



SOCIETY OF ACTUARIES

**9<sup>th</sup> Annual Product Development Actuary  
Symposium  
June 2009**

**4A: 'The Money Pit' - Reflecting the Risks We  
Are Taking In Pricing Products**

[Dominique Lebel](#)

## Market Consistent Pricing – Risk Management at the Point of Sale

### Product Development Symposium

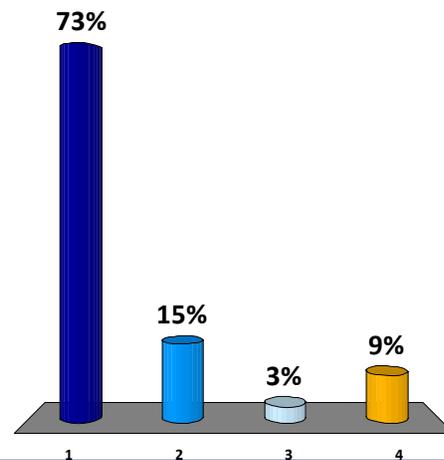
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June 2009



## What is your primary pricing metric?

1. Real world IRR
2. Real world profit margin
3. Risk neutral profit margin (MCEV)
4. Real world VNB (EV)



## Shortcomings 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 based on company’s overall cost of capital
  - Hurdle rate typically does not vary by product
  - But different products have different levels of risk
- A product with a higher pricing IRR does not necessarily create more shareholder value than a product with a lower pricing IRR
  - Depends on risks inherent in each product
- 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?

***Consideration should be given to pricing products such that all risks undertaken are measured in an objective and consistent way***

## Traditional vs. market consistent pricing approaches

### Traditional

- Typically the discount rate used is the same for all products and is based on the cost of capital of the company
- Credit spreads and equity risk premiums are capitalized at issue
- The costs of options and guarantees are generally not valued in a manner that is consistent with how they are valued in the market

### Market Consistent

- The discount rate is set to reflect the risks inherent in each product
- Credit spreads and equity risk premiums are earned as insurer is released from risk
- The costs of options and guarantees are valued in a manner that is consistent with how they are valued in the market

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 a traditional VNB will equal the market consistent VNB
  - This is sometimes used to compare the relative level of risk between products

***Market consistent pricing provides a robust, transparent and objective economic perspective on new business profitability that is consistent across products. 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.***

PRESENT VALUE OF FUTURE PROFITS

With market consistent valuations, cash flows are valued using a discount rate which reflects the risk inherent in each cash flow

Assume that the investor has capital of 20, borrows 80 (at 5% pa) and then invests 100 in equities (with an expected return of 8% pa)

	Day 1	One year on
Assets	100	108
Liabilities	(80)	(84)
Capital	20	24

Note: The difference between the traditional and market consistent results may be partly compensated for by a higher "cost of capital" under the traditional methodology (see later)

- The actions of borrowing and investing do not create value on Day 1
- Using traditional pricing techniques the 24 might be discounted at, say, 10%. This would give a value of 21.8 on Day 1
- Under MCV the asset cash flows are discounted at 8% and the liability cash flows at 5%. This would give a value of 20 on Day 1. The effective discount rate for profits is 20%

## We can also risk adjust the cash flows

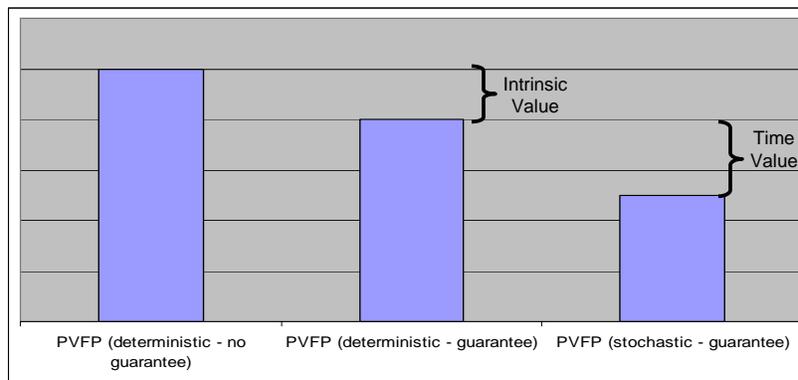
Assume that the investor has capital of 20, borrows 80 (at 5% pa) and then invests 100 in equities (with an expected return of 8% pa)

	Day 1	One year on
Assets	100	104.0
Liabilities	(80)	(83.2)
Capital	20	20.8

- The actions of borrowing and investing do not create value on Day 1
- An alternative approach is to project and discount everything at the risk free rate (assumed to be 4%)
- As the example shows, we get the same Day 1 result as the methods shown on the prior page
- This is called the certainty equivalent approach and is commonly used in practice

## Time Value vs. Intrinsic Value

- Total value of options and guarantees = Intrinsic value + Time value
  - Intrinsic value already captured in the certainty equivalent PVFP
  - Time value = PVFP (certainty equivalent) – PVFP (stochastic)



## Stochastic Modeling

- Generally, risk neutral valuations
  - Economic scenarios are derived from swap rates such that, on average, all assets follow the forward rates
- Model should be calibrated to market values
  - Equity option implied volatilities
  - Swaption implied volatilities
  - Initial swap rate curve
- Market consistency is tested by checking that initial asset market value = mean present value of asset cash flows discounted at risk free rate ( $1 = 1$  test)
  - Purpose is to ensure that the asset model is simulating risk free returns for all assets
- Assumptions used for stochastic models should be consistent with deterministic models
- Allowance should be made for dynamic management actions and policyholder behavior
- Relative to “real world” projections, the time value of financial options and guarantees will generally increase

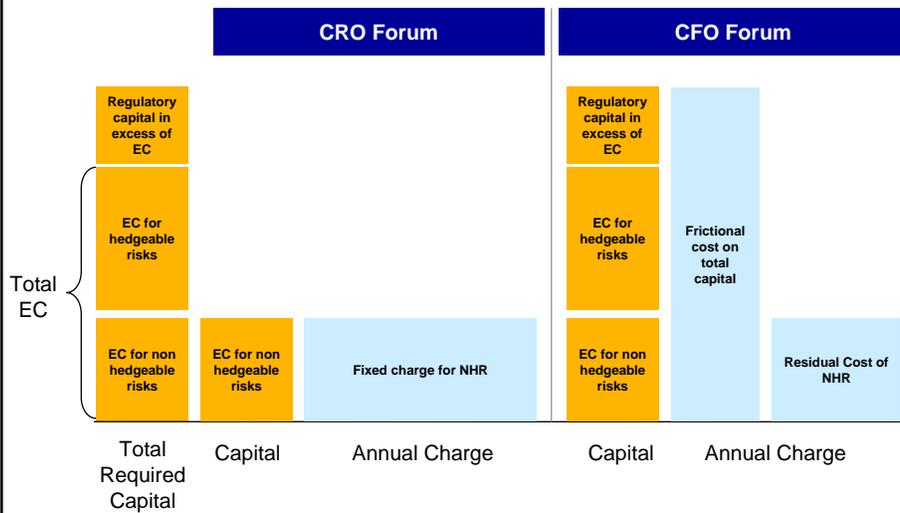
## Frictional costs should reflect the tax and investment expenses on the assets backing required capital

- Generally based on the difference between:
  - Earned rate (after tax and investment expenses) on assets backing required capital
  - Discount rate
- In a market consistent world:
  - Earned rate (before tax and investment expenses) is equal to the discount rate
  - Only costs left are the frictional costs of taxes and investment expenses on investment income on assets backing required capital
- Relative to “real world” projections, the cost of capital will generally decrease
- Additional frictional costs include agency costs and the cost of financial distress, but the CFO Forum decided to exclude these
  - General corporate risks that individual investors should assess

## Cost of residual non hedgeable risks (NHR)

- Finance theory states that investors do not need to be compensated for risks that can be diversified, provided the best estimate assumptions used in valuation reflect the mean
- An allowance needs to be made for the cost of non hedgeable risks not already allowed for in the time value of options and guarantees or the present value of future profits
  - Should include the impact of non hedgeable non-financial and non hedgeable financial risks
- NHR allowance is intended to allow for the following items:
  - Incomplete best estimates in the base model (e.g., operational risk)
  - Asymmetric risk distributions or asymmetric impact on results
  - Non-linearities/correlations with market risk (e.g., dynamic policyholder behavior)
  - Non hedgeable financial risk (e.g., swap market not deep and liquid at long durations)
- The allowance is distinct from the frictional costs of required capital

## Reconciliation between the CRO and CFO Forum approaches



## Implications for North American products and companies are numerous

- Market consistent pricing can have significantly different impacts by company depending on several factors including:
  - Product mix
  - Split of fixed vs. variable/segregated fund business
  - Level of guarantees
  - Amount of asset risk (e.g., credit quality of assets)
  - Treatment of future flexible policyholder credited rates
- Everything else being equal (e.g., assuming the same product charges), a product (Product A) with more guarantees, more asset risk and without management levers to mitigate adverse experience ought to be considered more risky than a similar product (Product B) with opposite characteristics
  - The pricing metric used should show a less favorable result for Product A relative to Product B
  - This is the case under a market consistent pricing framework

## 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%

\*June 30

Comparison of market consistent vs. traditional profit margins (positive figure indicates market consistent greater than traditional)

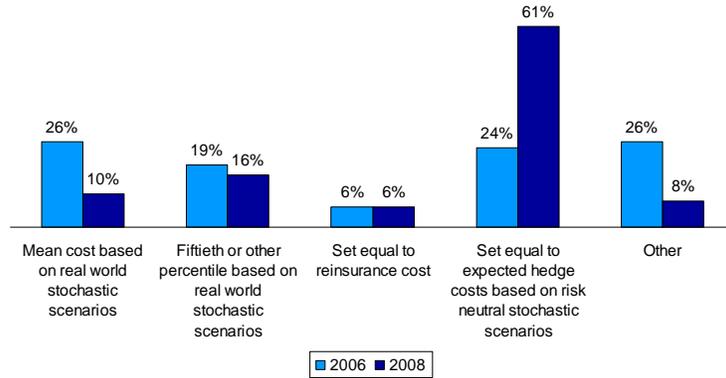
Product	Company A	Company B	Company C
Term Insurance	2.3%	1.4%	N/A
Universal Life/Variable UL	2.7%	-9.1% to +1.4%	N/A
Fixed Annuities	-4.1%	-3.6% to -0.5%	-1.0%
Payout Annuities	-4.9%	-7.6%	-6.1%
VAs/Segregated Funds	0.0%	N/A	-1.8%
Fixed Indexed Annuities	N/A	-5.3% to -3.9%	N/A
Critical Illness	1.0%	N/A	N/A
Group Life & Health/Employee Benefits	1.1%	N/A	1.9%

Typical Implied Discount Rates Relative to Typical Internal Rates of Return Used to Price Common Products

Product	Typical Implied Discount Rate
Term Insurance	Lower than typical IRR used
Universal Life/Variable UL	Varies
Fixed Annuities	Varies, but generally higher
Payout Annuities	Higher than typical IRR used
VAs/Segregated Funds	Varies, but generally higher
Fixed Indexed Annuities	Higher than typical IRR used
Critical Illness	Lower than typical IRR used
Group Life & Health/Employee Benefits	Lower than typical IRR used

The approach used to set the cost of guarantees on variable annuity business has evolved over time

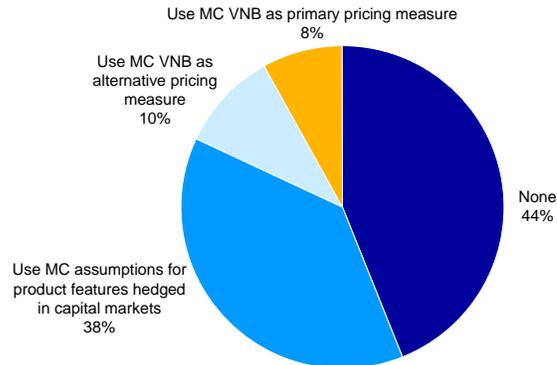
**Method Used to Determine Cost of Guarantees on VAs  
(e.g., Guaranteed Minimum Death Benefits, Guaranteed Minimum Income Benefits) (Percent of Responses)**



Note: Companies selected multiple responses if they used different methods for different guarantees.  
Source: 2006 and 2008 Tillinghast Pricing Methodology Surveys (i.e., methodology used to price products in 2005 and 2007)

Market consistent pricing methodologies or assumptions are most often used in the US for product features that are hedged in the capital markets

**Use of Market Consistent (“MC”) Pricing Methodologies or Assumptions  
(Percent of Responses)**



Source: 2008 Tillinghast Pricing Methodology Survey (i.e., methodology used to price products in 2007)

## While market consistent pricing was not broadly used in 2007 for a wide range of products, this is gradually changing

- 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)
  - More and more merger and acquisition and securitization transactions are being valued using both traditional and market consistent techniques
  - Some companies are embracing market consistent techniques because they believe these methods provide useful insights into asset-liability management
  - Others use market consistent pricing for incentive compensation to align compensation with the risks undertaken
- The above developments have motivated many 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
- Other companies have embraced market consistent pricing for its own sake
- IFRS Phase II, which is based on a fair value approach, could become required in 2014 in the US and in 2013 in Canada
- Consequently, the use of market consistent pricing should continue to increase in North America

## Those that act early can gain a competitive advantage

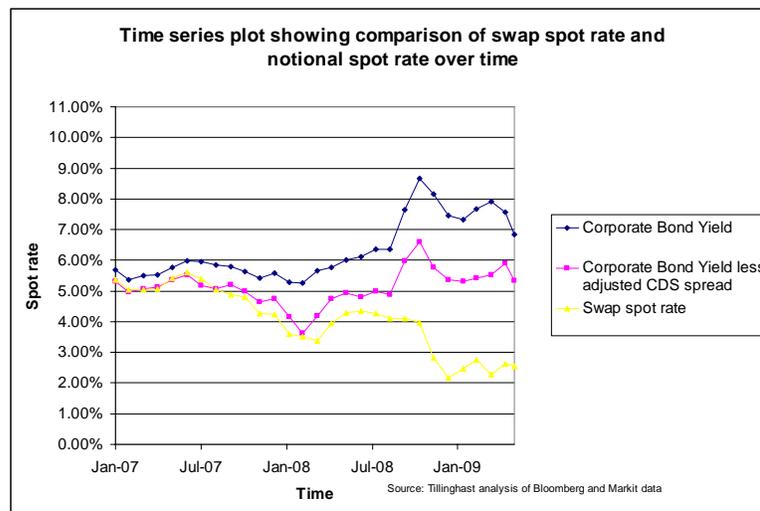
- Market consistent pricing could be used to develop strategic options
  - Companies could target products where current product charges are greater than prices required by the market
  - Companies moving first would gain leverage by targeting profitable products
  - Eventually inefficiencies will be corrected as competitors catch up
- Companies could also use market consistent pricing analyses to better understand the relative risks of their products
  - Depending on a company's risk appetite, measures could then be taken to de-risk certain products by increasing product charges or making changes to the product design
  - Product design changes could include
    - decreasing interest rate guarantees
    - making variable annuity/segregated fund guarantees less rich
    - introducing market value adjustments upon surrender
    - changing premiums from a guaranteed basis to an adjustable basis
- Companies could use market consistent pricing techniques to protect themselves against similar tactics used by competitors

## Markets are displaying highly unusual characteristics, compared to historic norms

- Nil/negative LIBOR swap spreads (over government) at medium to long durations
- Corporate bonds, CDS protection and LIBOR swap yields suggest potential arbitrage opportunities exist, at least in credit markets
- High implied volatilities
- Different sources of data at times show very different results

**Does the concept of “willing buyer, willing seller” still hold?  
Are market prices reliable?**

## Highly unusual market characteristics



## Current market conditions support the use of a “liquidity premium” in pricing predictable liability cash flows

- Corporate bond spreads have risen sharply
  - Part of this is an increased perception of default risk
  - However, this component can be measured to some degree by CDS spreads
  - The remainder includes a liquidity premium and any unexplained components
- Replicating portfolios are a common technique used to calculate market consistent values
  - Liability cash flows are replicated using a theoretical, easy-to-value portfolio of assets
- In a perfect market, all replicating portfolios for a liability will have the same value. In practice they do not due to market imperfections and other characteristics (e.g., liquidity)
- Where there are alternative replicating portfolios, the cheapest portfolio could be used to value liabilities
  - In MCEV, the LIBOR swap rate is already used instead of the government yield

## ‘Cheapest replicating portfolio’ in mark-to-market valuations

- For example, payout annuities have largely predictable cash flows over long terms
- Provided an annuity writer is protected against defaults, it will have no need to trade the investments and is unaffected by market value fluctuations
- Pricing should report sales of payout annuities as profitable if they are priced with an interest rate up to
  - Risk free rates, plus
  - The residual corporate bond spread over the CDS spread
- However, if a replicating portfolio cannot be constructed it should not be used

## Theory also supports the inclusion of an 'own credit risk' adjustment in mark-to-market valuations

- MCEV Principles treat guaranteed liabilities as being certain to be paid. In reality, there is a chance of default and this should theoretically reduce the value of the liabilities held
  - Some banks have (controversially) introduced this element to value their debt
- Until recently, the impact was small
- In current conditions the economic impact of allowing for own credit risk is very significant
  - The impact is of the same order of magnitude as the current liquidity premium

## End 2008 CFO Forum MCEV & market-consistent EEV reporting: comparison of reference rates

COMPANY	REFERENCE RATES END 2008 EV
Allianz, Hannover Re, Munich Re, Zurich	Swaps (government bonds for Allianz Korea)
Aviva	Swaps +150bps: UK and NL immediate annuities Swaps +300bps for US immediate annuities / +250bps for other US contracts Swaps: other businesses
AXA, Fortis	Swaps +50bps for European businesses, +100bps for most other businesses
CNP	Swaps +70bps
Generali	Government bonds: Italy, Czech Republic Swaps +50bps: most other European businesses Swaps for other business
Old Mutual	Swaps +300bps for US onshore business Swaps for other businesses
Prudential	MCEV approach used for UK annuities only: gilts + c.250-290bp (exact adjustment not disclosed)
Scottish Widows	Gilts +154bp for UK annuities; otherwise gilts
Standard Life	Reference rate set to 3.42% (gilts); for UK annuities investment return 6.44%

## Key statements for market consistent pricing

- 1 Market consistent pricing addresses some of the shortcomings of traditional pricing methods by providing a framework for understanding the tradeoffs between shareholder risks and rewards using a robust, transparent and objective economic methodology that is consistent across products
- 2 The use of market consistent pricing has recently extended beyond variable annuity guarantees to a wide range of life, health and annuity products
- 3 More and more companies are looking at the profitability of their business using market consistent approaches motivated by FAS 157 and 159, MCEV Principles, economic capital calculations, mergers and acquisitions and securitization transactions, asset-liability management, incentive compensation and IFRS Phase II
- 4 When markets are dislocated, adjustments can be made for liquidity premiums and own credit risk
- 5 Companies that are among the first to take action may benefit

## Thank You

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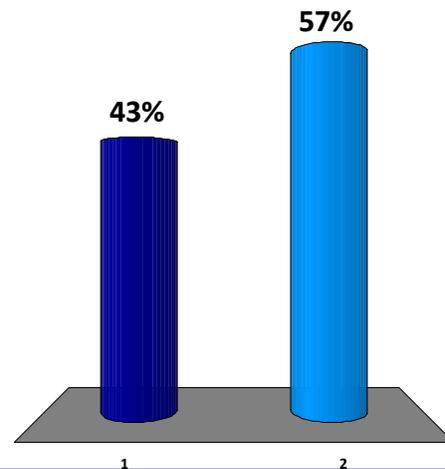
## Market Consistent Pricing – Reflecting the Risks in our Products

Brian Campbell, FSA  
Product Development Symposium  
June 30, 2009



Do you consider embedded value in your pricing process?

- 1. Yes
- 2. no



## Outline

- History of Embedded Value at Allianz
- Implementation Challenges and Considerations
- Challenges for Our Products and Actions Taken
- Concluding Remarks

## History of EV Reporting at Allianz Life

- First calculated in 1999
- 2000
  - EV guidelines developed at Group level
  - Movement analysis
- 2001
  - Reviewed by external consultants – Group published results
- 2003
  - Cost of options and guarantees estimated but not published
- 2004
  - Move towards EEV principles
  - Values of options and guarantees published
- 2005
  - Published and disclosed EEV results to public
- 2006
  - Published and disclosed Market Consistent Basis

## Why We Added MCEV as a Component of AZ Life Pricing

- **Our Parent Reports on MCEV**
  - Always the first Question – What is the VNB?
  - Especially “Now!”
- **Complements a Real World Approach**
  - Add on to Stochastic Real World Pricing
  - Highlights Financial Payoffs required to Achieve Expected Profits
- **Less Biased Approach to Valuing Guarantees**
  - Cannot “cheat” the market
  - As “Unbiased” as the Market is “Unbiased”

## Challenges to MCEV Pricing

- **Getting Buy-In from Senior Management as to Value of Measure**
  - Viewed initially with Skepticism
  - Difficult to link IRR target with MCEV result
  - RW PM helps provide a bridge
- **Lack of Calibration Techniques**
  - No formal secondary market
  - Limited disclosure by competitors
- **Balancing Real World and MCEV Targets**
  - Pure MCEV Approach may be uncompetitive
  - Cannot satisfy both without Compromise
- **Possible Approaches**
  - Negative MCEV Budget
  - Assumption or Methodology Adjustments
- **Monitoring Issues**
  - Selling positive MCEV business not “locked-in”
  - MCEV much more sensitive post-sale

## Implementation Challenges

- Requires Stochastic Processing
  - Most Lines already there
- Requires Risk Neutral Scenario Set
  - Modified Internal “Log-normal” Generator
  - Hedging Group Generators
  - Scenarios Provided by Parent – “Outside Vendor”
- If Already using Stochastic Pricing, to be added –
  - Fairly simple add on to existing modeling
  - Use Statutory earnings
  - No need to model hedging – frictional cost main consideration
  - Capital cost is also frictional – tax and investment expense
  - Result = average of PV of DE's

## Assumption and Methodology Considerations

- Market Environment to Utilize
  - Current, “Near-term” or “Long-term”
  - Swap rates
  - Market volatility
  - Fund parameters
  - Credit spreads
- Dynamic Policyholder behavior
  - Same as RW or Adjusted
  - Parameters to use
- Areas of Discussion
  - Liquidity Premiums
  - Mean Reversion
  - Sub-optimal behaviors

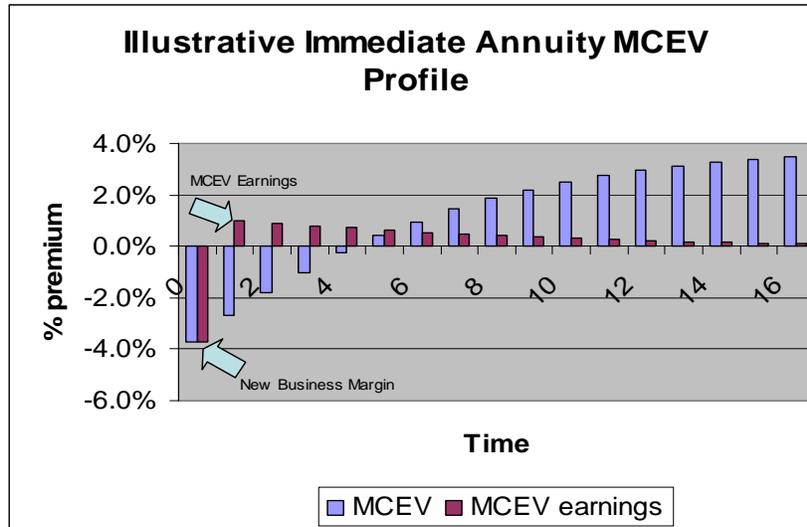
## Challenges with our Product Lines

- **Variable Annuities**
  - Variable Annuity Market driven by demand for Guarantees
  - Guarantees are Sensitive to Swaps, Volatility and Market Movements
  - Regulatory and Competitive constraints to constant “Re-pricing”
  - Limited ability to add management levers to control MCEV
  - Cannot enter and exit market without impact on market share
  
- **Fixed Annuities**
  - MYGA’s and SPIA’s typically have negative MCEV at issue
  - Index and Annual Rate Annuities have higher MCEV at issue
  - Spread compression at low swap levels leads to negative MCEV’s

## Actions Being Taken within our Product Lines

- **Focus on EV at Issue and Over Life of Product**
  - Both MCEV and IRR are Important Criteria
- **Close Monitoring of Guarantees Relative to Current Market**
  - Continued Balance of Competitiveness vs. Prudent Pricing
  - Take Advantage of Product Flexibility
- **Closer Tie between Pricing and Reporting**
  - Build Expectations and Faster Feedback Loop

## MCEV Emergence – An Example from the CFO Forum



## Conclusion

- Introducing MCEV into Pricing has its Challenges but ...
  - The Benefits make it worth it -
    - MCEV is a Valuable Complement to Real Word Pricing Especially for Product with Complex Guarantees
    - Allows for Greater consistency in Valuing Risk across Products
    - Takes Asset Arbitrage out of the Equation
    - Does Require Perspective as to how Given Products will React under MCEV

Will you consider embedded value in your pricing process?



1. Yes

2. no

