



Longevity Four:¹ Fourth International Longevity Risk and Capital Market Solutions Conference Amsterdam, 25-26 September 2008

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Longevity risk is an increasingly important risk for pension plan and annuity providers and, indeed, individuals to recognise, quantify and manage. It is not such an immediate or even as large a risk as, say, interest rate or inflation risk, two of the key risks that pension funds are now beginning to hedge using, for example, duration and inflation swaps. But having hedged these two risks, longevity risk becomes a relatively much larger risk to manage.

Longevity risk is also qualitatively different from other risks. It is essentially a long-term trend risk. Getting the trend improvements in life expectancy right is the key to managing this risk. However, this has proved difficult to do in the past and even official agencies have systematically underestimated previous mortality improvements. Nevertheless, longevity risk, like interest rate and inflation risks, is an unrewarded risk and pension plan and annuity providers are beginning to question whether this is a risk they should be assuming.

Having recognized the nature of longevity risk, the next step is to quantify it. Different stochastic mortality models are being developed to do this. Some are more successful than others in predicting changes in trend. Longevity, mortality and survivor fan charts are being developed to show confidence intervals of possible dispersions of life expectancies, mortality rates and survival rates around the most likely forecasts of these quantities in future years.

Having quantified the risk, the final step is to manage it. Both insurance contracts and capital market derivatives are being developed to do this. Recent examples include longevity swaps and q-forward contracts. Some hedge specific longevity risk, while others hedge aggregate longevity risk.

These new contracts were discussed at *Longevity Four: The Fourth International Longevity Risk and Capital Markets Solutions Conference* held in Amsterdam on 25-26 September 2008. It was hosted by Netspar and the Pensions Institute (at Cass Business School), organised by PensionSummit and sponsored by Cardano, EIM, Nationale Nederlanden, and Robeco; IPE and Pensions & Investments were media partners. The aim of the Longevity Conferences is to bring together academics and practitioners from all over the world to discuss and analyse these new developments.

The first conference was held at Cass Business School in London in February 2005. It was prompted by the announcement of the Swiss Re mortality catastrophe bond in December 2003 and the EIB/BNP/PartnerRe longevity bond in November 2004.

The second conference was held in April 2006 in Chicago and hosted by the Katie School at Illinois State University.² In the intervening period, there were further issues of mortality catastrophe bonds, as well as the release of the Credit Suisse Longevity Index. Life settlement securitisations were also beginning to take place in the U.S. In the UK, new life companies backed by global investment banks and private equity firms were setting up for the express purpose of buying out the defined benefit

¹ David Blake, Anja De Waegenaere, Richard MacMinn and Theo Nijman.

² The conference proceedings for Longevity Two were published in the December 2006 issue of the *Journal of Risk and Insurance*.

pension liabilities of UK corporations. Goldman Sachs announced it was setting up such a buy-out company itself because the issue of pension liabilities was beginning to impede its mergers and acquisitions activities. So there was now clear evidence that a new global capital market in longevity risk transference was beginning to emerge. However, as with many other economic activities, not all progress follows a smooth path. The EIB/BNP/PartnerRe longevity bond did not attract sufficient investor interest and was withdrawn in late 2005. But a great deal was learned from this about the conditions and requirements needed to launch a successful capital market.

The third conference was held in Taipei, Taiwan, on 20-21 July 2007. It was hosted by the National Chengchi University.³ It was decided to hold the third conference in the Far East, not only to reflect the growing importance of Asia in the global economy, but also in recognition of the fact that population ageing and longevity risk are problems that affect all parts of the world and that what we need is a global approach to solving these problems.⁴ Since the Chicago conference, there had been many new developments, including: the release of the LifeMetrics Index in March 2007 by JPMorgan, the Pensions Institute and Watson Wyatt (www.lifemetrics.com); the world's first publicly announced longevity swap between Swiss Re and the UK life office Friends' Provident in April 2007 (although this was structured as an insurance contract or indemnification rather than a capital market transaction); and the launch of the Institutional Life Markets Association also in April 2007.

Since the Taiwan conference, there were further developments in the capital markets. In December 2007, Goldman Sachs launched a monthly index suitable for trading life settlements.⁵ The index, QxX.LS, is based on a pool of 46,290 anonymized lives over the age of 65 from a database of life policy sellers assessed by the medical underwriter AVS (www.qxx-index.com). In July 2008, Institutional Life Services (ILS) and Institutional Life Administration (ILA), a life settlements trading platform and clearing house, were launched by Goldman Sachs, Genworth Financial and National Financial Partners. ILS/ILA are designed to modernize dealing in life settlements and meet the needs of consumers (by ensuring permanent anonymity of the insured) and of the capital markets (by providing a central clearing house for onward distribution of life settlement assets, whether individually or in structured form).

The world's first capital market derivative transaction, a q-forward contract⁶ between JPMorgan and the UK pension fund buy-out company Lucida took place in January 2008. The world's first capital market longevity swap was executed in July 2008. Canada Life hedged £500m of its UK-based annuity book (purchased from the defunct UK life insurer Equitable Life). This was a 40-year swap customized to insurer's longevity exposure to 125,000 annuitants. The longevity risk was fully transferred to investors, which included hedge funds and ILS (insurance-linked securities) funds. JPMorgan acted as the intermediary and assumes counter-party credit risk.

At the same time as these practical developments in the capital markets, academics were continuing to make progress on theoretical developments, building on the original idea of using longevity or survivor bonds to hedge longevity risk in the capital markets (Blake and Burrows, 2001). These included:

- Design and pricing of longevity bonds (e.g., Blake *et al.*, 2006)
- Design and pricing of longevity-linked derivatives, such as survivor swaps (e.g., Dowd *et al.*, 2006), survivor forwards and swaptions (e.g., Dawson *et al.*, 2008), and mortality options (e.g., Milevsky *et al.*, 2001)
- Securitisation and hedging in life insurance and annuities (e.g., Cowley and Cummins (2005), Dahl and Møller (2006), and Lin and Cox (2005))
- Mortality modelling (e.g., Cairns *et al.* (2006, 2008, 2009), Dowd *et al.* (2008), and Blake *et al.* (2008))
- Mortality term structure modelling and pricing (e.g., Bauer (2006), Bauer and Russ (2006), Biffis *et al.* (2006) and Hari *et al.* (2008)).

³ The conference proceedings for Longevity Three were published in the Fall 2008 issue of the *Asia-Pacific Journal of Risk and Insurance*.

⁴ In fact, Asia has the world's largest and fastest growing ageing population (United Nations, 2007).

⁵ Life settlements are traded life policies. In April 2007, the Institutional Life Markets Association started in New York, as the dedicated institutional trade body for the life settlement industry.

⁶ Coughlan *et al.* (2007).

It was decided to hold the fourth conference back in Europe, this time in Holland. Holland, like the UK and Ireland, is a European country with significant occupational defined benefit liabilities and hence has a significant exposure to longevity risk.

The following keynote speakers addressed the conference:

- Joanne Kellermann, Executive Director of De Nederlandsche Bank (DNB): Longevity risk and regulation of pension funds
- Anton Kunst, Netspar and Associate Professor of Medical Demography, Erasmus MC: Epidemiological perspectives on life expectancy
- Gilles Dellaert, vice president in Goldman Sachs' Longevity Markets Group: Longevity: A developing asset class
- Søren Fiig Jarner, Chief Analyst of ATP: Small-region mortality modelling
- Ronald Wuijster, Director of Strategy & Research at APG Investments: Longevity problems and investment solutions
- Guy Coughlan, Managing Director and Global Head of LifeMetrics and ALM Advisory JPMorgan Pension Solutions Group: The effectiveness of longevity hedges and the attractiveness of longevity investments.

The following workshops were also held:

- Bart Oldenkamp, Cardano: Hedging longevity risk for DB pension funds: an ALM perspective
- Marcos Flores, Credit Suisse: Overview UK longevity market: size, players, structures and pricing
- Michael Sherris, Australian School of Business: Securitization, structuring and pricing of longevity risk
- Mark Warshawsky, Watson Wyatt Worldwide: Optimizing the equity-bond-annuity portfolio in retirement: the impact of uncertain health expenses
- Nicholas Verwilghen, EIM: The three big risks trade-off: interest rates, inflation and longevity – Lessons learnt by a multi-manager
- Jochen Russ, LMU Munich: On the pricing of longevity-linked securities
- Mario Michael Schultz, Deutsche Börse: Xpect Data and Xpect Indices – Longevity risk evaluation and risk transfer
- Hal Pedersen, University of Manitoba: Mortality risk modelling: applications to insurance securitization
- Laurens Swinkels, Robeco: Longevity hedge: the next generation in liability driven investing
- Kevin Dowd, Nottingham University Business School: Backtesting stochastic mortality models: an ex-post evaluation of multi-period-ahead density forecasts
- Erik Tornij, ING: Modelling and pricing longevity risk in the Dutch insurance market: challenging topics and practical solutions
- Anja De Waegenaere, Tilburg University: Longevity risk in annuity portfolios: the effect of product design and portfolio composition
- Min-Hung Tsay, National Central University: Pricing survivor swaps with mortality jumps and default risk
- Hua Chen, Temple University: Longevity risk premium, extreme value approach and risk cubic pricing
- Anthony Webb, Boston College: Evaluating the advanced life deferred annuity – an annuity people might actually buy
- Hong-Chih Huang, Chengchi University: Optimal asset allocation incorporating longevity risk in defined contribution pension plans
- Sharon Yang, National Central University: Modeling longevity risk: an empirical study
- Jennifer Wang, National Chenchi University: Liability allocation under mortality systematic risk, non-parallel shift and parameter uncertainty
- Paul Hance, AEGON: Using survivorship bonds to reduce an economy's aggregate value-at-risk

- Jean Pinquet, University Paris 10: Long-term care: risk description of a Spanish portfolio and economic analysis of the timing of insurance purchase
- Enrico Biffis, Imperial College: Securitizing and tranching longevity exposures
- Atsuyuki Kogure, Yoshiyuki Kurachi, Keio University: A Bayesian evaluation of longevity risk: model comparison, measuring and pricing
- Jack C. Yue, National Chengchi University: Age-Period-Cohort Model and its application to Taiwan mortality rates by marriage status.

A number of the papers that were presented at the conference will be published in a special issue of *Insurance: Mathematics & Economics* that will be edited by Anja De Waegenaere, David Blake and Theo Nijman. At the end of the first day of the conference, there was a debate involving two motions which the conference participants voted on:

- “Longevity risk transfer will always be preferred in insurance form rather than via the capital markets”
- “Longevity risk in pension funds will be much larger than investment risk in 15 years’ time”.

The debate was chaired by Tom Boardman (Director of Retirement Strategy and Innovation, Prudential UK). The first motion was proposed by Gavin Jones (Vice President, Swiss Re) and opposed by Guy Coughlan (Managing Director and Global Head of LifeMetrics and ALM Advisory, JPMorgan Pension Solution Group). The second motion was proposed by Theo Kocken (Founder and CEO, Cardano Group) and opposed by Onno Steenbeek (Head of Corporate ALM and Risk Policy of the All Pensions Group, APG). Both motions were defeated in votes by audience participants.

Longevity Five is being planned in New York, 25-26 September 2009. For more information (including the full reference of the sources cited above): www.pensions-institute.org.

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