# Actuarial models for social security and pension funds

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***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

Aim of the course is to provide a knowledge about actuarial techniques for the evaluation of public pension-schemes and pension funds.

The following topics will be tackled: the structure of the Italian public and complementary pension systems, the development of regulations and main reforms of the public pension-scheme, the financial systems for managing the public pensions, the determination of premiums and actuarial reserves within the framework of an IVS system (disability, retirement and survivor), the methods for computing contributions and benefits for a defined benefit pension fund.

The course contemplates lectures as well as seminars involving experts so as to illustrate some of the issues linked to the management of the public pension and pension funds.

By the end of the course, students should be able to compute pension benefits and contribution levels for an IVS system and a defined benefit pension plan.

***COURSE CONTENT***

*Course outline and detailed learning goals*

*1. General information about pensions*

In this section we deal with the following topics:

* understand and know the concept of pensions;
* know which risks are covered by public pensions schemes and which kind of benefits are provided;
* understand Italy's three-pillar pension system.

*2. The Italian private and public pension system*

In this section we deal with the following topics:

* understand the Italian pension system;
* know the main reforms made to the Italian pension system in recent years;
* be able to compare different financial management systems;
* understand the impact of the different reforms and any individual initiative on the balance of a financial system.
* understand current legislation about private pension funds;
* compare Italian complementary pension system to European framework;
* understand the financial management methods for pension funds;

*3. Actuarial Models for public pensions (disability, retirement and survivor)*

In this section we deal with the following topics:

– choose appropriate technical bases for the determination of the premium in an IVS *(disability, retirement and survivor)* system;

– calculate the estimated present value of the benefits and wages related to a group pension plan with specific characteristics;

– understand and calculate capitalisation coefficients;

– determine the contributions for a hypothetical IVS system for different financial management systems;

– determine the actuarial reserves of an IVS system for different financial management systems;

– evaluate the equilibrium of a financial system for a specific accounting year;

– evaluate the relationships between the capitalisation coefficients and the transformation coefficients introduced by the Dini reform.

*4. Finance for a DC complementary pension fund*

In this section we deal with the following topics:

– understand the financial scheme of a DC pension fund when a financial guarantee is embedded in: best of *vs*. cliquet guarantees;

– evaluate the financial guarantee as an European option: CRR model vs. Black-Scholes model;

– evaluate the fair value of the cost of the financial guarantees: the Brennan and Schwartz model for pension funds;

– understand the financial strategies for managing a pension fund: buy and hold strategies *vs*. constant proportion portfolio insurance strategies;

– understand and evaluate risk-adjusted performance measures for investments of a pension fund;

– insight to the Directive IORP II.

***READING LIST***

Given the particular structure of the course and the analysis of certain topics over a long term horizon, it is not possible to identify specific textbooks that cover all course topics.

Instructional material will be made available on the Blackboard platform throughout the course.

Reading materials for further study (optional)

A. Tomasetti et alii, *Tecnica attuariale per collettività,* Kappa, Rome, 1995, vol. I.

C. Mottura, *Un’analisi della commissione di garanzia nei Fondi Pensione*, Atti VII Congresso Nazionale degli Attuari, 2004.

M. De Felice , F. Moriconi , *Definizione dei benchmark, Misurazione delle performance e Valutazione dei costi nei Fondi Pensione con minimo garantito, CONSOB* – Quaderni di Finanza n. 36, 1999.

N. Savelli, *Modelli attuariali per schemi pensionistici a prestazioni definite con capitalizzazione individuale,* Kappa, Rome, 1984.

N. Bowers, H. Gerber, J. Hickman, D. Jones, C. Nesbitt, *Actuarial mathematics*, The Society of Actuaries, Schaumburg, Illinois, 1997.

Ph. Bertrand Ph., J.L. Prigen, *Portfolio Insurance Strategies: OBPI versus CPPI*, GEQAM et Université Montpellier 1, Preprint, 2002.

***TEACHING METHOD***

Lectures

***ASSESSMENT METHODS AND CRITERIA***

The exam is based on a written examination.

To pass the exam the student must have a mark greater than 18 in both parts.

In case the exam has been failed, both parts must be taken again.

The examination regards the entire course syllabus. The examination is aimed at assessing the knowledge, the reasoning, the analytical rigour with regard to course topics.

***NOTES AND PREREQUISITES***

*Prerequisites*

Before entering the course, the student should have a basic knowledge of demographics and financial concepts, be able to evaluate premium and technical provisions for life insurance policies, have a knowledge of actuarial methods for annuity contracts.

*Office hours*

Further information can be found on the lecturers' webpages or on the Faculty notice board.