Introduction to Capital Motivated Longevity Solutions

André de Vries

VP, Business Development, EMEA, Global Financial Solutions

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Longevity Indemnity Reinsurance

“Longevity Swap”

- Indemnity reinsurance contract, but “swap” is helpful analogy
- Premiums = Expected Annuities + Loading (“fixed”)
- Benefits = Actual Annuities (“floating”) based on survival of annuitants

![Diagram of Longevity Indemnity Reinsurance]

- Policyholders
- Ceding Company
- RGA

Actual Annuities (floating) → Expected Annuities + Loading = Premiums (fixed) → Actual Annuities = Benefits (floating)
Cash Flows under Longevity Swap

Illustrating impact of different mortality scenarios

- Premiums
- Expected Benefit Payments
- Benefits in case of -20% mortality rates
- Benefits in case of +20% mortality rates
- Net Cash Flow in case of -20% mortality rates
- Net Cash Flow in case of +20% mortality rates

Paid by RGA

Paid by Cedant
Main Challenge in Transferring Longevity Risk

- Price can be decomposed in three parts:
  1. Starting Mortality Rates
  2. Mortality Improvement Rates
  3. Compensation for Capital and Costs

- Actual versus Perceived Costs:
  - “Catch-Up” Premium
# Longevity Risk Transfer in the Netherlands to Date

Based on General Dutch Population Mortality

<table>
<thead>
<tr>
<th>Ceding Company</th>
<th>Risk Takers</th>
<th>“Size”</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEGON</td>
<td>Capital Markets</td>
<td>EUR 12 bln of Reserves</td>
<td>February 2012</td>
</tr>
<tr>
<td>AEGON</td>
<td>Capital Markets and Reinsurer(s)</td>
<td>EUR 1.4 bln of Reserves</td>
<td>December 2013</td>
</tr>
<tr>
<td>Delta Lloyd</td>
<td>RGA</td>
<td>EUR 12 bln of Reserves</td>
<td>August 2014</td>
</tr>
<tr>
<td>Delta Lloyd</td>
<td>RGA</td>
<td>EUR 12 bln of Reserves</td>
<td>June 2015</td>
</tr>
<tr>
<td>AEGON</td>
<td>Reinsurer(s)</td>
<td>EUR 6 bln of Reserves</td>
<td>July 2015</td>
</tr>
</tbody>
</table>

# Indemnity versus General Population

## Type of Longevity Cover

<table>
<thead>
<tr>
<th></th>
<th>Indemnity</th>
<th>General Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>Actual Annuity Payments</td>
<td>Model Portfolio with General Population Mortality</td>
</tr>
<tr>
<td>Settlement</td>
<td>Difference between Actual Annuities and Premium</td>
<td>Difference between Initial and Ultimate Projection</td>
</tr>
<tr>
<td>Type of Contract</td>
<td>Like Reinsurance</td>
<td>Like Derivative</td>
</tr>
<tr>
<td>Parties</td>
<td>For Institutions that are not comfortable bearing basis risk</td>
<td>For institutions that can bear basis risk</td>
</tr>
<tr>
<td>Duration</td>
<td>Unlimited</td>
<td>Limited</td>
</tr>
<tr>
<td>Including Deferreds</td>
<td>Very Limited</td>
<td>Possible</td>
</tr>
<tr>
<td>Transfers</td>
<td>Challenging</td>
<td>Easier</td>
</tr>
<tr>
<td>Due Diligence</td>
<td>Extensive</td>
<td>Hardly</td>
</tr>
</tbody>
</table>
Capital Motivated Longevity Solutions

“Longevity Shock Absorber” = LSA

▪ Striking Balance between Costs and Benefits

▪ Improvement of Capital Position:
  • Increasing Own Funds
  • Reducing Solvency Capital Requirements

▪ Cash Flows:

Longevity Benefit
(by Risk Taker)

Inception

Maturity

Premiums
(by Insurer)
Tailoring Longevity Risk Transfer

Change in Mortality Rates

Term
Change in Mortality Rates

Longevity Benefit

Change in Mortality Rates

Attachment Points

Detachment Points
Two Components underlying Longevity Benefit

1. FV of Past Annuities
2. Present Value of Future Annuities

Future Years

Assumed Term
Longevity Shock Absorber

Best Estimate Annuities
Higher Mortality
Lower Mortality
Including Annuities beyond Term

- To increase benefit of LSA

- Take account of change in **annuities beyond term** based on **mortality experience** **during term**

- Based on difference between:
  - Projected PV of annuities beyond term **at inception** of LSA
  - Projected PV of annuities beyond term **at maturity** of LSA
Determining Present Value of Future Annuities

Also referring to as “Commutation”

**Mortality Model**
- Annuities Beyond Term
- Crucial Component
- Pre-agreed Model
- Also relevant for Attachment and Detachment Points
- Recalibrated at Maturity
- Based on Objective Data
Numerical Example

Projected Capital Relief of Longevity Shock Absorber

Objective

- Determine Projected Reduction in SCR Longevity
- Other aspects ignored:
  - Risk Margin
  - SCR Counterparty Default
  - Reinsurance Recoverable
- Longevity Shock Absorber (LSA):
  - 10 yr Term
  - Attachment Point of 5%
  - Detachment Point of 10%

Sample Portfolio

Accrued Annual Annuity Benefits
Upon Survival From Retirement Age

Current Age

Millions

- 0
- 5
- 10
- 15
- 20
- 25

- 30
- 40
- 50
- 60
- 70
- 80
- 90

Current Age
Projecting Mortality Rates

General Dutch Population – Male 50 yr

- Realized up to Start
- Best Estimate
- SII Longevity Stress

Initial Calibration Period

20% 20% 20%
Projecting Mortality Rates (continued)
Projected Capital Relief

Expected Reduction in Current and Future Longevity SCR

- SCR Longevity
- Projected Benefit
- Benefit as % of SCR Longevity (right axis)

Term Longevity Shock Absorber

Millions
Different Attachment and Detachment Points

Expected Reduction in Current and Future Longevity SCR

- 0% Attachment and 10% Detachment
- 5% Attachment and 15% Detachment
- 10% Attachment and 20% Detachment
- 15% Attachment and 20% Detachment
Conclusion

- Longevity Shock Absorber transfers remote longevity risk and thereby improves capital position under Solvency II

- Improves both sides of the Solvency Ratio:
  - Increasing Own Funds
  - Decreasing Solvency Capital Requirement

- Attractive price relative to other capital management solutions
Questions, Comments?

André de Vries, adevries@rgare.com
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