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There are worse things in life than death. For Woody Allen, it was the prospect of spending an evening with an insurance salesman. However, many insurance companies and pension funds face a prospect that is even more dire: the risk that their annuity and pension holders will live too long – or, more precisely, the risk that these people will on average live longer than anticipated.

Mary Hardy provided a nice discussion of this problem in one of her recent FEN columns (Hardy 2005), where she pointed out that life expectancy for men aged 60 is more than five years' longer in 2005 than it was anticipated to be in mortality projections made in the 1980s. This means five more years of pension, which is good news for the pensioner, but is potentially catastrophic for the pension provider who failed to anticipate the longevity improvement.

This problem threatens the solvency of the life and pensions industries, and some idea of its magnitude can be appreciated from the fact that the amounts exposed to longevity risk in the UK pensions industry alone were estimated to be £2,520 billion (about U.S. $4,424 billion) at the end of 2003 (Pensions Commission 2005) – or nearly £40,000 (or U.S. $70,000) for every man, woman and child in the UK.

Longevity Derivatives

Financial institutions exposed to longevity risk therefore need ways to manage it, but have traditionally been hampered by a dearth of suitable hedging instruments – in particular by the absence of longevity derivatives. However, this state of affairs is changing, and the first such derivatives – survivor or longevity bonds – were proposed

by Blake and Burrows in 2001. These took the form of annuity bonds whose annual coupon payments were tied to the survivorship index of some reference population. As members of this population gradually died off, the coupon payments would gradually fall, and Blake and Burrows suggested that such a bond might be a useful hedge for the annuity book of a life company. Before long, other longevity derivatives were also being proposed, including longevity swaps, options and futures, and there were the usual debates about their relative merits for different longevity risk management problems.

Besides giving insurance companies and pension funds means of hedging longevity risk, longevity derivatives also offer other interested parties the opportunity to acquire it. The most obvious counterparties are capital market investors who would be keen to acquire longevity exposure because longevity risks have low correlations with more conventional risk factors. This means that longevity risks have low beta – the capital markets' Holy Grail – and makes them potentially very attractive investment opportunities.

Financial institutions have also started to issue longevity derivatives. In December 2003, Swiss Re offered a three-year mortality bond whose principal payment was tied to an international mortality index. This bond offered investors a generous floating coupon payment in return for accepting the risk of a reduced principal payment in the event of a catastrophic mortality deterioration such as that associated with the Spanish flu pandemic of 1918. This bond allowed Swiss Re to lay off some of its extreme mortality risk and was well received by investors.

A second longevity bond was then announced in November 2004 by BNP Paribas. This was a 25-year annuity bond to be issued by the European Investment Bank (EIB), whose coupon payments were tied to a survivorship index of English and Welsh males aged 65 in 2002. This bond was targeted at life companies and pension funds wishing to hedge their annuity books and was similar in concept to the bonds proposed by Blake and Burrows. However, this second bond fared less well with investors and was withdrawn for redesign a year later.

During the last several years, a market for longevity swaps has also started to develop, and in December 2005 CS announced the CSFB Longevity Index, which aims to provide a benchmark longevity index against which longevity derivatives of various kinds can be calibrated.

We also know from our own discussions with practitioners that a number of financial institutions have plans to issue further longevity derivatives, but most institutions are extremely sensitive about giving any details away, especially after the failure of the

EIB/BNP bond issue – which was all the more embarrassing because of the fanfare associated with the bond's initial announcement.

Thus, longevity markets are beginning to develop, but progress so far has been mixed.

Ready to take off?

The controversy over longevity derivatives is also starting to heat up nicely. This became very apparent when a paper on longevity derivatives by the present authors (Blake et al 2006) was presented to a meeting of the Institute of Actuaries in London in February 2006. The meeting was very well attended (which attests to the interest in the topic) and led to a lively discussion, but the majority of the audience was sceptical. Perhaps the most critical reaction came from a participant who said the paper amounted to "little more than rearranging the lifeboats on the Titanic" and went on to suggest that the crisis in pensions, caused by low yields and too much longevity, could be solved by the actuarial profession pushing the case for higher interest rates.

However, no one in their right minds would ever suggest that longevity derivatives are a solution for the all past mistakes – the inadequate provisioning, low returns, bad risk management and so on – that have produced the current pensions crisis. Longevity derivatives cannot rectify all these problems, but still have their uses as risk management tools. We would also argue against the actuarial profession lobbying for higher interest rates; monetary policy should be geared towards price-level stability for the good of the economy as a whole and should not be manipulated to suit the convenience of annuity markets. Basic monetary economics also suggests that raising interest rates would also be counterproductive, as it would lead to lower inflation and possible deflation, which would create market pressures leading to even lower market interest rates down the road.

Instead, we would suggest that what is now needed is for participants in the longevity risk business to learn from experience – in particular, to learn from the failure of the EIB/BNP bond and to learn from the experience of other derivatives markets. One problem with the EIB/BNP bond was that it is capital intensive; it requires a high degree of upfront capital commitment for the degree of protection it offered. This particular problem can be ameliorated by looking for ways of increasing leverage so the bond provides more protection for less capital. We would also speculate that a second problem seems to have been basis risk – that the bond would provide a relatively poor hedge for a typical annuity book because the bond's reference population was insufficiently correlated with the population underlying a typical annuity book. However, there are many possible solutions to this sort of problem and they need to be carefully explored.

It is also important to learn from the experience of other derivatives markets, such as the markets for credit and property derivatives. These markets experienced their own problems, and many of these are comparable to those now faced by the longevity derivatives market – problems of leverage, basis risk, the valuation methodology to use in incomplete markets, liquidity, getting the "right" benchmark indices, mitigating counterparty credit risk and so on. There may also be other problems more specific to longevity risk markets, such as getting trustees to take responsibility for longevity risk management, concerns about reinsurance capacity and so forth.

Broadly speaking, the experience of other derivatives suggests that "teething" problems of one sort or another – including widespread initial scepticism and occasional costly "failures" – are only to be expected and are part and parcel of the process of capitalist experimentation and "creative destruction" – institutional "details" matter and take time to sort out. However, these problems are being addressed, and the fact that investment banks and other financial institutions are investing a lot of their time and effort into solving them suggests that the market for longevity products is about to enter a new and more mature stage of development. Indeed, we would go further and suggest that longevity may well be the next big frontier for financial derivatives. The lesson for derivatives dealers? Eat, drink and be merry, for tomorrow we die . . . or, there again, we might die some other day instead.

For More Reading

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