Actuarial science speciality

ECTS credits
8 credits

Semester
Every year

In brief

Course langage: English

Presentation

Prerequisites

Content of course unit Data and decisions of the DDEFi track and its own prerequisites

Learning objectives

* Understand how individual behaviors aggregate in the insurance market and how prices form
* Know the principles driving the pricing of insurance products and be able to apply it to simple products
* Understand the need of provisioning and know the basic model to compute provisions
* Know how to choose a pricing model according to the risks and issues of an insurer
* Know the current regulation and its impact on insurance pricing and provisioning
* Know how to value an insurance portfolio
* Know the basic data science models and their usage

Description of the programme

This unit is composed of three courses: Economics of insurance, Actuarial science 1, Actuarial science 2, of 24 hours each,and is complemented by the second part of the data sciences project (9 hours course and 12 hours project) devoted to models and their validation.

Economics of insurance

1. Introduction: Risk attitude and preferences
2. The single risk model

3. Product differentiation
4. Unobservable criteria
5. Moral hazard
6. Extensions and exercises
7. Topic: Duration models and life tables

Actuarial science 1

1. Introduction to actuarial science
   i. Life insurance model: fair premiums and prudent pricing
   ii. Non-life specificities: provisioning and variability of non-life risks
2. Life Insurance, saving products, and accounting
   i. Introduction on Mathematical Reserves
   ii. Saving contracts and performance distribution mechanisms
   iii. Performance indicators for an insurance company
3. Non-Life Insurance
   i. Mechanisms of Non-Life Insurance
   ii. Loss experience and reserving
   iii. Introduction to Non-Life Reinsurance

Actuarial science 2

1. Valuing an insurance portfolio
2. Asset-liability management in insurance
3. Accounting and financial communication of insurance companies
4. The current regulation: IFRS17
5. CAT risk and CAT reinsurance
6. Focus on long-term care

Data science projects: models and their validation

1. Projects and models
   i. The Bias-Variance tradeoff
   ii. Feature Selection
   iii. Feature Engineering
   iv. Defining a metric
2. Models and applications
   i. Regressions (linear, polynomial, penalized et logistic)
   ii. Decision trees (random forest and gradient boosting)
3. Focus on Natural Language Processing (NLP)

Generic central skills and knowledge targeted in the discipline

* Understand how the insurance market works, in particuler how insurance demand forms and reacts.
* Understand the impact of asymmetries of information on the insurance market, and how they can be accounted for.

* Know the concepts of actuarial value, faire premium and reserving.
* Know the model used for estimating reserves.
* Know how to measure the profitabity of a insurance production and of a insurance portfolio.
* Know the regulatory setting and its impact on the insurance business
* Know how to use data science models (Natural Language Processing in particular) in business projects.

How knowledge is tested

* Written exam (Economics of insurance): 25%
* Project (Actuarial science 1): 25%
* Written exam (Actuarial science 2): 25%
* Project (Data science projects): 25%

Bibliography

Economics of insurance

* Picard, Economic Analysis of Insurance Fraud. Handbook of Insurance.
* Schlessinger, The Theory of Insurance Demand. Handbook of Insurance.

Actuarial science 1 & 2

* Charpentier, Computational Actuarial Science with R,
* Tosetti, Weiss and Poncelin, Les outils de l'actuariat vie

Data science projects

* Zeng, A and Casari, A. Feature Engineering for Machine Learning. O'Reilly Media.
* Müller, A. and Guido, S. Introduction to Machine Learning with Python. O'Reilly Media.

Teaching team

* Economics of insurance : Hajare El Hadri (Centrale Marseille), Sofia Ruis (Aix-Marseille Université)
* Actuarial science 1 : Mitra Fouladirad (Centrale Marseille), Xavier Guerrault (AXA), Renaud Mouyrin (AXA), Matthias Servel (AXA)
* Actuarial science 2 : Corinne Cherki (AXA), Alban Davand (AXA), Carelle Merlo (AXA), Emmanuelle Mimart (AXA), Sofiane Ournidi (AXA), Yannick Ropert (AXA)
* Data science projects: Alexandre Chirié (Mantiks) et Maxilimilen Défourné (Mantiks)

Sustainable Development Goal

Actuarial science speciality

Access to health

Descent work and economic growth

Reduced inequalities

Total des heures		**100h**
CM	Master class	81h
PJ		19h