VI. Conference Report

Second International Longevity Risk and Capital Market Solutions Symposium*

By Richard MacMinn and David Blake

The Second International Longevity Risk and Capital Market Solutions Symposium was held at the Sheraton Hotel, Chicago, Illinois on the 24th of April 2006. It was hosted by Professor Richard MacMinn, Editor of the Journal of Risk and Insurance, and Professor David Blake, Director of the Pensions Institute at Cass Business School, City of London. The first symposium was held at Cass Business School, on 18th February 2005.

As populations in countries around the world age, governments, corporations and individuals face increasing longevity risk. Pay-as-you-go state pensions and corporate pension plans are beginning to put severe financial pressures on governments and companies; IBM and Verizon are just two recent examples in the US, and British Airways and the Co-op provide two current UK examples in the UK. Mortality improvements especially at older ages make it ever more likely that individuals with inadequate pension arrangements will end their lives in poverty.

Capital markets do provide governments, corporations and individuals with a means of transferring risks and resources across time, as well as spreading risks across individuals. Similarly, individuals can transfer money forward via security purchases to fund their retirement years. However existing instruments do not allow agencies, corporations or individuals to effectively hedge the longevity risk that they face.

One theme of the conference was to examine how longevity risk could be modelled and how improved modelling could lead to improved methods of pricing longevity risk. Another theme was to look at recent private sector issuance of mortality-linked instruments and securitizations. Yet another was to assess the role of the state in directly issuing such instruments.

The conference was opened by Lord Turner of Ecchinswell, past chairman of the United Kingdom Pensions Commission. His key question was: Who should bear longevity risk? His answer was that it should be individuals themselves in the pre-retirement phase. This was because individuals had a natural offset in the form of their human capital and the possibility of later retirement. However, post-retirement, after human capital had been exhausted, society as a whole had an interest in a well functioning and fairly priced annuities market that hedged individual longevity risks. The absence of a hedge for aggregate longevity risk, however, suggested that there was a case for the government to step in and help the annuities market by issuing longevity bonds. But this could only happen after the government reduced its exposure to pre-retirement longevity risk by indexing the state pension retirement age to the increase in longevity.

Eric Stallard of Duke University looked at demographic issues in longevity risk measurement and modelling. Resolving such issues was necessary to allow survivor bonds to have coupons that are proportional to the number of survivors at each future date. As minimal requirements, we need accurate measures of the initial size and defining characteristics of each cohort, decrements due to death or emigration, and increments due to immigration. In terms of modelling, the following factors help to explain why mortality is declining: improvements in physical and cognitive health and in the diagnosis and treatment of chronic and disabling illnesses, innovations in preventative medicine, pharmaceutical innovation, improvements in health-related behaviour, decreased hazardous exposures, and improved levels of education and socio-economic status.

Jeffrey Brown of the University of Illinois (in a contribution co-authored with Peter Orszag) examined the political economy of government-issued longevity bonds. He argued that government-issued longevity bonds could help to complete markets and enhance intergenerational risk sharing: only the government can do the latter. But he warned that there was no guarantee that the efficient allocation of risk will be achieved through the political system. This is because the current generation of politicians might have an incentive to shift more risk than is optimal to future generations. Further, there was possibility that the government might not even share risk efficiently within each generation.

Morton Lane of Lane Financial examined the pricing of some recent life securitization issues, such as the Swiss Re mortality catastrophe bond and the Queensgate closed book indemnity bond. He

* The Geneva Association has edited a special Etudes et Dossiers Working Paper Series including all presentations given during this symposium. Should you be interested in this publication, please contact the secretariat of the Geneva Association.

concluded that the Swiss Re bond was cheap, that the senior tranche of the Queensgate bond was fairly priced, while the C-trance was expensive.

David Cummins of the Wharton School looked at how the securitization of life assurance assets and liabilities could be value enhancing. He argued that securitization creates value for insurers because with the growth of insurance markets and increasing risk, insurers need additional risk-bearing capacity, the capacity of the reinsurance market to bear risk is inadequate, and raising new external capital can be expensive and so it might be cheaper in the long run to transfer risk to capital markets rather than raising equity. He also argued that securitization creates value for investors because they are constantly searching for securities that offer both yield and are valuable for diversification: many types of insurance risk have low correlation with traditional investments and investors might be willing to assume this risk for less than the cost of raising new equity.

Tom Boardman of Prudential Assurance UK considered the annuitization lessons from the UK, the world's largest life annuity market. Recognising that many consumers did not value annuities highly ('I give all my pension savings away in exchange for an annuity and could die tomorrow leaving nothing for my kids'), the Pru went back to the drawing table and came up with the concept of the money-back annuity. This returns capital in the form of death benefits if the individual dies within 10 years of starting the annuity, but switches into full annuitization if the individual survives this period and so begins to enjoy the benefits of the mortality cross-subsidy.

Kevin Dowd of Nottingham University Business School (in a joint presentation with David Blake, Andrew Cairns and Richard MacMinn) examined the construction, valuation and use of longevity bonds. There are two key ways of constructing longevity bonds. The first decomposes the cash flows on a riskless fixed income government annuity bond into a longevity bond with the residual claims forming an 'inverse' longevity bond. The second combines a government annuity bond whose cash flows are based on projected mortality of the reference population and a longevity swap. The former can be priced using standard discounted cash flow methods, whereas the latter needs to be priced using incomplete market methods such as the Wang transform. The interest rate and mortality risk hedging properties of the bonds were also examined.

Dave Dowrich of Credit Suisse looked at the new Credit Suisse Longevity Index. This provided an objective, transparent and consistent source of expected average lifetime and mortality rate data, based on publicly available statistics. The aim is to create index values, underlying mortality rates or cumulative survival rates that can be used to settle longevity and mortality based transactions, such as those associated with longevity bonds and longevity swaps.

Moshe Milevsky of York University in Toronto (in a joint presentation with David Promislow and Virginia Young) considered the financial valuation of mortality risk via the instantaneous Sharpe Ratio. The starting point was the recognition that the law of large numbers breaks down under aggregate mortality risk and so this risk can never be entirely eliminated. Given this, one solution is to price a longevity insurance policy via the Sharpe Ratio which takes into account the non-diversifiable risk contained in such policies.

Yijia Lin of the University of Georgia (in a joint presentation with Samuel Cox and Shaun Wang) looked at ways of improving current mortality forecasting models. One is to include jump processes to account for extreme mortality events such as the 1918-19 Spanish flu pandemic. Another is to use multivariate exponential tilting which is equivalent to a multivariate Wang transform. Using these improvements, the authors come to the conclusion that the Swiss Re bond is a good deal for investors.

The final presentation was given by Andrew Cairns of Heriot Watt University in Edinburgh (jointly with David Blake and Kevin Dowd). He presented a new mortality forecasting model called the two-factor model. One factor accounts for common mortality shocks across all ages, while the second accounts for age-dependent shocks. The parameters attached to these factors are modelled as random walks with drift. The model is more parsimonious and more robust than the popular Lee-Carter model. To illustrate, the model was used to price longevity bonds with different terms and for reference populations with different initial ages. A particularly interesting finding is that the longevity risk premium incorporated into the price of a longevity bond is more sensitive to the initial age of the reference population than to the maturity of the bond: in other words, a one year increase in the reference population's age leads to a larger increase in the longevity risk premium than a one year increase in the bond's maturity.

The conference ended with a round table discussion of the issues raised in the symposium chaired by Lord Turner and with panel members Nirmaljit Singh Paul (World Bank), Jeff Katz (MARC) and Tom Boardman (Prudential Assurance UK).