Financial Risk Management for the Life Insurance / Wealth Management Industry

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Agenda

1. Introduction
2. Products with Guarantees
3. Understanding & Managing the Risks
INTRODUCTION
The Argument for Guarantees

- Guarantees can enhance existing products
  - Meet consumer needs
    - Pre (accumulation) / Post retirement (distribution)
    - Focus on Investment linked guarantees
  - Differentiates risk managing institutions from their competitors
    - Profitability and return on capital
    - Improve sales & market share
A Trip Down Memory Lane

- Guaranteed Annuity Options
  - The Equitable

- With Profits / Participating Business

- Variable Annuities

- Defined Benefit Pension Schemes

- These products contained embedded options & guarantees that were:
  - Priced approximately (or not at all)
  - Not well understood
  - Managed (sometimes crudely) but lacked transparency
  - Exposed when markets moved adversely
Implications of Guarantees

• Investment linked guarantees introduce financial risks
  – The guarantee is an embedded option
  – In principle, the guarantee should be;
    • Understood & Quantified
    • Priced accordingly
    • Risk managed appropriately
PRODUCTS WITH GUARANTEES
# The Product Concept

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retirement savings</td>
<td>Available for investment purposes</td>
</tr>
<tr>
<td>Choice of managed funds</td>
<td>Attractive</td>
</tr>
<tr>
<td>Menu of different guarantees</td>
<td>Attractive and differentiable</td>
</tr>
<tr>
<td>Offered as optional rider policies</td>
<td>Flexible and Customisable (customer has choice and a feature for sales adviser)</td>
</tr>
<tr>
<td>…with commercially attractive charges</td>
<td>Transparent (key to treating customers fairly)</td>
</tr>
<tr>
<td>…sufficient to meet the cost of hedging</td>
<td>Profitable and capital efficient</td>
</tr>
</tbody>
</table>
## Guaranteed Classes

<table>
<thead>
<tr>
<th>Product</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMDB (Death)</td>
<td>• Guaranteed investment return upon death</td>
</tr>
<tr>
<td></td>
<td>• Return of premium, roll-up, ratchet, reset, combos</td>
</tr>
<tr>
<td>GMIB (Income)</td>
<td>• Guaranteed annuitisation factors or minimum income levels</td>
</tr>
<tr>
<td></td>
<td>• Ideal retirement savings / protection product</td>
</tr>
<tr>
<td>GMWB (Withdrawal)</td>
<td>• Guaranteed regular withdrawal amounts</td>
</tr>
<tr>
<td></td>
<td>• Specific term (7% for 15 years) or 5% for life</td>
</tr>
<tr>
<td>GMAB (Accumulation)</td>
<td>• Guaranteed investment return at future point in time</td>
</tr>
<tr>
<td></td>
<td>• Various time periods and renewal options available</td>
</tr>
<tr>
<td>EIA (Equity Indexed Guarantees)</td>
<td>• Credit interest based on equity index performance</td>
</tr>
<tr>
<td></td>
<td>• Designs include: point-to-point, monthly averaging, monthly sum cap, high water mark, variable participation rates</td>
</tr>
</tbody>
</table>

### Guarantee Types

- Death Benefit
- Income Benefit
- Withdrawal Benefit
- Accumulation Benefit
- Equity Indexed
Best Sellers!

**U.S Market Development Timeline**

1980 – GMAB & GMDB  
1995 – Ratchet GMDB and EIA  
1996 – GMIB  
2002 – GMWB and exotic GMAB’s  
2004 – x% for life GMWB  
2005 – more complex features introduced such as Bonuses for non-utilisation or ratchets on withdrawal rates

**Other Market Developments**

- Considerable activity across Europe
- Japanese market development & growth significantly quicker than the U.S
## Illustrative Hedge Costs (bps of AV)

<table>
<thead>
<tr>
<th>Asset Allocation</th>
<th>Policy Distribution</th>
<th>GMDB Max [ Annual Ratchet &amp; 5% Rollup ]</th>
<th>GMAB 10 yr waiting period with reset</th>
<th>GMIB Max [ 5% Rollup &amp; Annual Ratchet ]</th>
<th>GMWB 7% Maximum withdrawal amount (15 Year Term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggressive</td>
<td>11%</td>
<td>59</td>
<td>100</td>
<td>47</td>
<td>57</td>
</tr>
<tr>
<td>Moderately Aggressive</td>
<td>25%</td>
<td>51</td>
<td>82</td>
<td>42</td>
<td>37</td>
</tr>
<tr>
<td>Moderate</td>
<td>40%</td>
<td>39</td>
<td>64</td>
<td>36</td>
<td>14</td>
</tr>
<tr>
<td>Moderately Conservative</td>
<td>17%</td>
<td>27</td>
<td>40</td>
<td>34</td>
<td>2</td>
</tr>
<tr>
<td>Conservative</td>
<td>7%</td>
<td>20</td>
<td>20</td>
<td>26</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>41</strong></td>
<td><strong>65</strong></td>
<td><strong>38</strong></td>
<td><strong>21</strong></td>
</tr>
</tbody>
</table>
RISK MANAGEMENT
The Goal of Risk Management

• Appropriate Charges
  – Product transparency & attractiveness
  – Finance the hedging programme
  – Risk management is an integral part of product design

• Manage Risk through Hedging
  – Reduce P&L volatility
  – Reduce the level of required capital (and the volatility of the capital requirement)
  – Economically hedge the liability

• Consider full or partial hedge, based on risk preferences

Primary Objectives of the Hedge

- Economic 65%
- Earnings 20%
- No Hedging 15%

Source: Moody’s Survey
Risks

• Capital Market
  – Market movements
  – Interest rates
  – Volatility
  – Others
    • Credit, Inflation…

• Actuarial / Policyholder Behaviour
  – Lapse
  – Longevity
  – Take-up Rates
  – Asset Allocation

\[
\begin{align*}
\text{Beginnin} & \text{g of Period Guarantee Value} \\
+ & \text{Interest} \\
- & \text{Claims} \\
+ & \text{Guarantee Premiums} \\
+ & \text{Changes due to market movements} \\
\text{End of Period Guarantee Value} & = \\
\text{Beginning of Period Asset Value} & = \text{Gains on Hedge Assets due to market movements} \\
& - \text{Losses on Hedge Assets due to market movements} \\
\text{Net Gain (Loss)} & = \\
\text{EOP Guarantee Value} & - \text{EOP Hedge Asset Value}
\end{align*}
\]
A Lesson in Latin ("the Greeks")

- **Delta**
  - is the sensitivity of the guarantee / option value to market price movements

- **Gamma**
  - is the sensitivity of delta to market price movements

- **Rho**
  - is the sensitivity of the guarantee / option value to interest rate movements

- **Vega**
  - is the sensitivity of the guarantee / option value to changes in implied volatility
## Instruments

<table>
<thead>
<tr>
<th></th>
<th>Options (Put / Call / Exotic)</th>
<th>Index Futures &amp; Swaps</th>
<th>Variance Swaps</th>
<th>Interest Rate Futures &amp; Swaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delta</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vega</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Rho</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>
Risk Management Strategies

• Stay Naked
  – Not recommended / sustainable

• Static
  – Involve a bank, but at what cost

• Semi-Static
  – Buy and hold using a portfolio of options

• Dynamic
  – Need to manufacture the risk management internally

Source: Moody’s Survey
### Income Statement Projection

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Projection Year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Income</strong></td>
<td>12,274</td>
<td>46,955</td>
<td>98,129</td>
<td>124,681</td>
<td>7,797</td>
</tr>
<tr>
<td>Charge Income</td>
<td>668</td>
<td>1,728</td>
<td>3,461</td>
<td>2,902</td>
<td>2,609</td>
</tr>
<tr>
<td><strong>Investment Income</strong></td>
<td>11,606</td>
<td>45,227</td>
<td>94,668</td>
<td>121,780</td>
<td>5,188</td>
</tr>
<tr>
<td>- Fixed Income Portfolio</td>
<td>244</td>
<td>1,470</td>
<td>4,729</td>
<td>10,155</td>
<td>13,587</td>
</tr>
<tr>
<td>- Futures</td>
<td>1,865</td>
<td>6,156</td>
<td>8,421</td>
<td>6,261</td>
<td>334</td>
</tr>
<tr>
<td>- Options &amp; Swaps</td>
<td>9,497</td>
<td>37,601</td>
<td>81,517</td>
<td>105,364</td>
<td>-8,732</td>
</tr>
<tr>
<td><strong>Total Expenses</strong></td>
<td>9,827</td>
<td>39,441</td>
<td>91,189</td>
<td>125,981</td>
<td>11,271</td>
</tr>
<tr>
<td>Increase in Fair Value Liability</td>
<td>9,758</td>
<td>39,292</td>
<td>91,067</td>
<td>125,977</td>
<td>11,271</td>
</tr>
<tr>
<td>Interest on Debt</td>
<td>69</td>
<td>150</td>
<td>122</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td><strong>Pre-Tax Income (Hedged)</strong></td>
<td>2,447</td>
<td>7,514</td>
<td>6,940</td>
<td>-1,300</td>
<td>-3,474</td>
</tr>
<tr>
<td><strong>Pre-Tax Income (Unhedged)</strong></td>
<td>-9,158</td>
<td>-37,713</td>
<td>-87,728</td>
<td>-123,080</td>
<td>-8,662</td>
</tr>
<tr>
<td>Equity Market Return</td>
<td>-25%</td>
<td>-25%</td>
<td>-25%</td>
<td>-25%</td>
<td>15%</td>
</tr>
<tr>
<td>10 Year Interest Rate</td>
<td>5.0%</td>
<td>5.0%</td>
<td>4.0%</td>
<td>4.0%</td>
<td>3.0%</td>
</tr>
</tbody>
</table>
Risk Management Strategies

Quarterly P&L Volatility Unhedged

Quarterly P&L Volatility Delta-Vega Hedged

Quarterly P&L Volatility Delta-Vega-Rho Hedged
Systems Requirements

Financial Projection System
*Nested stochastic analysis of hedge programme*

- **Actuarial Liability Valuation**
  - Nightly risk neutral (seriatim) valuations

- **Trade Positioning System**
  - Links to live market data and configured to issue trade recommendations consistent with selected hedging strategies

- **Financial Reporting System**
  - Regular reporting for financial control, hedge profitability, projections and attribution analysis

IT Interface → In force Data → Financial Projection System → Trade Positioning System → Financial Reporting System → IT Interface

Asset & Market Data
The Future?

Menu of Guarantees

Centralised Hedging Operation

Internal Funds
External Funds
Investment Platform
Distribution Channels
DISCUSSION

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