New Product Opportunities and Managing the Risks

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Agenda

- Structured products background
  - Option-based structured products
  - Constant Proportion Portfolio Insurance

- Variable annuities
  - new products
  - managing the risks
Structured products

Bespoke investments:
- Tailored to meet the aims of the target investors
- Providing improved access to assets
  - eg access through a tax efficient vehicle or structure
- Changing the balance of income and capital performance compared to direct investment
- Providing exposure to the performance of risky assets with certain performance guarantees
Option-based structured products

Structured returns linked, in a pre-defined way, to the performance of specified assets.
Option-based structured products

Advantages:

- The product return is precisely defined
  - should aid disclosure to investors
- Administration of the product is relatively simple
  - the same product for all investors (a single unit price)
- A packaged hedge can be obtained to cover all, or almost all, risks
- Documentation is standardized
Option-based structured products

Disadvantages:

- Many assets cannot be used as the underlying
- Long term can present a (hedging) problem
- All investors must usually enter and leave (exposure to the underlying) on one date
- It is difficult or expensive to include features
  - increasing guarantees or active management
- Pricing is not transparent at entry or exit
Constant Proportion Portfolio Insurance

More an approach to follow than a defined return

Value of CPPI Fund

Cost of Minimum Return

Cushion

Cushion x Multiplier

Target Value of Risky Assets

Safe Assets

Actively Rebalanced
Constant Proportion Portfolio Insurance

Advantages:

- Only illiquid assets cannot be accessed
- Longer term (10 year+) is usually possible
- Investors can enter on different dates with guarantees provided at multiple points in time
- The approach is highly flexible
  - increasing or unusual guarantees, active management
- Pricing can be transparent at entry and exit
Constant Proportion Portfolio Insurance

Disadvantages:

- Individual guarantees are difficult
  - still a single fund with one price for all investors
- Each CPPI product is unique
  - an administrative burden for the hedging entity
  - product performance is highly path dependent due to the variable allocation to risky assets
- The investor runs most of the hedging risks
CPPI simulation

![Graph showing CPPI simulation with Return to Date on the y-axis and Time From Commencement (Years) on the x-axis. The graph displays two lines representing Risky Asset Value (blue) and CPPI Product Value (red). There is a label indicating a 9.0% pa return.](image)
CPPI simulation

Return to Date

Risky Asset Value  CPPI Product Value

7.7% pa

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making financial sense of the future
Risk management

- Option-based structured products
  - the product provider would usually purchase a packaged matching asset from a bank
  - the banks hedge using internal models
- Constant Proportion Portfolio Insurance
  - the investor runs most of the hedging risks
  - gap risk usually taken by a bank
Agenda

- Structured products background
  - Option-based structured products
  - Constant Proportion Portfolio Insurance

- Variable annuities
  - new products
  - market activity
  - managing the risks
What is a Variable Annuity?

<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 (similar to unit linked)</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>
The GMxB’s

Any or all of the following features are possible:

<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>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>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>
</tbody>
</table>
## Recent product launches

**Multinationals have been busy!**

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>Type</th>
<th>Sold In</th>
<th>Underwritten</th>
<th>Hedged In</th>
<th>Launch Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hartford</td>
<td>SafetyNet</td>
<td>GMWB</td>
<td>UK</td>
<td>Ireland</td>
<td>US</td>
<td>February 2005</td>
</tr>
<tr>
<td>AXA</td>
<td>Twinstar</td>
<td>GMIB</td>
<td>Germany</td>
<td>Ireland</td>
<td>US and Paris</td>
<td>March 2006</td>
</tr>
<tr>
<td>AXA</td>
<td>HALF time</td>
<td>GMDB / WB / AB (USD); GMDB / IB (Yen)</td>
<td>Japan</td>
<td>Japan</td>
<td>US and Paris</td>
<td>March 2006; HALF Time February 2007</td>
</tr>
<tr>
<td>AXA</td>
<td>Estate Planning Bond</td>
<td>GMWB, GMDB</td>
<td>UK</td>
<td>Isle of Man</td>
<td>Paris</td>
<td>June 2006</td>
</tr>
<tr>
<td>AIG / Living Time</td>
<td>Living Time 75</td>
<td>GMWB / AB / DB</td>
<td>UK</td>
<td>UK</td>
<td>N/A</td>
<td>June 2006</td>
</tr>
<tr>
<td>AEGON Scottish Equitable</td>
<td>5 for Life</td>
<td>GMWB</td>
<td>UK</td>
<td>Ireland</td>
<td>US</td>
<td>September 2006</td>
</tr>
<tr>
<td>Manulife</td>
<td>IncomePlus</td>
<td>GMWB</td>
<td>Canada</td>
<td>Canada</td>
<td>US / Canada</td>
<td>October 2006</td>
</tr>
<tr>
<td>MetLife</td>
<td>Trustee Investment Plan</td>
<td>GMWB / AB</td>
<td>UK</td>
<td>UK</td>
<td>US</td>
<td>December 2006</td>
</tr>
<tr>
<td>Manulife</td>
<td>Step Life</td>
<td>GMWB</td>
<td>Japan</td>
<td>Japan</td>
<td>Reins to US / Canada</td>
<td>December 2006</td>
</tr>
<tr>
<td>Manulife</td>
<td>IncomePlus</td>
<td>GMWB</td>
<td>Hong Kong</td>
<td>Japan</td>
<td>Confidential</td>
<td>February 2007</td>
</tr>
<tr>
<td>Hartford</td>
<td>Platinum</td>
<td>GMWB / IB hybrid with DB</td>
<td>UK</td>
<td>Ireland</td>
<td>US</td>
<td>February 2007</td>
</tr>
<tr>
<td>ING</td>
<td>Generacion F Unico</td>
<td>GMAB, GMDB</td>
<td>Spain</td>
<td>Confidential</td>
<td>Confidential</td>
<td>March 2007</td>
</tr>
<tr>
<td>AXA</td>
<td>Accumulator Future, Seleccion</td>
<td>GMAB, GMWB, GMDB</td>
<td>Spain</td>
<td>Ireland</td>
<td>Paris</td>
<td>March 2007</td>
</tr>
<tr>
<td>AXA</td>
<td></td>
<td>GMWB</td>
<td>France</td>
<td>Paris</td>
<td></td>
<td>May 2007</td>
</tr>
<tr>
<td>Lincoln</td>
<td>i2Live Retirement Plan</td>
<td>GMWB / IB Hybrid</td>
<td>UK</td>
<td>UK</td>
<td>US</td>
<td>May 2007</td>
</tr>
<tr>
<td>ING</td>
<td>Europerspektiva</td>
<td>GMAB / DB</td>
<td>Hungary</td>
<td>Hungary</td>
<td>Confidential</td>
<td>June 2007</td>
</tr>
<tr>
<td>AXA</td>
<td></td>
<td>GMWB</td>
<td>Belgium</td>
<td>Not Disclosed</td>
<td></td>
<td>September 2007</td>
</tr>
</tbody>
</table>

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UK

Portfolio International Awards

- AXA’s Estate Planning Bond
  - Best Inheritance Tax (IHT) Product December 2006
  - Also Ranked 1st for Estate Planning Packaged Products by Defaqto May 2006
- AEGON’s Five for Life
  - Best Life Assurance Product December 2006
- Hartford:
  - Gold
  - Platinum
- Lincoln: i2Live
  - Accumulator
  - Drawdown
  - Annuity
- MET Life: Trustee Investment Plan (Secure Retirement Option)
- Other related
  - Scottish Life: Protected Profits/ Riley -- EIA

There is more activity, but not yet in the public domain
Europe

ING starts European Variable Annuity roll-out in Spain

ING announced today the launch of its Variable Annuities (VA) products in Spain. The launch is the start of a broader European introduction, which is in line with ING’s strategy to capitalise on trends that are related to the aging population. … ING has set up a central product development and risk management team that will closely operate with local businesses in order to leverage on best practices and experience. …

There is considerably more activity, but not in the public domain

Sources:
http://www.generali.com/generalicom/sezione.do?idItem=132971&idSezione=132970
http://212.101.74.54/que_es.html
http://www.axa.be/nl/rg_twinstar_home.html

LEHMAN BROTHERS
European Insurance Team
AXA: 1-Overweight
Target Price: EUR 36
Investment summary
AXA posted strong Q4 APE sales helped by some potentially more volatile group contract wins in France but also highlighting the resilience of the underlying performance in its key territories in the US, France, UK and Japan.
Asset management was also particularly strong with revenues growing by 28% as was already anticipated owing to Alliance Bernstein’s prior disclosure of its Q4 results.
One point of particular note is that the new German Twinstar product (variable annuity look-alike) continues to sell well contributing 12.5% of German APE and probably more like a third of new business profits; this augurs well for the roll-out of similar products in the rest of Europe.

Analysis
Life
• APE grew by 14% for the full year with 3% growth in Q4 which may seem low but which represents a very strong performance given that Q4 last year was boosted by some one-off sales.
• French sales were particularly strong in Q4 (up 47% q-o-q) boosted by some mandate wins in group non-unit-linked single premium contracts.
• UK sales remained strong (up 29% q-o-q) as unit-linked investment bond sales took off in Q4.
• US variable annuity sales were robust rising we believe by 17% in dollars for the full year and by 14% in Q4. We estimate that AXA probably remained at its number 3 position in the VA market.
• In Japan, sales were helped by renewed focus on the medical product. The Yen denominated variable annuity lookalike product was launched this quarter and will impact sales this year.
• In Germany, the Twinstar product (variable annuity lookalike) contributed 12.5% of German APE and probably more like a third of new business value we estimate (new business value will be disclosed on Feb 22).
Guarantee risks

The nature of the guarantees leads to a variety of different risks with a complex interaction between them

**Market Risks**
- Asset Values (delta)
- Asset volatility (vega)
- Interest rates (rho)
- Convexity (gamma)

**Non-Market Risks**
- Lapses
- Longevity
- Withdrawal utilisation
- Business mix (age/sex)
Delta

- Delta measures the impact of a small immediate change in the value of the underlying asset.
Rho

- Rho measures the impact of a small immediate change in interest rates

- Buying swaps (receive fixed, pay floating) neutralises the liability guarantee value over a relatively wide range of interest rate movements due to their convexity
Vega

- Vega measures the impact of a small immediate change in asset volatility

- Options are sensitive to changes in equity volatility
- They can be used to hedge delta and rho
- Also provide gamma protection due to their convexity
- Can also use variance swaps and swaptions for vega
Gamma

- Gamma measures the impact of changes in delta i.e. in the convexity of asset values

- Convexity can be seen as the difference between the liability value for large movements and the first order hedge asset value
- Gamma is usually hedged using options
## Instruments used

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Delta</th>
<th>Rho</th>
<th>Vega</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity Index Futures</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currency Forwards</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation &amp; Credit Swaps</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bond Futures</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Interest Rate Swaps</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Interest Rate Swaptions</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Variance Swaps</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Equity Options (ET &amp; OTC)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Non-market risks

- Generally no available instruments, but effective mitigation techniques can be achieved.
- Lapses: Policyholders act dynamically, therefore need to be able to respond dynamically ➔ Dynamic hedge more effective than static hedges. Need to be careful with assumption basis and pro-active in monitoring and gathering experience.
- Mortality: Margins in pricing basis important ➔ Traditional actuarial techniques apply. Reinsurance IS possible.
- Other: As for traditional business. Diversification is beneficial.

Reliable performance monitoring, financial reporting and responsive control is essential.
Practical implementation I

- Components
  - Grid technology
  - Live interfaces
  - Liability option valuation
  - Trade positioning
  - Risk alerts and monitoring
  - Performance measurement
  - Financial Control

- Steps
  - Hedge design and testing
  - Infrastructure setup
  - On-going maintenance
Practical implementation II

Daily
- Trading Grid
- Monitor Markets
- Nightly Valuation

Weekly
- Produce P&L Report
- Performance Attribution

Quarterly/Annually
- Monitor Experience
  - Fund Modeling
  - Mortality
  - Lapses
  - Fund Transfers
  - Financial Reporting
  - Hedging Strategy for New Products
“Day in the Life”

- Markets open (NYSE)
- Send trade grids to traders
- Morning hedge call
- Compile hedge runs
- Trading as needed throughout day
- Markets close
- Start nightly hedge runs
- Hedge runs completed
Questions?

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