SYLLABUS DEL CORSO

Metodi Quantitativi per le Assicurazioni

2526-2-F1601M065

Learning objectives

The central theme of the course is the set of mathematical and statistical methods used to answer questions such as determining the premium of a life insurance policy or calculating the amount needed to secure a supplementary pension. These are fundamental questions both for the investor purchasing protection (which often has features very similar to those of an investment), and for the insurance companies selling it, which—while collecting premiums—must monitor their exposure to various sources of risk in a continuously evolving regulatory environment.

The course consists of two modules: Actuarial Mathematics (taught by Prof. Fabio Bellini) and Statistics for Insurance (taught by an industry professional). We recommend including this course in your study plan alongside Insurance Risks, held in the second semester, which focuses more on methods for non-life insurance.

In summary, we can ex ante outline the following learning objectives:

- Understand the fundamental concepts of modeling human life duration and use them to calculate the actuarial value and premium of the main types of life contingencies

- Use R to download, visualize, and model mortality data, as well as to perform actuarial calculations and simulations

- Critically read and interpret the information document of a life insurance policy

- Understand the quantitative aspects of insurance regulation, with particular focus on the Solvency II framework as it applies to life insurance

Contents

1) Modeling the duration of human life

2) Formulas for calculating the actuarial value and premium of life contingencies

3) The mathematical reserve and the decomposition of profit in traditional actuarial mathematics

4) General premium calculation principles based on expected utility theory and the Esscher transform; connections with option pricing theory

5) Participating, unit-linked, and index-linked life insurance policies

6) Introduction to Solvency II and risk management in insurance companies

7) Current topics and emerging issues

Detailed program

1) Modeling the duration of human life

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Prerequisites

Basic knowledge of general mathematics (derivatives and integrals), financial mathematics (annuities and present values), and probability (random variables).

Teaching methods

Lectures, assignment and discussion of problems and exercises, R programming lab, and exploration of current topics.

Assessment methods

The examination for the two modules, Actuarial Mathematics and Statistics for Insurance, will take place in a single session consisting of an oral exam and the discussion of a project developed in R.

Textbooks and Reading Materials

- Olivieri, A., Pitacco, E., [Introduction to Insurance Mathematics](#)
- Charpentier, A. [Computational actuarial science with R](#)
- Wicham, H., Grolemund, G. [R for Data Science](#)
- Cesari, R., Valerio A. [Risk Management e imprese di assicurazione](#)
- materiali forniti dai docenti

Semester

Primo semestre

Teaching language

Italiano

Sustainable Development Goals

QUALITY EDUCATION