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Lessons Learned – A Risk Perspective

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Equity-Based Insurance Guarantees Conference

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Lessons Learned – A Risk Perspective

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Market Risk is Systematic

- GMDBs were the first widespread annuity guarantee, beginning in the 1990s.
  - Performance guarantee in down markets.
  - Dual trigger
  - Policyholder lapsation, withdrawal, and allocation choices

- Early feeling was that dual trigger provides strong diversification, and limits opportunity to “optimize” benefit.

- Learned otherwise…
  - In a protracted down-market, your trigger diversification disappears while mortality marches on with certainty.
  - In a protracted down-market, fee income declines while obligations increase.

Lesson 1

Know what breaks the deal.
What can go wrong and how bad can it get?

Product Design Matters

- Return of Premium GMDB design has several structural weaknesses.
  - Lapse/repurchase when benefits are out of the money
  - Elective allocation to high volatility funds
  - Dollar-for-Dollar withdrawals

- Ratchet GMDB escalates all of these weaknesses.
  - Certain escalation
  - Risk escalation

- Ratchet GMDB up-market risk exposure came as a surprise to some.

Lesson 2

Fully understand what bets you are making.
Fully understand the consequences of those bets.

Dizzying Bet Sophistication

GMAB

- Certain payout timing.
- Certain benefit level.
- Equity contingent payout.
- Single payout.

- Intelligent elective behavior typically erodes benefit value.

- Natural hedge instruments.
- Dynamic hedging is highly effective.

GLWB

- Equity-contingent payout timing.
- Equity-contingent benefit level.
- Rate contingent payout.
- Indeterminant, multi-period payout.

- Intelligent elective behavior increases benefit value.

- No natural hedge instruments.
- Convexity and cross limit dynamic hedge effectiveness.

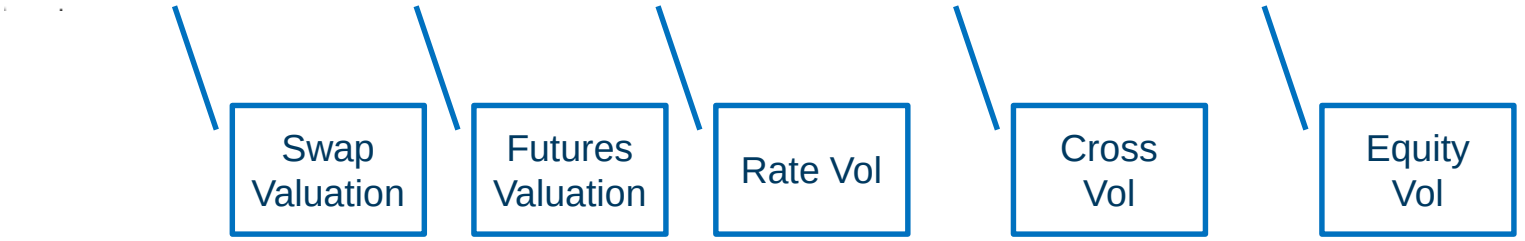
Lesson 3

Complex products lead to complex behaviors – and limited choices.

Seek Simple Hedges that Fail Simply

- If you purchase static hedges, you pay the premium and outsource risk management.
- If you dynamically hedge, you assume material risk in exchange for lower cost.
- Understanding the risk of dynamic hedging is difficult when managing complex risks.

$$\frac{\partial V}{\partial t}\cdot dt + \kappa(\theta - r)\frac{\partial V}{\partial r}\cdot dt + rS\frac{\partial V}{\partial S}\cdot dt + \frac{1}{2}\frac{\partial^2 V}{\partial r^2}\left(dr^2 - \eta^2 r\right) + \frac{\partial V}{\partial r \partial S}\left(dr \cdot dS - \rho\eta\sqrt{r}\sigma(t)S\right) + \frac{1}{2}\frac{\partial^2 V}{\partial S^2}\left(dS^2 - \sigma(t)^2 S^2\right) = rV \cdot dt$$



- Subtle market behaviors can make complex dynamic hedges fail in leveraged ways.

Lesson 4

Risk exchange is not the same as risk transfer.

Building Institutional Understanding of Hedging

- A lot of intuition that works well for retained financial risk (actuarial pricing) doesn't necessarily translate well to financial risk transfer (hedging, market valuation)

- Some important examples of misunderstanding…

  – Schroedinger's Cat Hedges (*simultaneously dynamic and static*)
  – Big Foot Hedges (*everyone has seen Big Foot on YouTube…*)
  – Potemkin Hedges (*they seem like the real deal…*)

  – Feyman-Kac Theorem (*a.k.a. Risk-Neutral Scenarios*)

  – The Amicable ESG Conundrum (*why we all need a few good enemies*)

Lesson 5

Deep understanding of the math is essential (but not sufficient).

Make Sure Your ESG Reflects Your Opinions

- Risk-Neutral ESGs are mechanical extensions of your valuation model.
- Real-World ESGs are judgmental assessments of Risk and Reward.
- Need to make sure we reflect things we <u>really</u> believe.
  - Forecastable rates and volatility
  - Volatility/Return causation
  - No-Arbitrage Conundrum
  - Free Money Machines
  - Eye-o-Meter evaluations
- Understanding what you care about is hard. Developing and managing models that addresses those cares is even harder.

<u>Lesson 6</u>

Don't be surprised when your decisions are 100% consistent with your opinions.

Managed Funds and Indices

- Managing the underlying fund performance to simultaneously provide a sound customer value proposition and to manage insurance company capital volatility – pure genius!

- Performance story for early funds was sometimes disappointing.
  - Insurance isn't an alpha-generator
  - Weak designs bet on forecastable volatility and returns
  - Undiversified high-volume always gets picked-off.

- Effort has moved to Proprietary Crediting Indices
  - Sound diversification
  - High complexity leads to significant over-optimization potential.
  - High cost + difficult value assessment

Lesson 7

Clearly-differentiated, low-complexity products lead to the best outcomes for everyone.

Statutory Accounting Hedges

- When you are hedging a GAAP Fair-Value Liability there is natural income alignment with hedge assets.

- Overall impact of Fair-Value hedging is to react early, and settle down after claim is relatively certain.

- When you are hedging a STAT Reserve or Capital several potential mismatches arise.
  - Use of real-world scenarios for valuation
  - Use of portfolio rates for discounting
  - Use of catch-up mechanisms (e.g. SOP 03-1 benefit ratio)
  - Overall impact is to smooth valuations, and only react when claim is relatively certain.

- Statutory Greek-matching leads to increasing protection after stress market events.

Lesson 8

Buying insurance after the house has caught fire is expensive and does little to transfer risk.

Other Thoughts for Discussion

- Policyholder Behavior
  - Expected vs Deterministic vs Stochastic models of behavior
  - Is complexity really your friend?

- Framework controls for pricing, hedging, and valuation
  - Controls ensuring safe operation
  - Controls warning of potential failure
  - Importance of active oversight

- Integrated systems for pricing, hedging, and valuation
  - Ensuring consistency
  - Avoiding false consistency
  - Building for speed and efficiency

Discussion

If only I had known…