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# Longevity Risk and Reinsurance

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## WHAT IS LONGEVITY RISK?

Longevity risk is the risk of populations living longer than expected—for example, through medical advances or declining health risks such as smoking. It is a global challenge driven by the ongoing substantial increases to postretirement life expectancy and is systematic in nature.

Longevity risk affects:

- Governments who have to fund promises to retired individuals through pensions and healthcare from a shrinking tax base
- Corporate sponsors who fund retirement and health insurance obligations to former employees accrued over many years
- Individuals who may have reduced or no ability to rely on governments or corporate sponsors to fund retirement.

As governments and corporations consider how to manage these risks, the insurance sector provides a natural home for the combined asset and liability management challenge of funding longer lives—as illustrated by recent transactions by General Motors and Verizon.

Globally the aggregate value of private defined-benefit pension liabilities totals US \$23 trillion.<sup>1</sup> The uncertainty of these liabilities has been crystallized in a low interest rate environment, creating financial motivation for risk transfer. Though the balance sheet of the insurance and reinsurance sector is part of the solution to these stretched liabilities, the scale of the issue is likely to exhaust insurance market capacity at some point in the future.

## RISK TRANSFER AND LONGEVITY REINSURANCE

Longevity risk can be transferred in a number of ways. The simplest is equivalent to the single premium immediate annuity (SPIA) whereby a risk holder pays a premium to an insurer and passes both asset and liability risk. For a pension plan or insurer, this involves a large transfer of assets to a third party, with the possibility of material credit risk exposure.

It is perfectly possible to eliminate the longevity risk only, while retaining the underlying assets via (re) insurance of the liability. Here, instead of paying a single premium, the premium is spread over the likely duration of the liabilities of 50 or 60 years, aligning premiums and claims and moving uncertain cash flows to certain ones. (See illustration below)

Beyond management of the systematic risk that has been a key driver of pension plan de-risking, there has been reinsurance activity in the U.K. for individual annuities. In markets with compulsory annuitization at retirement (such as the U.K. and Canada), there is opportunity for underwritten annuities where annuitants in ill health gain additional income. Reinsurers support primary companies both in assuming risk and also in supplying underwriting services and expertise. In 2012, nearly US \$6 billion of immediate annuities were transacted through the enhanced annuity market in the U.K.—the majority of which included some form of reinsurance. The longer-term impact is to introduce significant exposure to selection in the individual annuity market.

**MOTIVATION FOR RISK TRANSFER**  
In the transfer of longevity risk for a given pension plan or insurer, there are two main components:

- i) Current levels of mortality (base mortality), which are observable but vary substantially across socio-economic and health categories and are diversifiable across individuals; and

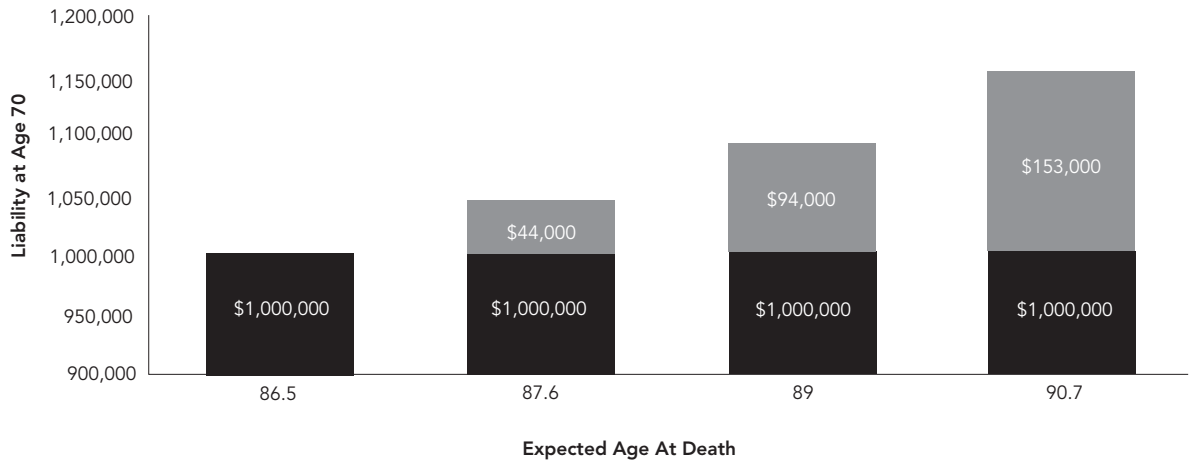


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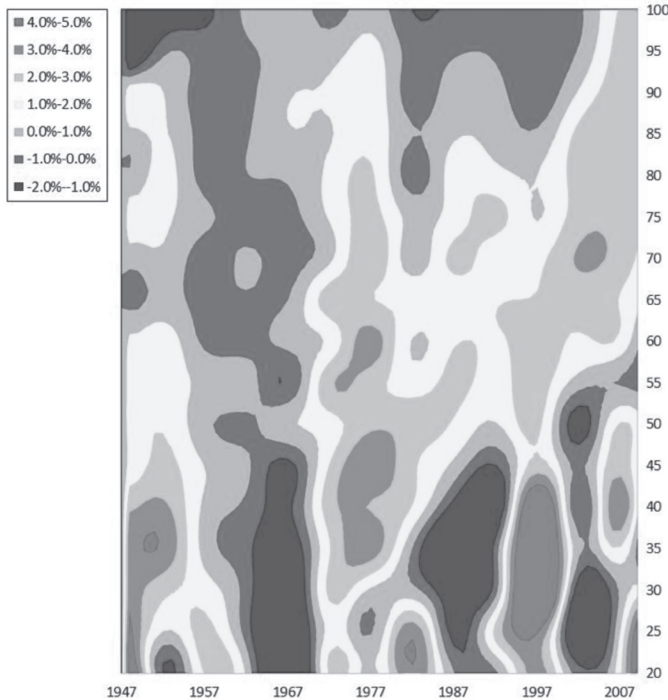
### Liability Sensitivity to Longevity



ii) Longevity trend risk, which is systematic in nature as it applies to populations (e.g., improvements in medical treatment), and therefore does not diversify between longevity exposures for a holder of the risk.

The most direct offset available to the systematic mortality trend risk is through holding exposure to increasing mortality; for example, through appropriately selected books of life insurance policies.

For a pension scheme or an insurance company, one reason to cede risk is uncertainty around the exposure to that risk, particularly due to the systematic nature. The graph above illustrates the incremental impact of increasing expected age at death of a longevity liability for a 70-year-old at a 4 percent discount rate.<sup>2</sup>



Source data: [www.mortality.org](http://www.mortality.org), Swiss Re analysis

A more detailed view of the risk is to look at the mortality improvements by calendar year and age. The graph to the left shows U.S. male mortality improvements now running in excess of 2 percent a year at postretirement ages. A long-term difference of 1%pa is equivalent to a one-year difference in life expectancy at normal retirement ages.

U.S. tables such as RP-2000 have included the use of projection scale AA where improvements vary by age. The Society of Actuaries (SOA) has recognized that Scale AA is based on outdated data that does not capture the level of improvement that has been observed recently. They have therefore released proposed revised improvement tables (“Scale BB”). However, these expect mortality improvements to rapidly return to lower long-term improvements relative to improve-

ments calculated on the U.S. population from the Human Mortality Database (HMD) and the evidence of the Social Security Administration (SSA). (See charts to the right)

The SOA<sup>3</sup> estimates that a move to Scale BB may increase pension liabilities by the order of 3 percent, using a 6 percent discount rate. Lower discount rates push up the value of long-dated guarantees and increase the financial impact of uncertainty, with the SOA estimating a 2 percent drop in discount rate increasing the impact by 20 to 30 percent.

In the U.K., the Institute of Actuaries has moved away from providing a single improvement table given the lack of certainty around such a calibration. Instead, they require that actuaries make a decision themselves as to the appropriateness of a projection table.

The increasing recognition of uncertainty has led to substantial research and development across actuarial, demographic and statistical disciplines. These include a wide range of statistical models developed from the Lee-Carter model, and have enhanced the focus on the ability to develop prospective models that take account of possible future medical advances. In an economic capital environment, new modeling can lead to substantial capital implications.

## RISK APPETITE AND REINSURERS

One question that arises is the rationale in acquiring such a long-term and uncertain risk.

Life insurers and reinsurers hold exposure to long-dated mortality risk through long-term or permanent life insurance products. There, in addition to the underwriting and pandemic risk, is substantial exposure to adverse mortality trend development.

It is unlikely that the same lives would be covered under both mortality and longevity insurance policies, but at a larger level the exposure to mortality trend should be partially offsetting. This generates anti-correlation, reducing risk and economic capital requirements across a portfolio incorporating both liabilities.

Male Annual Mortality Improvements				
Age	Scale AA	Scale BB	HMD (2000-2010)	SSA (2000-2007)
65	1.4%	1.2%	2.1%	2.4%
70	1.5%	1.5%	2.6%	2.8%
75	1.4%	1.5%	2.5%	2.6%
80	1.0%	1.5%	2.6%	2.3%
85	0.7%	1.5%	2.6%	2.1%

Female Annual Mortality Improvements				
Age	Scale AA	Scale BB	HMD (2000-2010)	SSA (2000-2007)
65	0.5%	1.2%	2.1%	2.4%
70	0.5%	1.2%	2.1%	2.0%
75	0.8%	1.2%	1.8%	1.6%
80	0.7%	1.2%	2.2%	1.6%
85	0.6%	1.2%	2.0%	1.4%

It is notable that though the risk transfer market is active in the U.K. with investment banks often acting as intermediaries, the vast majority of the risk is passed to the reinsurance market either directly or via banks or insurers.

Date	Pension Plan	Principal	Risk Holder	Size
2009	Babcock International	Bank	Reinsurance	GBP 1.2bn
2009	RSA	Bank	Reinsurance	GBP 1.9bn
2009	Royal County of Berkshire	Swiss Re		GBP 1.0bn
2010	BMW	Bank	Reinsurance	GBP 3.0bn
2010	British Airways	Bank	Reinsurance	GBP 1.3bn
2011	ITV	Bank	Reinsurance	GBP 1.7bn
2011	Rolls-Royce	Bank	Reinsurance	GBP 3.0bn
2011	British Airways	Bank	Reinsurance	GBP 1.3bn
2011	Pilkington	Insurer	Insurer and Reinsurer	GBP 1.0bn
2012	AkzoNobel	Swiss Re		GBP 1.4bn
2012	LV=	Swiss Re		GBP 0.8bn
2013	BAE Systems	Insurer	Insurer and Reinsurer	GBP 3.2bn

This underlines the illiquid nature of the risk and the perceived value of anti-correlation to the reinsurance market.

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Overall, the global volume of longevity risk is larger than the ability of the insurance sector to absorb it. For this, as with other risks, the capital markets provide the largest available form of capital—already exposed to the risk indirectly as holders of government debt or of equity in corporations with pension plan exposure. Attracting investors to a new long-duration asset class is a challenge that requires further development by the industry. One example is Swiss Re's 2010 Kortis bond, which covers the difference in mortality improvements between U.S. lives at insured ages and U.K. lives at postretirement ages. Subsequently, Aegon has also used an index-based instrument to protect against adverse longevity trends for the Netherlands population. These approaches represent the initial phase of development of capital market instruments for longer-tenor mortality trend risk transfer by using population indices, a more transparent means of transacting risk.

## CONCLUSION

Longevity risk materializes when substantial accumulations of longevity crystallize exposure to mortality trend. This is different from mortality risk where the underwriting risk at individual policy level motivates risk transfer separately from any trend considerations. For longevity, the focus of risk transfer has been for in-force transactions with a material defined liability.

Longevity is a structural demographic risk that is currently held in a variety of hands, but arguably least efficiently as a material liability for corporate sponsors with defined-benefit pension plans.

The insurance sector is a natural home for these risks as a holder of large volumes of long-dated mortality trend risk. The underwriting assessment in setting base mortality and appropriately allowing for trend are at the core of the reinsurance skill set. The risk is carried most efficiently on the insurance balance sheet where, under an economic view, the partial anti-correlation of mortality and longevity may provide compelling capital benefits. But ultimately the structural challenge of an aging society cannot be solved by insurance alone. The industry needs to work with other stakeholders to provide certainty to the retirement benefits of our aging populations. ■

## END NOTES

- <sup>1</sup> International Monetary Fund 2012.
- <sup>2</sup> 100% UP94 with Scale AA improvements.
- <sup>3</sup> SOA—Mortality Improvement Scale BB report.