

St. Petersburg Spring School on Risk Management, Insurance, and Finance 2019 The Programme

March 21st, 2019

Longevity and Long-term Care risks: innovations in insurance product design

by Professor **Ermanno Pitacco**, University of Trieste, Italy

Summary of the Course

Life annuities constitute an appropriate tool providing the retiree with a lifelong income. Nevertheless, we can observe that, in many countries, the propensity to convert into a life annuity the resources available at the retirement time is rather poor. Of course, good reasons, strictly related to the technical features of the «standard» life annuity, underpin the non-annuitization choice. In particular, as the life annuity is an illiquid asset in the retiree's portfolio, the preference for income drawdown strategies can easily be understood.

In the framework of health insurance products, the long-term care (LTC) stand-alone policy provides resources to afford expenses caused by senescent disability. Hence, this insurance cover can be classified as a pure protection product. Nonetheless, its price is rather high, especially because of the safety loading that the insurer needs to charge in order to face pricing (and reserving) risks originated by rather poor statistical data. A barrier on the demand side then follows.

To stimulate the purchase of insurance products, in particular in the old-age segment of the insurance market, various alternative products can be conceived, some of which have actually been proposed. Looking at recent trends in the product design, we can see,

1. as regards life annuities:
 - a. a shift from «investment» to «longevity insurance» provided by old-age life annuities;
 - b. an extension of the rating principle, leading to «special-rate» (or «underwritten») life annuities;
2. as regards LTC insurance, a shift from stand-alone products to «combo» products, e.g. including lifetime-related benefits.

We note that:

- approach 1a implies a restriction of the insurance coverage;
- approach 1b implies an extension of the potential market;
- approaches 1b and 2 can be implemented via health-linked life annuities.

In this seminar, special attention is placed on «health-linked life annuities», which can suggest interesting alternatives to traditional products. We propose a formal framework which encompasses diverse arrangements. In particular, we note that linking the annuity benefit to the health status can be implemented according to two different approaches.

A «static» linking approach can be recognized when, for a given premium, the benefit amount depends on the individual's health status at the time the annuity is purchased, and does not vary throughout the individual's whole lifetime. This is the case of the special-rate annuities: the mortality assumption adopted in the annuity rate calculation depends on the health status of the client, assessed via underwriting process. Hence, given the single premium, the annuity benefit is higher if the life expectancy is smaller.

A «dynamic» linking approach is conversely adopted if the benefit amount is adjusted, throughout time, according to the evolution of the individual's health status. In this context, the care pension, which provides an uplift of the pension amount in the case the retiree enters into a senescent disability status, constitutes an already implemented example.

Finally, looking at health-linked life annuities from a technical perspective, we note that an appropriate product design can improve the profitability and/or the risk profile of the insurer's portfolio. In particular, we will first prove that the care pension is less exposed to pricing (and reserving) risks than other LTC insurance products. Then, we will show that special-rate life annuities can raise the size and the profitability of a life annuity portfolio without worsening its risk profile.

The seminar is organized as follows:

- Introduction & motivation
- Life annuities: from investment to longevity insurance
- Long-term care insurance products: from stand-alone to «combo» products
- Health-linked life annuities: a general framework
- Concluding remarks

March 22nd, 2019

Transferring of Insurance Loss Risk to Capital Markets

by **Bohumil Stádník**, University of Economics in Prague

Summary of the Course

Insurance-linked securities (ILS); such as mortality-linked securities and its derivatives, longevity (survivor) bonds, mortality catastrophe bonds or natural catastrophe (CAT) bonds; are defined as investment instruments which are linked to cover the insurance claims resulting mainly from life insurance events, such as longevity/mortality events, or natural catastrophes (CAT bonds) as earthquake, floods or hurricane damages; and whose values are closely connected to the probability of certain insured event.

The reason of securitization of typical insurance products is the under/overestimation of the value of death/health or natural catastrophes-related claims. In the last years, the mortality improvements has become serious issue for pension funds and annuity providers to manage. The reason is that longevity has been systematically underestimated, making balance sheets more risky to unexpected increases in liabilities. On the other hand, we also newly observe issues of mortality bonds. The first mortality bond, known as Vita I, was issued by Swiss Re Group in December 2003 and was designed to reduce Swiss Re's own exposure to catastrophic mortality events, such as major terrorist attacks, avian flu pandemics, or other natural catastrophes.

The traditional way of transferring insurance company risk is through reinsurance market. However, these lack the capacity and liquidity to support an estimated global exposure in excess of \$20tr (e.g., Loeys et al., 2007). The solution is to turn to capital markets which could play a very important role, offering additional capacity and liquidity to the insurance market. Well-known example of Hurricane Andrew in 1992 and its disaster consequences for insurance business (11 insurance companies went bankrupt, caused by more than 600 000 insurance claims filed) basically have started ILS story in the field of CAT bonds. In other words: insurance industry, using ILS, transfers insurance companies risks to capital markets which also allow more transparent and competitive pricing of these products.

ILS have many interesting aspects of interest for investors and risk managers. They have shown low correlations with other types of investment risks, such as interest rate or currency risk or they may provide attractive yields. Its pricing is an interesting challenge for researches.

The course should introduce the audience to the specifics of ILS instruments included their historical development, valuation, risk management and their technical aspects. The content:

- ILS instruments introduction
- Securitization of life insurance assets and liabilities
- Longevity risk transfers
- Longevity risk pricing and optimal security design
- The EIB longevity bond
- Mortality catastrophe bonds
- Recent trends in mortality-linked securities
- Mortality indices
- Mortality swaps and forwards
- Mortality/longevity futures and options
- CAT bonds design, trigger problematics
- CAT bonds valuation
- ILS market characteristics

References

Blake, D. and W. Burrows (2001). Survivor bonds: Helping to hedge mortality risk. *Journal of Risk and Insurance*, vol. 68:339–348.

Bauer, D., M. Boerger and J. Russ (2008). On the pricing of longevity-linked securities. Tech. rep., Georgia State University.

Dahl, M., M. Melchior and T. Møller (2008). On systematic mortality risk and risk-minimization with survivor swaps. *Scandinavian Actuarial Journal*, vol. 2008(2–3):114–146.

Dowd, K., A. Cairns, D. Blake, G. Coughlan, D. Epstein and M. Khalaf-Allah (2008b). Backtesting stochastic mortality models: An ex-post evaluation of multi-period-ahead density forecasts. Pensions Institute Discussion Paper PI-0803.

Loeys, J., N. Panigirtzoglou and R. Ribeiro (2007). Longevity: A market in the making. *J.P. Morgan's Global Market Strategy*.

Summary of the Course

This course gives an introduction to the new IFRS standard for insurance contracts. The first part of the course is focused on giving a general introduction on the background and content of the IFRS 17 standard. The second part of the course will then focus more deeply on the different measurement approaches for insurance contracts. The third part will then consider the more practical side on how to choose and set up a Target Operating Model for different types of insurance companies. In the fourth and last part of the day, we will discuss the ongoing discussions in the insurance sector on the interpretation of IFRS 17.

A basic understanding of market consistent valuation (best estimate cash flow models, Embedded Value, Solvency 2) is helpful but not an absolute requirement. Part of the programme focuses on modelling aspects and is therefore rather targeted to people interested in the practical, actuarial aspects and/or responsible for implementation of IFRS 17.

The seminar is organized as follows:

Part 1. Introduction

- Background and history of IFRS 17
- Overview of the standard & basics
- Q&A.

Part 2. Measurement approaches

- Measurement models
- Presentation and profit patterns
- Q&A.

Part 3. Modelling

- Target Operating Models for IFRS 17
- Q&A.

Part 4. Implementation status

- Ongoing discussions on interpretations
- Implementation status worldwide
- Q&A.