

EC372 Economics of Bond and Derivatives Markets**Longevity Swaps – an Emerging Market**

As with most swap contracts, a *longevity swap* comprises the exchange of a fixed sequence of payments for a ‘floating’ sequence. What distinguishes longevity swaps is that the floating payments vary with the length of life (longevity) of a well-defined population group.

The **simplest example** – unrealistic but capturing the crucial feature – is of a swap for which the ‘floating’ payment is a life-time annuity paid to a specific individual (i.e. a pension). Although the payments may be constant across time (perhaps they are adjusted for inflation), the sequence is ‘floating’ in the sense that the payments cease when the individual (the annuitant) dies.

Thus, the annuitant, I , might be a 60-year old individual who receives £25,000 each year. These payments represent the floating sequence. The fixed sequence would be an amount $£N$ for, say, 15 years. What determines N ? Presumably this depends on the expected life of the annuitant and the objectives of the parties (most importantly, their respective attitudes to risk), A and B to the swap. Suppose that A agrees to pay $£N = £28,000$ per annum to B for 15 years, in exchange for the annuity. If I dies younger than 75 (= 60 + 15), then B clearly gains, but if I survives longer, then A may gain – depending on when I dies relative to the Net Present Value of £3,000 (= 28,000 – 25,000) for the 15 years of the swap.

A **real-world illustration** is provided by the swap agreed in June 2009 between A , the *Trustee of the Devenport Royal Dockyard pension scheme*, and B , *Credit Suisse* (a financial services company, i.e. a multifunction bank). In this illustration, ‘the annuitant, I ’, comprises the pool of retired members of the pension scheme, who apparently had an average age of 67 at the inception of the swap. The details of the contract have not been made public. Even so, it should be clear that the pension trustees have reduced (perhaps eliminated) the uncertainty associated with the unknown longevity of the defined group of pensioners.

Comments:

1. What determines the **value**¹ of the swap? The ‘fair value’ of the swap at any date is usually expressed as difference between the Net Present Values (NPVs) of the fixed and floating payments’ sequences. For longevity swaps, the NPV of the floating sequence depends on actuarial assessments of the expected lifetime of I (in addition to the interest rate at which the sequence is discounted). But the negotiated value of the swap (expressed in the terms of the contract) will also depend on the preferences (risk-aversion) of A and B and any differences in their beliefs (i.e. their actuarial assessments).

¹The value would be reflected either in the amount N of the fixed sequence or in a side-payment between A and B at the inception of the swap.

2. What are the *risks* of the swap? Apart from the uncertainty of I 's lifetime (or lifetimes of members of the pool in realistic illustrations), which should not be considered as a risk of the swap², the risk is exactly the same as for any swap, i.e. default of A or B – including inability to fund variations in good-faith deposits needed to support continuation of the swap – that would lead to the swap's premature termination. The risk of default could be especially relevant because longevity swaps are likely to be of long duration (e.g. 10 years, or more) at their inception.

3. What will be needed for the market to become more developed?

(a) Media reports argue that potential counterparties have yet to learn how to assess the attractiveness of contracts that may be on offer.

Setting aside counterparty risk, the actuarial assessment of longevity has a reputation for great accuracy – albeit complicated by the tendency for individuals to live longer as a consequence of improvements in health-care and lifestyles. Hence, estimation of the likely outcomes (as always subject to statistical error) should be no more problematical than for many other financial contracts.

(b) More important than learning about the risks associated with longevity shocks could be that there is no 'price' (i.e. contractual terms) that would satisfy both parties: in the simple example above, the cost to A (pension company), in securing certainty in its annuity payments, may not be sufficient to induce B (bank) in bearing the uncertainty. That is, the differences in preferences (for risk-bearing across uncertain states of the world) may not be sufficient to generate a viable market.

(c) *Standardized benchmark indexes* would facilitate comparisons among contracts that may be needed for the market to expand to the extent that it becomes possible to a 'market price' for longevity swaps (such that potential parties to a swap could more effectively compare the relative attractiveness of available contracts – much as now exists for plain vanilla interest rate swaps and for Credit Default Swaps).

J. P. Morgan's *LifeMetrics* offers a set of indexes (with 'toolkit') that measure mortality according to various criteria, and hence which could support the construction of financial instruments such as longevity swaps.³ For example, the floating component of a swap could be determined as a function of one or more of the publicised indexes (together with other information specific to the swap parties).

Despite the existence of industry-wide benchmark indexes, the parties to swaps are likely to customize the contracts to suit their specific needs, e.g. demographic characteristics of the pool of annuitants, the risks of which are traded in the swap. Hence, longevity swaps are likely to remain 'bespoke' over-the-counter agreements (more akin to forward rather than futures contracts) even when linked to benchmark indexes.

²It is this risk that the swap is intended to share between the two parties

³See <http://www.jpmorgan.com/pages/jpmorgan/investbk/solutions/lifemetrics>. It seems that in 2005 Credit Suisse introduced a 'Longevity Index', though it may have now been withdrawn as the company no longer publicises its existence.