

Overview of Longevity De-Risking and Longevity Risk Capital

Joint Networking Event
PRMIA and Actuarial Profession
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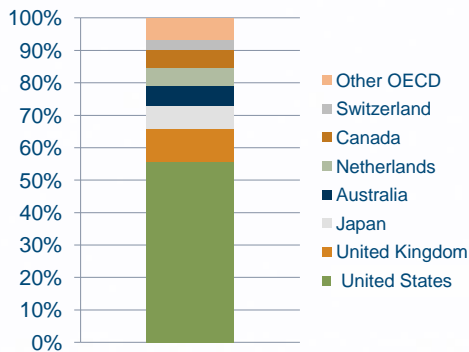
Agenda

- Market Background on Longevity De-Risking
- Solvency II, Longevity Risk Capital and Diversification
- Benchmarking Assumptions
- Conclusions



“Governments must wake up to the cost of longevity”, argues UK think tank, ILC-UK

Pension Assets in OECD Countries 2011



Source: OECD Pension Market In Focus No.9, September 2012



The cost of our ageing society

Daniela Silcock and David Sinclair

December 2012
www.ilcuk.org.uk

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Phoenix transfers £5bn annuity book to Guardian

Prudential Financial signs pension transfer agreement with General Motors Co.

L&G buys £390m of reinsurance from RGA

Pension Corp hedges £300m in Munich Re deal

Pacific Life completes £300m longevity reinsurance

JP Morgan hedges workers' longevity risk

Verizon Sends \$7.5 billion in Pension Funds to Prudential Financial

ITV signs £1.7bn pensions longevity deal

Rolls-Royce in £3 billion longevity swap with Deutsche Bank

Hannover reinsures L&G £1bn longevity swap

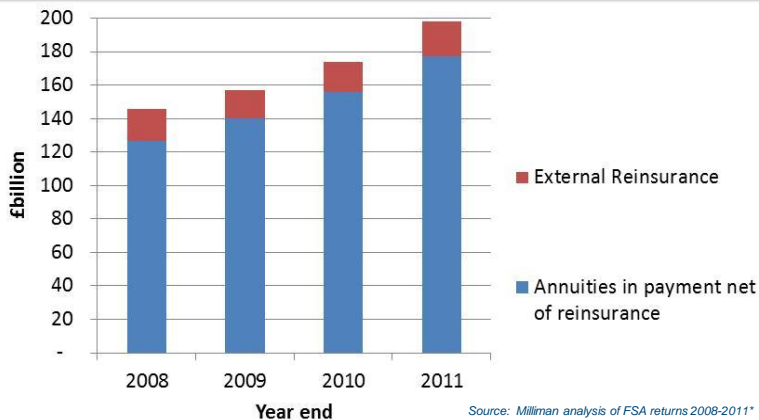
Aegon signs €12bn longevity Swap with Deutsche Bank

BA completes £1.3bn buy-in with Rothersey Life

Swiss Re completes first longevity trend bond

The UK Insured Annuity Market

Total UK Mathematical Reserves for Annuities in Payment



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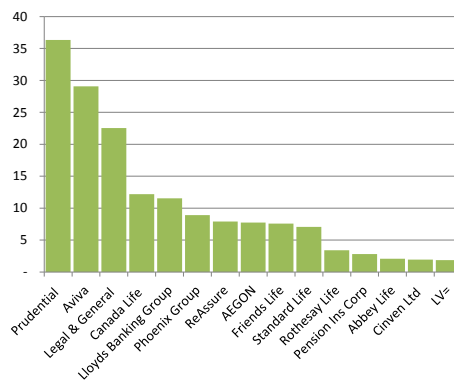
Key Drivers for Insured Annuity Transactions

Key de-risking drivers have included:

- Capital efficiency and company restructuring
- Concerns over future improvements
- Economic capital
- Uncertainty over Solvency II

BUT, Who continues to retain the risk?....

Top 15 UK Annuity Risk Holders* by Net Reserves End-2011 (£bn)

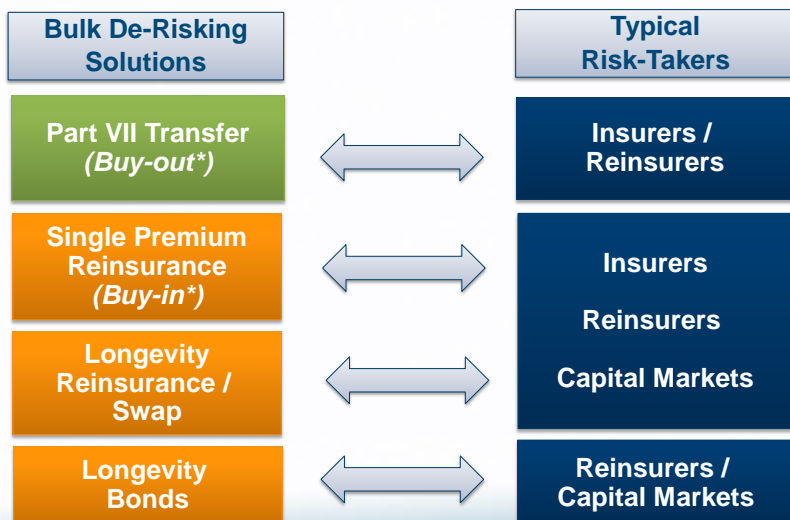


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Major Types of Insured Annuity Bulk Solutions



**Example Corporate Pension Scheme Risking Parallel Solution*

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Major Bulk Insured Annuity Transactions*

Date	Risk From	Risk To	Size	Deal Type
2012	Pension Insurance Corporation	Munich Re	£0.3 bn	Longevity swap
2012	Phoenix	Guardian Financial Services	£5 bn	Part VII Transfer**
2012	Aegon	Deutsche Bank	Notional €12 bn	Longevity swap
2011	Legal & General	RGA	£0.4 bn	Longevity swap
2011	Rothsay Life / Paternoster	Prudential Retirement	£0.5 bn	Longevity swap
2011	Rothsay Life / Paternoster	RGA	£1.1 bn	Longevity swap
2010	Rothsay Life	PacLife Re	c£0.3 bn	Longevity swap
2010	Paternoster	Rothsay Life	£2.8 bn	Part VII Transfer
2010	Swiss Re	Kortis	£0.05 bn	Longevity Bond
2009	Credit Suisse	PacLife Re	£0.3 bn	Longevity Swap
2009	Rothsay Life	PacLife Re	c£0.5 bn	Longevity Swap
2009	Aviva	RBS/Partner Re	c£0.5 bn	Longevity Swap
2008	Abbey Life	PacLife Re plus others	£1.3bn	Longevity Swap
2008	Friends Provident	Swiss Re	£1.7 bn	Reinsurance
2008	Standard Life	Canada Life	£6.7 bn	Reinsurance
2008	Canada Life	JP Morgan	£0.5 bn	Longevity Swap
2008	Lucida	JP Morgan	£0.1 bn	Longevity Swap

**Based on press releases only, excludes private transactions, **planned Part VII transfer*

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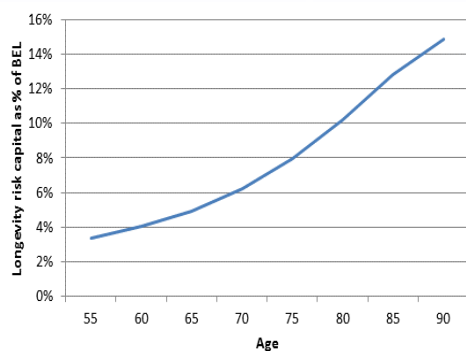
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SII: Standard Formulae Longevity Stress

Longevity Risk Capital as % Best Estimate Liability by Age



- 1-in-200 standard stress is 20% immediate and permanent reduction in annuitant mortality (QIS 5: 20%, QIS 4: 25%)
- Longevity tail “events” arguably manifest themselves via a long term increase in mortality improvement rates, rather than one-off shock
- Internal models will consider shocks to both the level and trend of mortality rates (and volatility)

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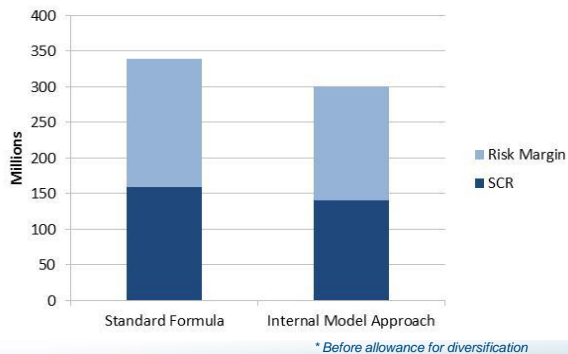
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REVEAL™ Case Study

- Case study of 50,000 annuitants using longevity risk projection system, REVEAL™, to illustrate relative size of SCR and risk margin for longevity:

Longevity Capital* (SCR + Risk Margin) required under Standard Formula and "Internal Model"



Under the stochastic "Internal Model" approach taken in the case study, the resulting longevity capital requirement was over 10% lower than under the Standard Formula requirement

Source: Milliman case study: Modelling Longevity Risk under Solvency II

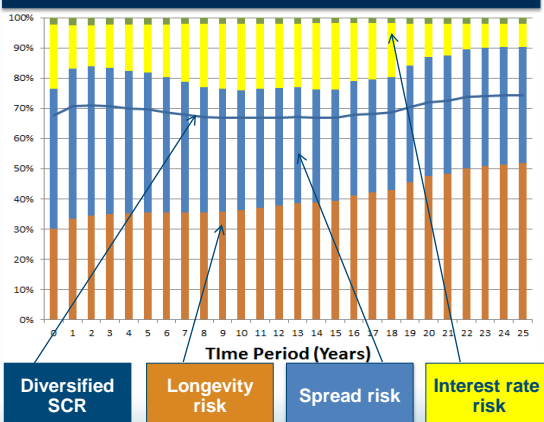
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Illustration: SCR for Monoline Annuity Writer*

Relative Size of Capital Components for Illustrative Monoline Annuity Writer



- Typical key risks for monoline annuity writers are:
 - Widening of credit spreads
 - Longevity
- Under standard formulae, longevity risk capital component increases as a % of total SCR as lives in the portfolio get older
- Diversification benefit is likely to be around 30% for a firm with a balanced annuitant age profile

*Assumes no new business for ease of illustration
Source: Milliman Illustrative Analysis

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Solvency II: Standard Formulae Diversification

Latest Draft SII Life U/W Module Correlation Matrix

$i \backslash j$	Mortality	Longevity	Disability	Life expense	Revision	Lapse	Life catastrophe
Mortality	1	-0.25	0.25	0.25	0	0	0.25
Longevity	-0.25	1	0	0.25	0.25	0.25	0
Disability	0.25	0	1	0.5	0	0	0.25
Life expense	0.25	0.25	0.5	1	0.5	0.5	0.25
Revision	0	0.25	0	0.5	1	0	0
Lapse	0	0.25	0	0.5	0	1	0.25
Life catastrophe	0.25	0	0.25	0.25	0	0.25	1

- Range of approaches exist on economic capital / internal model basis

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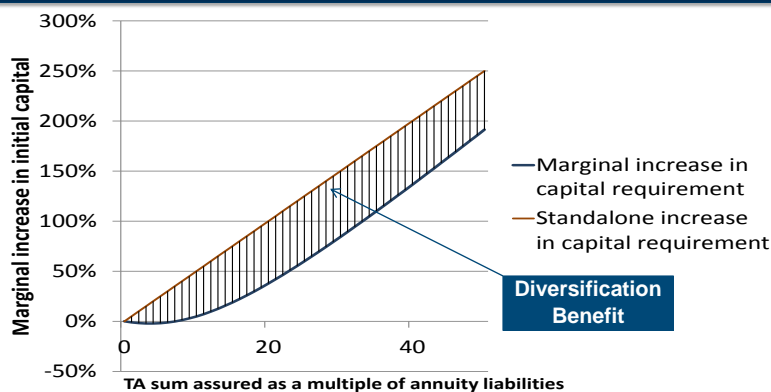
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Optimising Risk Capital Through Product Mix

- A significant volume of term business can be written with minimal or Life U/W capital requirement and vice versa

Stand Alone vs Marginal Capital Increase



Source: Milliman analysis

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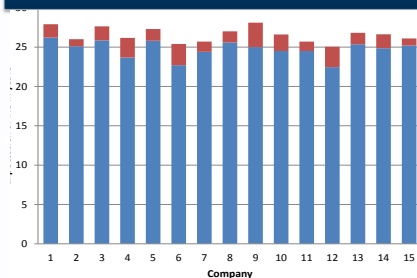
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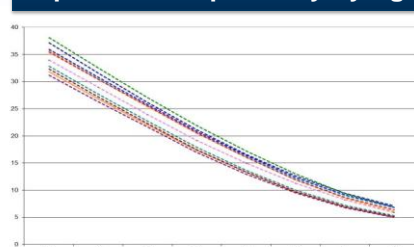
Pillar 1 Longevity Bases Benchmarking YE 2011

- Increasingly, annuity writers are using CMI projections for P1 valuations

Life Expectancy at 65 by Company



Implied Life Expectancy by Age



Source: Milliman Analysis of UK FSA Returns 2011

- Best estimate assumptions typically set using a combination of approaches (e.g. analysis of own / industry / population experience) and blending using credibility theory (e.g. LCFT) as well as comparing to reinsurance rates
- Stochastic models such as P-Spline, Lee Carter models (eg APC) and CBD are used to understand potential range of outcomes

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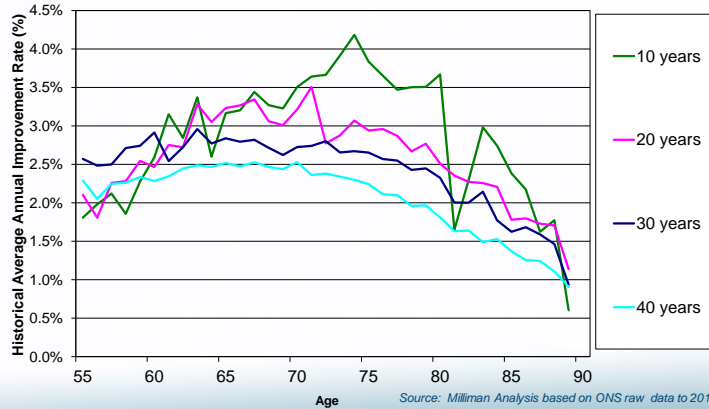
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Benchmarking to Past Improvements

- Comparing implied equivalent annualised improvements can offer additional insight

Equivalent Annualised Average Historical E&W Population Improvements by Age and Period up to 2010



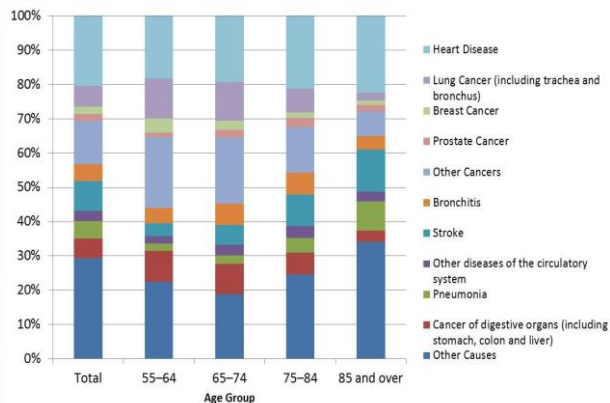
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Communicating Range of Outcomes

- Narrative scenario based stresses help to contextualise potential impact of range of medical advancements
- Own Risk and Solvency Assessment (ORSA) by Boards
- Capital Market Investors to understand potential downside

Major Cause of Death by Age Group



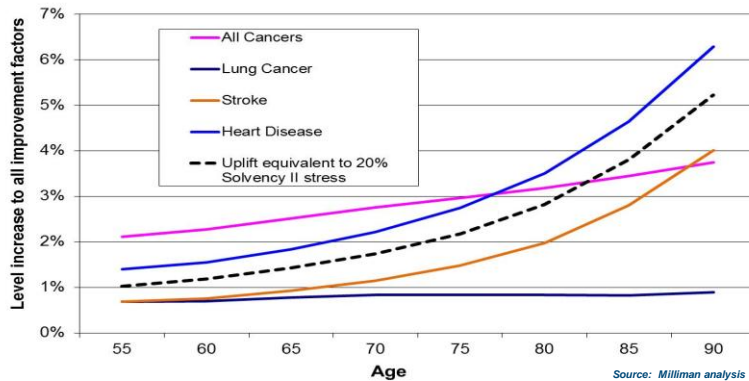
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Reasonableness of Stresses to be Tested

Equivalent Flat Uplifts to Future Improvements for Selected Cause of Death Elimination



- “1-in-200” Solvency II Longevity Risk Stress is broadly equivalent to the immediate elimination of approximately 65-75% deaths from Heart Disease

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Conclusions

- The search for capital efficient de-risking solutions continues and these are increasingly critical to maintaining competitiveness
- Solvency II will impact the longer term capital requirements of annuity writers and active lobbying will continue
- There is an increased focus on robust processes for best estimate and stressed longevity assumptions
- The use of cause of death analysis enables the risks to better understood by management and investors
- Economic capital models for longevity risk are becoming increasingly sophisticated and are potentially diverging from Solvency II requirement to create own standard.

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