

Editorial

Special Issue “Quantitative Risk Assessment in Life, Health and Pension Insurance”

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The high volatility in financial markets, together with the ultra-low interest rates environment and the increased expectation of life, constitute serious threats for providers of long-term investment guarantees and lifelong benefits. Even if the COVID-19 pandemic is currently causing a mortality shock, its influence on future mortality is not clear, and one possible scenario could be a further increase in the life expectancy of survivors. The risk involved by all these “exogenous” factors is amplified by the uncertainty characterizing the individual behavior when taking decisions concerning, e.g., surrender, partial withdrawals, annuitization. The study of suitable solutions allowing to build resilience against these risks is a real challenge.

This Special Issue contributes to this challenge, and collects five high-quality research papers analyzing theoretical or practical aspects related to the following topics:

- (i) Design of new pension insurance products and risk-management of loan insurance (Olivieri 2021; Planchet et al. 2022);
- (ii) Assessing capital requirements for demographic risk in a life insurance portfolio—stochastic models and numerical techniques (Clemente et al. 2021; Costabile and Viviano 2021);
- (iii) Analysis and risk-management of the long-term impact of COVID-19 on the life insurance business (Carannante et al. 2022).

In detail, the paper by (Clemente et al. 2021) focuses on the evaluation of capital requirements for both mortality and longevity risk. To this end, a stochastic model for traditional life insurance contracts is proposed and framed within the Solvency II Directive. In this context, the authors extend the classical methodologies developed in a local accounting framework, and prove that the valuation of demographic profit can be significantly affected by the financial conditions in the market, so that the financial component cannot be completely separated from a purely demographic one. The paper ends with the presentation of a case study of a portfolio of life insurance contracts, which testifies the effectiveness of the model in highlighting the main drivers of capital requirement evaluation.

The paper by Costabile and Viviano (2021) addresses the problem of approximating the future value distribution of a large and heterogeneous life insurance portfolio by proposing two regression-based methodologies: the former is an extension of the well-known least squares Monte Carlo approach; the latter is grounded on the class of generalized beta distribution of the second kind. Extensive numerical experiments are conducted in order to assess the performance of the proposed methods, both in terms of accuracy and efficiency. To this end, a solid benchmark based on nested simulations is considered. The obtained results show that both methods represent valid alternatives to the benchmark in terms of accuracy, but strongly outperform it in terms of computational time. These conclusions are particularly relevant for insurance companies, helping them to reduce the computational effort needed to evaluate solvency capital requirements.

The paper by Olivieri (2021) introduces some elements of flexibility in the traditional annuity design that can better meet the preferences of annuitants, hence fighting their



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lack of attractiveness observed in many markets. In more detail, on one hand, the new design allows the benefit amount to fluctuate according to a given mortality/longevity experience, and on the other, provides a pricing structure alternative to classical upfront loading. This structure is based on periodical fees applied to the policy account, as usually occurs in the case of variable annuities. The fees can be assessed in order to incorporate an allowance for both the expected profit and the risk retained by the insurer. This product can be particularly appealing for individuals that need a longevity protection different from that supplied by traditional annuities: even if they are exposed to the risk of future benefit reductions as a consequence of higher longevity, this risk can be compensated by a lower premium loading.

The paper by [Carannante et al. \(2022\)](#) investigates the long-term effects of COVID-19 on life insurance profitability, and proposes a proactive mortality risk management based on dynamic premium adjustments which allows to prevent these effects and to increase the resilience of the business. In particular, the authors explore how the COVID-19 pandemic mortality shock has affected the profitability of annuity providers, and conclude that, unlike what might be expected, the involved mortality acceleration does not increase the profitability if their portfolios are well diversified in terms of age of the annuitants. Then, the longevity improvements continue to represent the main issue for these providers and lead them to frequently adjust their mortality assumptions, particularly if their portfolio is composed by contracts held by relatively young people.

The paper by [Planchet et al. \(2022\)](#) starts from the observation that many loans are currently rejected due to the presence of a pathology in the applicant, and analyzes how improvements in the knowledge of health and pooling risks, based on open data and risk pooling scenarios, can broaden access to loan insurance. In particular, the authors show how to use open data to estimate loan insurance premiums for a variety of diseases, and prove that through these data, the descriptions of the risks of mortality and disability for serious pathologies can be significantly refined. Then, a more accurate assessment of these risks enables enlargement of the insurance portfolios and to keep premiums at reasonable levels.

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