Introduction to actuarial mathematics and risk theory

PROF. ALBERTO FLOREANI; PROF. PAOLA BIFFI; PROF. NINO SAVELLI

MODULE I: *Prof. Alberto Floreani* (2 CFU)

Course aims and intended learning outcomes

The course introduces to:
- insurance products and the underlying business models in the insurance company perspective;
- the financial statement of an insurance company.
- At the end of the course the student will be able to:
- Know the basic characteristics of non-life, life and investment based insurance products (IBIPs) and understand the differences in the underlying business models;
- Know the structure of the financial statement of a non-life insurance company and understand how to assess the profitability of a non-life insurer through technical indicators (e.g. combined ratio, claims ratio);
- Know the structure of the financial statement of a life insurance company and understand the different accounting approaches that are used to assess the profitability of a life insurer.

Course content

1. The financial statement of a non-life insurance company:
   - Non-life insurance products;
   - Main characteristics of non-life insurance business;
   - The financial statement of a non-life insurance company;
   - Non-life technical provisions measurement according Italian local GAAPs;
   - Financial instruments measurement according Italian local GAAPs;
   - Technical indicators.
2. The financial statement of a life insurance company:
   - Life insurance products and Investment based insurance products (IBIPs);
   - Main characteristics of life insurance business and the drivers of profitability for life insurance products and IBIPs;
   - The financial statement of a life insurance company;
   - The alternative presentation approaches for IBIPs: Premiums as revenue or deposit component;
   - Life technical provisions measurement according Italian local GAAPs.
3. Introduction to the different measurement approaches in insurance (Italian local GAAPs, IFRSs, Solvency II and Embedded Value)

Reading list

A. FLOREANI, Lecturer notes, 2019-20, Available on course BlackBoard.

Teaching method

Lectures; numerical examples and exercises.

Assessment method and criteria

Written examination with open questions (50% - 3 or 4 questions) to assess the knowledge of the topics and numerical exercises (50% - 1 or 2 numerical problems) to assess the understanding of the logic behind the financial statement of an insurance company and the ability to read accounting figures and technical indicators.

Notes and prerequisites

Place and time of consultation hours
Monday, starting at 11.30 am (via Necchi, 5, "ex conventino", room C1).

MODULE II: *Prof. Nino Savelli (4 CFU)*

MODULE III: *Prof. Paola Biffi (4 CFU)*

Course aims and expected learning outcomes

This module presents the basic actuarial tools in the life insurance field. The student will be able to understand the evolution of life and death events for individuals and populations and to apply models and techniques to calculate premiums and reserves in life insurance.

Course contents

− *Fundamental biometric functions*: biometric functions – survival functions mortality tables. By using the statistical data and the corresponding life tables, suitable probabilities are assigned to life and death events.
− *Traditional life insurance contracts:* the main contracts concerning life and death for individuals and groups. The point of view of the insurer is presented to set benefits both in the demographic and financial setting.
− *Annuity products:* actuarial value for life annuities, both for individuals and groups, also enclosed in pension funds. The quantitative methods are given to understand the evolution of the stream of payments in a life annuity and to identify the action of the time and of the life probabilities on it.
− *Premium calculation:* basic rules with loading conditions and expenses. The student will be able to state the equilibrium payment corresponding to the promised benefits, relative to the different products.
− *Life insurance reserving:* the policy reserve for some insurance products under the various time approaches. The student will learn how the different insurance cycle and the obligations of the insurer and the insured affect the reserve dynamics.

Reading list

Lectures notes, available on Blackboard (Course Documents)

Suggested Readings:
D.C.M. DICKSON-M.R. HARDY-H.R. WATERS, *Actuarial Mathematics for Life Contingent Risks*, Cambridge University Press.
E. PITACCO, *Matematica e Tecnica attuariale delle assicurazioni sulla durata di vita*, Ed. LINT, Trieste, 2000.
OLIVIERI-E. PITACCO, *Introduction to Insurance Mathematics*, Springer, 2011.

Teaching method

Lectures; numerical examples and exercises.

Assessment method and criteria

Written examination with open questions to assess the knowledge of the topics and numerical exercises.

Notes and prerequisites

In order to understand the topics dealt with in the course, the concepts of basic mathematics, probability, statistics and financial mathematics are necessary.

Place and time of consultation hours
Further information can be found on the lecturer's webpage at
http://docenti.unicatt.it/web/searchByName.do?language=ENG, or on the Faculty notice board.