion de portefeuille empirique

COURSE LANGUAGE
English

TEACHER
TBA

COURSE DESCRIPTION AND OBJECTIVES
The aim of this course is to provide the fundamentals of empirical research in asset and portfolio management so that students can move into the full range of research areas in market finance.

COURSE OUTLINE
1. Theory in asset and portfolio management
   - Optimal portfolio theory and the CAPM: reminder
   - Factor models
   - Risk and performance measures
   - Traditional and alternative portfolio management strategies
   - Integrating sustainability into portfolio management strategies
2. Numerical technics in asset management
   - Tools and databases used in empirical portfolio management
   - Optimization methods in asset management (with R)

ORGANIZATION
Semester: S2
Teaching Hours: 24 h of lectures
Comment: Elective.
Examination Method:

BIBLIOGRAPHY AND TEXTBOOKS
Research on Project, Programme and Portfolio Management Integrating Sustainability into Project Management, Roxana Cuevas, Constanta-Nicoleta Bodea, Pablo rres-Lima, 2021, Springer Verlag
Investments, Bodie, Kane and Marcus, 2013, Mc Graw Hill
Investment analysis and portfolio management, Reilly and Brown, 10e edition
Quantitative portfolio management witjh application in Python, P. Brugiere, 2020, Springer

Dernière mise à jour / last update: septembre 2024.

Advanced Topics in Finance
Sujets avancés en finance

COURSE LANGUAGE
English

TEACHER
TBA

COURSE DESCRIPTION AND OBJECTIVES
This course aims at presenting current research topics in finance. It will leverage on the current research projects of AMSE members or AMSE visitors.

KEY PROFESSIONAL SKILLS UPON GRADUATION
Know the current research topics in Finance.

ORGANIZATION
Semester: S2
Teaching Hours: 24 h of lectures
Comment: Elective.
Examination Method:

BIBLIOGRAPHY AND TEXTBOOKS
Research on Project, Programme and Portfolio Management Integrating Sustainability into Project Management, Roxana Cuevas, Constanta-Nicoleta Bodea, Pablo rres-Lima, 2021, Springer Verlag
Investments, Bodie, Kane and Marcus, 2013, Mc Graw Hill
Investment analysis and portfolio management, Reilly and Brown, 10e edition
Quantitative portfolio management witjh application in Python, P. Brugiere, 2020, Springer

Dernière mise à jour / last update: juin 2025.

Research Methodology
Méthodologie de la recherche

COURSE LANGUAGE
English

TEACHER
Christian SCHLUTER – christian.schluter@univ-amu.fr
Miriam TESCHL – Miriam.teschl@ehess.fr

COURSE DESCRIPTION AND OBJECTIVES
The first part of the course is made of lectures devoted to the epistemology of economics and to the description of today's organization of academic economics. This course discusses methodological and epistemological questions concerning the practice and understanding of economics. The aim is to have a better understanding of how we see, understand and intervene is this world as economists.
The second set of lectures consists of three parts: research design, which will focus on good research design, and ways to credibly communicate the validity of the chosen approach; how to write a referee report, with the objective of the referee report being to *evaluate* the contributions of the submitted paper, ending in a judgement of whether the paper could eventually be published in the target journal, it involves evaluating the relevance as well as the quality of the scientific content and of the writing; academic writing.

KEY PROFESSIONAL SKILLS UPON GRADUATION
Capacity to understand research papers, capacity to construct a research proposal, key communication skills, critical thinking.

ORGANIZATION
Semester: S2
Teaching Hours: 24 h of lectures

BIBLIOGRAPHY AND TEXTBOOKS
A.F. Chalmers, 2013, What is this thing called science?, Hackett Publishing Company
Milton Friedman, 1953 The Methodoloy of Positive Economics, reprinted in Hausman, Daniel (ed.), 2008, The Philosophy of Economics: An Anthology, Cambridge University Press, pp. 154 - 187.
Martin Hollis and Edward Nell, 1975, Rational Economic Man: A philosophical critique of neoclassical economics, Cambridge University Press
Thomas Kuhn, 1996 The Structure of Scientific Revolution, University of Chicago Press

KEYWORDS
Academic writing, communication skills, research design, methodology, epistemology, science, model, falsificationism

Cours spécifique Magistère
Dernière mise à jour / last update: juin 2025.

Big Data Tools (MAG)
Outils des Big Data (MAG)

COURSE LANGUAGE

English in Marseille

TEACHER

Hervé MIGNOT – practitioner from Equancy

COURSE OUTLINE

1. Hadoop. HDFS. MapReduce. Stockage et calculs distribués. Déploiement d'un cluster.
2. Préparation, stockage et traitement des big data : Pandas, Hive and Pig
3. Data visualisation avec matplotlib & seaborn
4. Alternatives : solutions propriétaires, bases NoSQL, ElasticSearch

ORGANIZATION

Semester: S1
Teaching Hours: 24 h of lectures
Comment: Class exclusive for Magistere students.

Cours spécifique Magistère
Dernière mise à jour / last update: juin 2025.

Machine Learning and New Data (MAG)
Machine learning et nouvelles données (MAG)

COURSE LANGUAGE
English in Marseille

TEACHER
Quentin LIPPMANN – quentin.lippmann@univ-amu.fr

COURSE DESCRIPTION AND OBJECTIVES
This course proposes to study the processing and analysis of unstructured data, and more specifically textual data and images.

COURSE OUTLINE
This course is divided in two parts of 12 hours each. The first part covers text as data. The second is about image as data.

Part 1 – Text as Data

Block 1 – Foundations of NLP

Students will learn about the complete document-pre-processing pipeline, beginning with tokenisation and the construction of n-grams. They will create Bag-of-Words representations and apply TF–IDF weighting to highlight discriminative terms. We will then move to distributed word representations through word embeddings, extract entities with Named-Entity Recognition, and analyse sentence structure by performing dependency parsing.

Block 2 – Large Language Models

Students will learn about the transformer architecture and its self-attention mechanism, compare pre-training with fine-tuning, and experiment with in-context learning. They will study Reinforcement Learning from Human Feedback as an alignment method and practice prompt-engineering patterns to steer model behaviour. We will tackle hallucination and explore retrieval-augmented generation as a mitigation strategy.

Part 2 – Image as Data

Block 1 – Image Fundamentals

Students will learn about digital image representation and colour spaces, then examine convolution operations—kernel size, stride, padding—and their effect on the receptive field. They will study activation and pooling layers for feature extraction and understand bounding-box regression. Anchor-based and anchor-free object-detection strategies will be compared.

Block 2 – Facial Analysis, Segmentation & Generative AI

Students will learn about classical Haar cascades versus modern RetinaFace detectors for face localisation. They will map facial landmarks, build embedding-based recognition pipelines, and evaluate systems using FAR, FRR, ROC curves, and demographic-bias checks. Promptable segmentation models will be introduced, followed by diffusion-based generative models for image synthesis.

All the concepts are applied and illustrated in Python applications.

KEY PROFESSIONAL SKILLS UPON GRADUATION
To learn how to process and analyse textual data
To learn how to process and analyse images

ORGANIZATION
Semester: S1
Teaching Hours: 24 h of lectures
Comment: Class exclusive for Magistere students.

Cours spécifique Magistère
Dernière mise à jour / last update: juin 2025.

End-of-Studies Project (MAG)
Projet de fin d'études (MAG)

COURSE LANGUAGE
French in Marseille

TEACHER
A teacher + a practitioner

COURSE DESCRIPTION AND OBJECTIVES
The end-of-studies project is carried out in collaboration with a company from October to March. This project enables students to carry out operational engineering work in data science and to compare theory with applications in the professional world.

KEY PROFESSIONAL SKILLS UPON GRADUATION
To be able to tackle a data science problem and write a report to answer it.
To know how to work as a team and to meet a set of specifications.

ORGANIZATION
Semester: S1
Comment: Class exclusive for Magistere students. Bimonthly meetings with supervisors, and autonomous work between meetings.
Examination Method: Project + Defense

Cours spécifique Magistère
Dernière mise à jour / last update: juin 2025.

Topics in Data Science (MAG)
Sujets en Data Science (MAG)

COURSE LANGUAGE
English in Marseille

TEACHER
Pierre MICHEL – pierre.michel@univ-amu.fr
Christophe HURLIN – practitioner

COURSE DESCRIPTION AND OBJECTIVES
This course aims to raise students' awareness of topical issues in data science.

COURSE OUTLINE
1. Conformal prediction
   a. Introduction and theoretical foundations
   b. Conformal prediction for regression
   c. Conformal prediction for classification
2. Algorithmic fairness
   a. Introduction to algorithmic fairness
   b. Framework for fairness in machine learning
   c. Measuring algorithmic fairness
   d. Testing for algorithmic fairness
   e. Mitigating algorithmic biases

KEY PROFESSIONAL SKILLS UPON GRADUATION
Understand how to make conformal prediction for regression and classification
Understand algorithmic fairness, and how to measure it, test it and mitigate its biases.

ORGANIZATION
Semester: S2
Teaching Hours: 24 h of lectures
Comment: Class exclusive for Magistere students.

Cours spécifique Magistère
Dernière mise à jour / last update: juin 2025.

Projects in Data Science (MAG)
Projets en Data Science (MAG)

COURSE LANGUAGE
English in Marseille

TEACHER
Pierre MICHEL – pierre.michel@univ-amu.fr
Christophe HURLIN – practitioner

COURSE DESCRIPTION AND OBJECTIVES
This course is complementary to the course of « Topics in data science ». The goal of this course is to make students work on projects related to the topics studied in the other course.

KEY PROFESSIONAL SKILLS UPON GRADUATION
To be able to tackle a data science problem and write a report to answer it.

ORGANIZATION
Semester: S2
Teaching Hours: 24 h of lectures
Comment: Class exclusive for Magistere students.