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De-risking strategy: Longevity spread buy-in

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ABSTRACT

The paper proposes a demographic de-risking strategy for a pension provider, to deal with the future uncertainty in longevity over a long time horizon. The innovative idea of a longevity spread buy-in is presented. The formulae for calculating the buy-in premium are proposed in the case of pension plans. The proposal directly impacts the pension provider's risk management systems and hence can be an important part of the overall approach to risk management. The numerical results, developed under specified stochastic hypotheses for the dynamics of the underlying financial and demographic processes, show how the proposal of the paper can be practically implemented.

1. Introduction

Several approaches can be considered when dealing with longevity risk management for portfolios of life insurance and pension contracts. With regard to defined contribution pension plans, longevity risk management is treated by means of tools such as securitization and risk-sharing, as studied in Cairns et al. (2006b), Blake et al. (2006) and Cox et al. (2010). Another approach is to hedge the longevity risk by transferring it to a third party with techniques such as the longevity swap, the pension buy-in and pension buy-out. Thus, Cox et al. (2013) focus on this research agenda obtaining a type of hedge ratio when transferring longevity risk from a defined benefit pension plan. As clearly observed in Lin et al. (2015), the longevity hedge can be made by longevity swaps and longevity insurance, removing only the longevity risk.

When the pension buy-in is structured for the longevity risk transfer, the pension provider matches his future obligations or part of them, paying a premium to a third party: the pension buy-in transaction involves the trustees of a scheme purchasing an insurance policy to cover the future outflows due to the current pensioners. The pension buy-out strategy transfers obligations and assets, all or part of them, to a third party: the pension annuity buy-out removes the pension risks by transferring the accrued pension liabilities to a regulated insurance company in return for a premium. The basic difference among these last three strategies is that, while the longevity hedge transfers only the longevity risk, the pension buy-in and pension buy-out, based on the valuations of future obligations in the first case and obligations and assets in the second case, transfer also other risks such as the interest rate risk.

In recent years, the increase of buy-in and buy-out market has been significant, in particular in the UK. In fact, UK is leading the way in pensions de-risking (cf. Lin et al., 2015), but other countries also are looking to reduce pension risk increasing the employment of buy-in and buy-out techniques. At the moment, it seems that the economic crisis has had the effect of a strong growth in the volume of transactions, in particular of the buy-ins (cf. Lin et al., 2015). Looking ahead, on the basis of the turbulence of the financial markets and continuing upward trends longevity, it is likely that pension schemes will be still oriented to manage benefits and liabilities, so de-risking is expected to be at the top of insurance companies' objectives also for the next decade. Actuarial practitioners have already been predicting for a few years that annual transaction volumes could hit $25 billion by 2017 (LCP, 2012). The majority of annuity transactions have been structured as buy-in since the cost of de-risking pension scheme is often lower than the expected future cost of doing nothing (cf. Grant Thornton, 2011).

On this topic, Lin et al. (2015) develop an interesting analysis on the impact of the transaction costs, the counter-party default

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probability and the underfunding ratio on the expected total pension cost, showing how they can influence any hedging choice. In particular, they show that the buyout strategy is more expensive than the buy-in one. These innovative de-risking strategies open up new opportunities for pension plans; nevertheless an acceptable and reliable method of valuing a buy-in and buy-out has yet to be developed.

One of the main challenges of a buy-in strategy is managing the longevity risk in pension annuities. If the human lifetime reveals itself longer than expected, this implies meaningful financial risk to manage and the buy-in strategy allows this risk to be transferred to insurers or reinsurers, giving rise to an asset for the pension provider. Differently from the longevity swaps, a buy-in strategy can involve and control the risks connected to longevity risk, leaving the liabilities in the pension plan. The relevance of longevity risk for annuity/pension providers depends on the specific characteristics of the particular annuity or pension portfolio. A basic problem lies in measuring the effect of mortality improvements on the present value of pensions/annuities; within this context, Khalaf-Allah et al. (2006) treat just this problem, taking into account the interactions with the age and gender of the pensioners, the evolution of interest rates and the survival trend. Such an analysis allows us to mark out the key age ranges related to higher expected costs due to future mortality improvements.

The current paper is centered on longevity risk management: the aim is hedging the longevity uncertainty in those age intervals in which the risk of underestimating future liabilities is high, as a result of higher mortality improvement than expected. Identifying the so-called "dangerous" age intervals is an important goal in the light of the performance analysis approach, in particular when measuring the impact of the longevity risk on a life annuity portfolio (cf. Di Lorenzo and Sibillo, 2002) and when quantifying additional costs due to mortality improvements (cf. Khalaf-Allah et al., 2006). The idea which we propose in the paper is connected to what we call the longevity spread, that is the spread between the number of survivors implied by the technical base the insurer chooses for the actuarial valuations and a model considered "dangerous", in the sense that it represents a more risky scenario in terms of number of survivors — a scenario which is possible with low probability. Within this framework, a particular buy-in strategy is proposed just in order to cover the risk due to an excessive number of survivors (with consequent higher future costs than expected), in the case that the dangerous survival trend comes true. The model is implemented and the empirical application is illustrated. The paper is organized as follows: in Section 2 a survey of the pension buy-in and buy-out schemes is presented; in Section 3, a description of the buy-in contracts is provided; in Section 4, the actuarial assessment of the pension plan is explained; Section 5 introduces the idea of the longevity spread and presents the buy-in strategy we propose, providing the valuation formulas. Finally, in Section 6 an empirical application of the model is shown. Section 7 concludes.

2. Buy-in and buy-out transactions: a market roadmap

The pension buy-out strategy transfers obligations and assets, all or part of them, to a third party: the pension annuity buy-out removes the pension risks by transferring the accrued pension liabilities to a regulated insurance company in return for a premium. The basic difference among these strategies is that, while the longevity hedge transfers only the longevity risk, the pension buy-in (or bulk annuity) and pension buy-out, based on the valuations of future obligations in the first case and obligations and assets in the second, transfer also other risks such as the investment risk, interest rate risk, inflation risk and in some cases operational risk.

Buy-in and buy-out transactions are extremely popular in the UK, with a steady risk transfer of over $10bn a year in 2014 and 2015, followed by around $5bn by December 2016. In 2016 the market got off to a slow start, mainly due to the headwinds of low interest rates (low interest rates make funding a buy-in transaction more expensive for unhedged pension funds because they increase the size of the pension deficit), the implementation of Solvency II and Brexit uncertainty.

Solvency II insurance regulation came into force in January 2016, and requires higher capital requirements for insurers that are offering bulk annuities. This naturally leads to a higher cost of risk transfer; however, the market remained buoyant, with steady volumes and increased competition with new entrants to the market.

In a market where funded solutions increase in price, we would expect pension funds to turn to longevity swaps as an interim solution, which prepares pension funds for a buy out at some point in the future. This is a market in which we believe that there is space for innovation and further growth.

At the current time, the longevity swap market is dominated by two distinct types of transactions:

"Traditional longevity swaps", whereby full risk transfer for longevity risk is achieved through the realized longevity of current in payment pensioners being swapped principally for fixed longevity rates plus a fee as already described in this paper. This is the preferred pension fund hedging strategy for longevity risk;

"Capital Markets Longevity Swaps" on the other hand are mainly used in the Netherlands by insurance companies to manage longevity risk. The latter swaps tend to be based on reference population based mortality statistics rather than individuals in the pension fund or annuity book. They also tend to offer out-of-the-money protection from declining mortality rates, resulting in a payment to the hedge buyer if longevity improvements exceed a certain threshold. One final feature is that they tend to be shorter dated than traditional swaps, with anywhere between 5–40 years in maturity.

We believe that various pressures could lead to the development of a "middle way" for longevity de-risking transactions which lies between "Traditional Longevity Swaps" and "Capital Market Longevity Swaps".

These pressures consist of: limited capacity in the reinsurance market which is the ultimate taker of longevity risk, the high cost of de-risking longevity in deferred liabilities and increased regulatory requirements for banks and insurance companies pertaining to longevity risk.

"Middle Way" longevity swaps would provide out-of-the-money, capital efficient transactions that could be based on individual lives instead of population based mortality rates. The use of population based transactions has been subject to increasing regulatory scrutiny recently. The scrutiny is focussed around demographic basis risk arising from the reference of the swap to population mortality rates, rather than the actual lives in the portfolio. Therefore, a 'middle way' swap, which uses capital markets features (such as shorter maturity, and having an out of the money payoff) but which references actual lives, may be a more palatable solution for market practitioners and regulators alike.

In Fig. 1 the de-risking transactions described above are presented schematically. We have used color coding to show how the features of existing transactions could combine into a new type of longevity swap. There we summarize the two principal types of longevity risk-transfer transactions that have been seen most widely executed in the longevity risk transfer market to date, along with a new type of swap, here shown as 'The Middle Way'. We believe that 'The Middle Way Swap' could form a blueprint for a new type of risk transfer transaction, which essentially bridges the features of the two most popular transactions so far, by taking the advantages for users from both, and combining them into one new instrument. The two most frequently seen transactions in the