



## Pricing for Risk

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## Items planning to cover

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- Overview of traditional pricing methods
- Emerging techniques
- A sample approach — VA products with living benefits

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## Overview of Traditional Pricing Methods

### Overview of traditional pricing methods

- Most common pricing measure is statutory internal rate of return (“IRR”)
  - Pricing objective is based on achieving a rate of return in excess of the company’s hurdle rate
  - Hurdle rate often linked to company’s overall cost of capital
  - Hurdle rate typically does not vary by product (although have seen on occasion)
  - Based on deterministic or stochastic scenarios, generally real world scenarios
- Cost of capital historically based on rating agency or NAIC formula
  - Has provision for various risks
- IRR often supplemented/replaced by alternative measures
  - Profit margin
  - VNB
  - Return on assets
- These alternative measures generally use discount rate equal to either the pre-tax earned rate or EV discount rate
  - Results in less “cost” of capital

### Under traditional approaches, products are priced under the implicit assumption that arbitrage opportunities exist

- Asset risk premiums are capitalized during pricing
- These risk premiums are passed to policyholders before insurers are released from risk
- If insurers believe that these arbitrage opportunities exist, why not just borrow at the insurer's credit rating and invest in riskier assets rather than manufacture and distribute insurance products?

### Issues with traditional capital formulas

- Does not reflect company specific product risks
- Has been slow in past to adjust to emerging new product features that can contain significant risk
  - e.g., living benefits on VAs
- Does not directly capture second order risks
  - Premium payments on flexible premium life products
  - Dynamic policyholder behavior
  - Changes in YRT reinsurance rates
- Difficult to keep pace with changes in asset related offerings
  - Also did not capture risks from widening of credit spreads

## Emerging Techniques

Several new techniques are emerging for reflecting risks in pricing

- Incorporate provision for risks that are hedged
- Base capital on economic capital approach
- Move to market consistent pricing

### Price product to make provision for hedging risks

- Becoming standard approach on VA living benefits
  - Addressed in next section
- Expect to see it emerging in other lines of business as well

### Use of economic capital has expanded in the industry

- Companies are at various stages of implementing
- Two primary approaches have been used
  - One-year stress test method
  - Run-off method
- Determine on real world views of risk
- Need to determine value of assets and liabilities at end of period — often market consistent for one-year approach
- Unlikely to be fully implemented until rating agencies embrace
  - Rating agencies have been supportive but this has not yet led to tangible benefits
- Some companies are beginning to reflect in their pricing
  - Have to be mindful of rating agency requirements or RBC requirements
  - Discussion of considerations in implementing is provided in final section

## Market consistent pricing is beginning to emerge in the U.S.

- Market consistent techniques are making their way into a wide range of applications
  - US GAAP (FAS 157 and 159)
  - The European Insurance CFO Forum MCEV Principles
    - Published in June 2008, requires member companies to publish year-end 2011 embedded values and VNBs using market consistent techniques
  - Many companies, domestic and international, are using market consistent methodologies to determine economic capital (a la Solvency II)
  - Some merger and acquisition transactions are being valued using market consistent techniques in addition to traditional techniques
  - Some companies are embracing market consistent techniques because they believe these methods provide useful insights into asset-liability management

Continued . . .

## Market consistent pricing is beginning to emerge in the U.S.

- The above developments have motivated some companies to look at the profitability of their products using market consistent techniques
- Some of these companies have made, or are in the process of making, changes to their products and/or pricing
  - Exit certain product lines
  - Reduce guarantees
- IFRS Phase II, which is based on a fair value approach, could become required in 2014 in the US and Canada

Consequently, we would not be surprised to see the use of market consistent pricing continue to increase in North America

Typically, for each product, a value of new business (“VNB”) is determined which reflects the value to shareholders created through the activity of writing new business

- VNB = Present value of future profits after tax
  - Time value of financial options and guarantees
  - Frictional costs of required capital
  - Cost of non hedgeable risks
- Common metric is the profit margin: VNB / present value of premiums
- Implied discount rate is the discount rate such that the discounted traditional VNB cash flows (i.e., with asset risk premiums included) will equal the market consistent VNB
  - Sometimes used to compare the relative level of risk between products
  - The higher the implied discount rate, the higher the level of risk
  - Good tool to communicate market consistent pricing results to senior management
- Market consistent pricing can be used as an additional pricing tool in combination with traditional internal rate of return and profit margin metrics

If the VNB is greater than zero, the return is greater than the market price of the risks undertaken. A VNB less than zero reduces shareholder value.

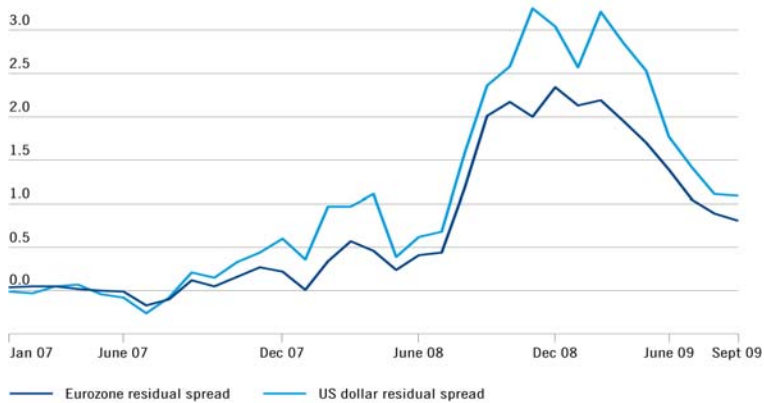
However, there are issues with market consistent

- Market values not reliable at some points in time — see next slide
- Lack of consensus on treatment of fixed product credited rates
  - Perhaps the biggest issue in applying to U.S. products
- Effectively removes companies that employ this technique from those product lines where credit spreads are largely passed onto policyholders
  - Immediate annuities is most visible

Without adjustment, market consistent techniques broke down as of December 31, 2008

- Unusual market conditions: corporate bond yield less credit default swap spread less the swap yield curve
- Led to concept of liquidity premium in market consistent valuations

**Eurozone and US dollar residual spreads over swaps (average up to 10 years)**



Source: Towers Perrin analysis of Bloomberg and Market data

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Published information shows that market consistent pricing can have significantly different impacts on VNB margins by company

**Comparison of Market Consistent vs. Traditional European Embedded Value Profit Margins**

Company	Year	Value of New Business Profit Margin		
		Traditional	Market Consistent	Difference
Allianz US	2005	1.9%	2.5%	0.6%
Aviva US*	2007 / 2008	1.9% / 2.0%	0.9% / -0.2%	-1.0% / -2.2%
AXA US	2004	1.8%	1.3%	-0.5%
Old Mutual US	2007	2.3%	1.0%	-1.3%
Zurich/Farmers	2005	4.4%	6.6%	2.2%

\*Aviva 2008 results as of June 30; Aviva results include adjustments for liquidity premium

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## Sample Approach

The approach to pricing WB features has become more standardized — although major issues exist in choice of assumptions

- Pricing of WB rider now routinely makes provision for cost of hedging
  - Priced using risk neutral scenarios
  - Most companies indicate they make provision for full 3 greek hedging
- Typical approach is to determine cost of rider separately, then incorporate into base product pricing
  - Often expressed as annual cost via PV calculation
- Base product generally priced using real world scenarios — a few companies moving to risk neutral to support full market consistent pricing
- Provision for hedge effectiveness (or ineffectiveness) is typically made by assuming hedging replaces  $1 - HE\%$  of real world claims
  - Effectively assumes hedging is covering cost of claims as they emerge
- Variations on approach
  - Attempt to model impact of hedging directly — requires stochastic-on-stochastic testing, which can be difficult/time consuming to do
  - Vary timing of hedge payoff — move from time of claim to spread over hedging period

### A key issue is what to assume for the parameters underlying the risk neutral scenarios

- Two ends of spectrum
  - Use today's swap rates and implied volatility
  - Use long-term estimates (with implicit margin)
- Considerations
  - Product priced today will not be available for sale for several months, will then be sold over ensuing 6-12-18-24 months
  - Not necessarily locking in hedging costs at time product is issued
  - Can tailor assumptions to specific type of hedging (e.g., realized vol for delta hedging)
- Becomes significant issue when economic conditions move around

Majority of companies in our WB survey indicate they price either using market conditions at time of pricing ("current") or current as well as long-term estimates. Those using long-term estimates exhibited following for pricing on 3/31/09:

- RFR: roughly 125bp higher
- PV: consistent with Level observation on page 22

### Capital markets have moved considerably over time

Tenor	Swap Rate								
	6/30/06	12/31/07	9/30/08	10/31/08	12/31/08	3/31/09	5/31/09	6/30/09	9/30/09
1	5.69%	4.22%	3.96%	3.17%	1.27%	1.18%	.86%	.88%	.63%
5	5.65	4.18	4.09	3.84	2.10	2.23	2.85	2.97	2.64
10	5.73	4.67	4.49	4.46	2.49	2.90	3.78	3.78	3.44

Tenor	S&P Implied Volatility								
	6/30/06	12/31/07	9/30/08	10/31/08	12/31/08	3/31/09	5/31/09	6/30/09	9/30/09
1	15%	22%	27%	41%	35%	37%	29%	28%	27%
5	16	25	28	36	35	35	29	30	30
10	19	27	30	36	34	34	30	32	32

Source: Bloomberg for swap rates, banker quotes for implied volatility

Another key issue is how to derive implied volatility assumptions past last observable period

- We see three approaches being used in the industry
  - Grade to target ultimate (“mean reversion”) — generally historical realized volatility with margin or average of historical implied volatilities
  - Hold level at last observable tenor
  - Hold level throughout period
- Industry results for S&P

Tenor	2009 WB Survey Results (3/31/09 – Mean)			2008 Survey
	Target Ultimate	Last Observable	Level	
1	35%	37%	28%	17%
5	33	35	28	20
10	31	35	28	22
15	29	35	28	22
30	27	35	28	23

A suggested approach to setting risk neutral assumptions for pricing

- Develop set of long-term assumptions
  - Need to meet target profit goals on this basis
- Also undertake a variety of sensitivity tests
- Calculate profitability on a periodic basis (e.g., monthly) under current assumptions
- Profitability of business sold in current period must meet minimum profit threshold (could be close to target)

### Industry practices on assumed level of hedge effectiveness vary

- Results from our GMWB Pricing and Hedging Survey
  - Mean vs. tail in context of real world pricing; tail for capital calculation

Hedge Effectiveness	Mean Pricing	Tail Pricing
< 75%	1	5
75% <= X < 90%	2	2
90% <= X < 100%	3	1
100%	4	2
Total	10	10

- Observations
  - Surprised at high prevalence of 100% on mean pricing
  - Lower assumed HE for tail pricing is consistent with our expectations
  - Less extensive hedge program (i.e., dynamic hedging of delta) should have lower assumed HE

### Approach for reflecting capital and reserve levels in pricing

- U.S. companies are generally leveraging off C3 Phase II methodology for capital; perhaps blending in internal economic capital as well
  - Many companies are in process of reconsidering their approach
- Ideally, calculation would be done via stochastic-on-stochastic testing (theoretically could involve stochastic cubed with hedging)
  - However, not practical for many companies, so factor based
  - Degree of factor sophistication varies
- Lots of issues
  - Multiple of CTE90 level or higher CTE level
  - Degree of diversification: single cell vs. total product vs. total VA block
  - Treatment of hedging, including assumed level of hedge effectiveness and amount of hedge credit
- Companies are still in process of determining how to reflect VA CARVM in pricing
  - Some base on standard scenario

## Reflecting partial withdrawals via a cohort approach is becoming standard industry practice

- Typical cohorts:
  - 1. Begin immediately
  - 2. Deferred 5 years
  - 3. Deferred 10-20 years
  - 4. Withdrawals only if policyholder deep ITM (better choice than no withdrawals)
- Cohorts 2 and 3 generally set in consideration of specific product features (e.g., bonus, waiting period, age tier)
- Assumed mix by cohort varies by issue age; earlier for older issue ages
- It may also be appropriate to assume withdrawal utilization triggered based on the in-the-moneyness for cohorts 1-3 also
- Typical to assume policyholders withdraw maximum allowable amount once withdrawals start
- Once started, typical to assume they last indefinitely

## Dynamic lapse

- There are two primary approaches to defining perceived value for in-the-moneyness, used primarily for dynamic lapse
  - PV of future payments
  - Benefit base amount
- Prevalence in industry is roughly 50%-50%
- Even within a particular approach, there is considerable variation by company on specific formula
- We favor the benefit base approach
  - What policyholders see in their statement
  - PV approach generally requires a 30%+ drop in funds before ITM kicks in — we think policyholders would place more value on a benefit they are paying  
75-100 bp for
  - Emerging experience (still limited) suggests lapse dampening happening at smaller levels of equity market drops