



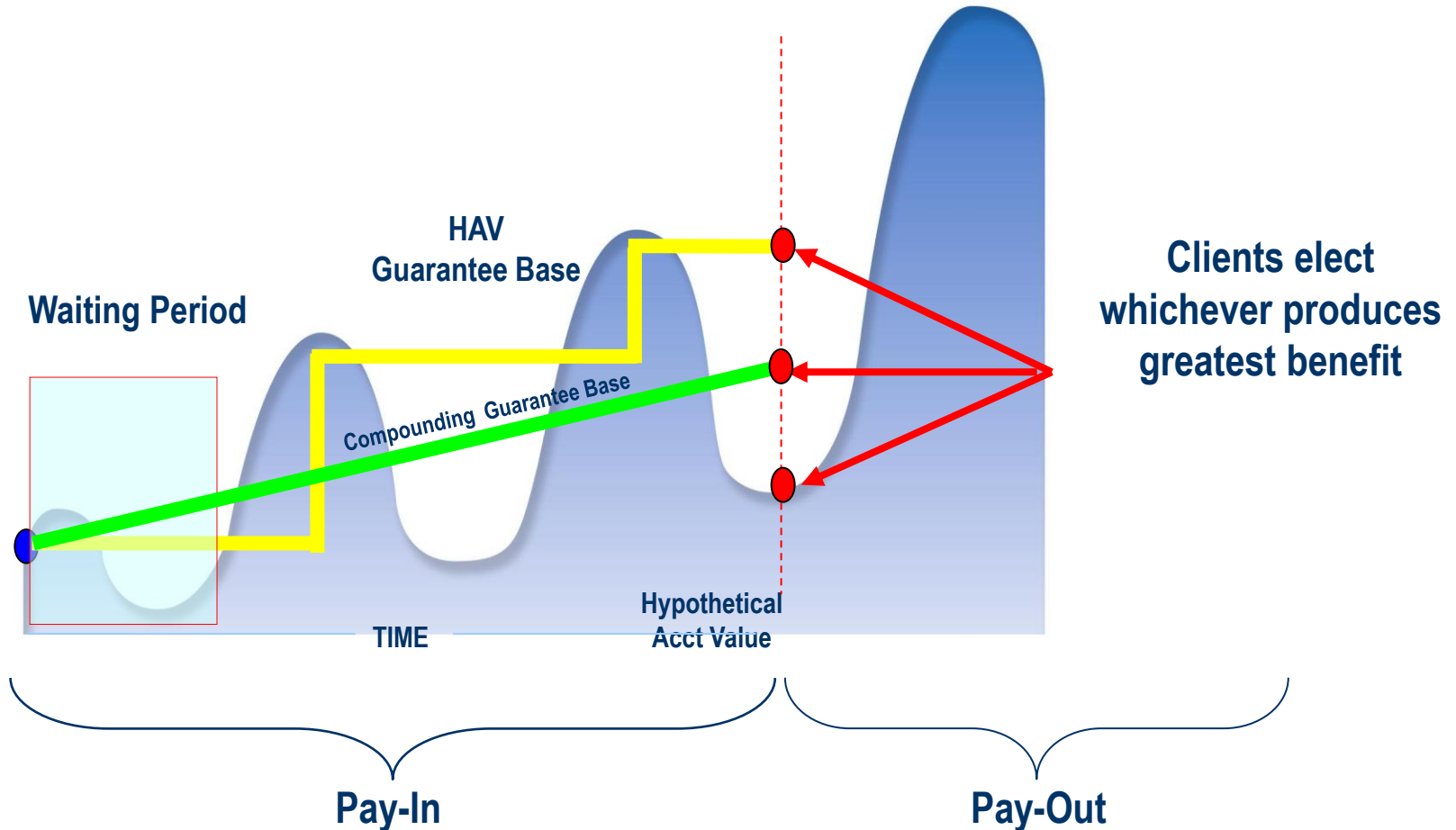
Hedging Variable Annuity Guarantees in the Current Environment

Actuaries' Club of Hartford/Springfield

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Regynald Heurtelou, Vice-President, MetLife ALM

VA Guarantees – Some Basics



VA Guarantees – Some Basics

GMDB – Guaranteed Minimum Death Benefit

GMAB – Guaranteed Minimum Accumulation Benefit

GMIB – Guaranteed Minimum Income Benefit

GMWB – Guaranteed Minimum Withdrawal Benefit

GMxB : Often used as a Common Reference

VA Guarantees Hedging – Risk Sources

Examples:

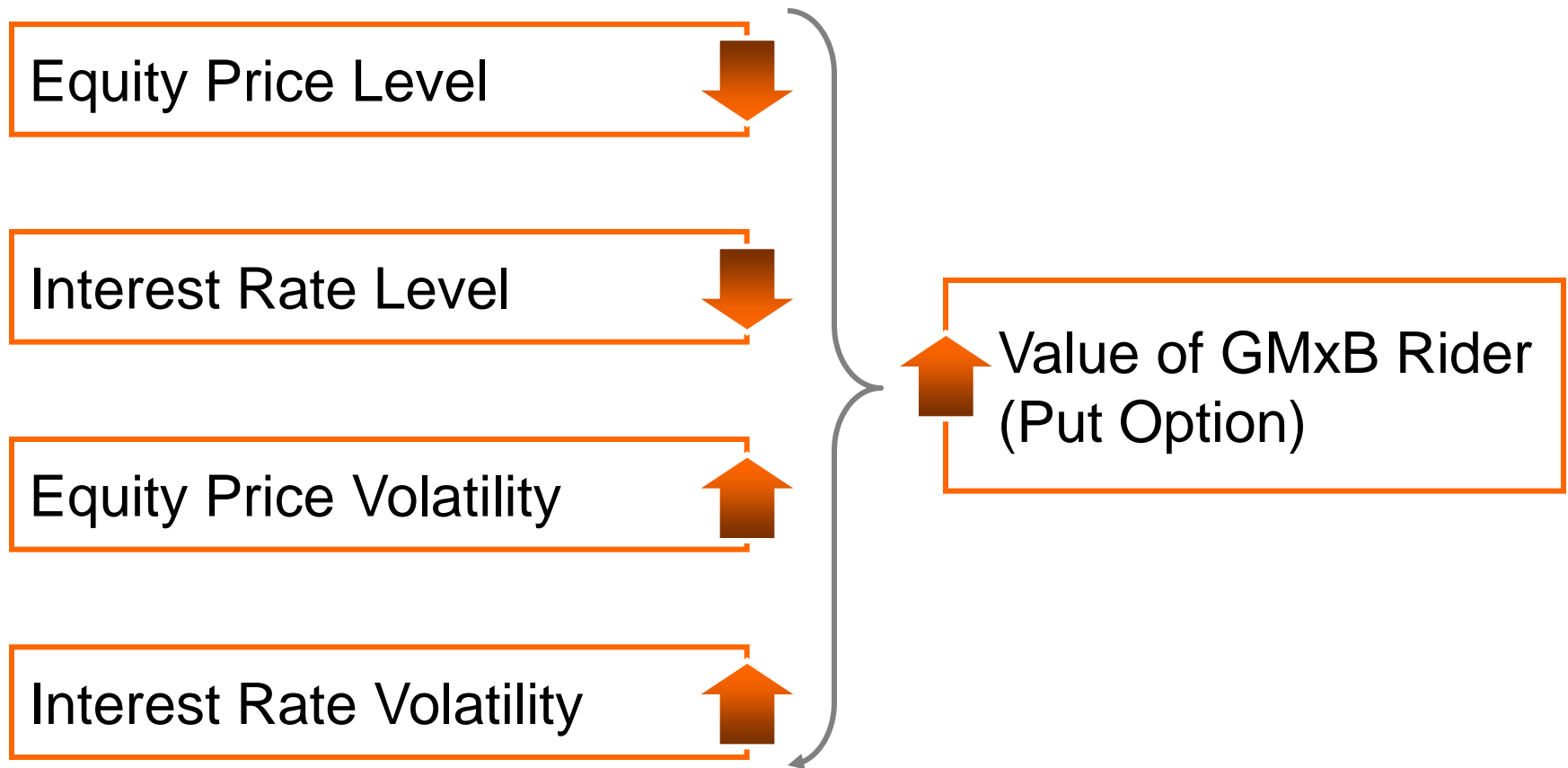
- Equity Level
- Interest Rate Level
- Equity/Rate Volatility
- F/X Level/ Volatility
- Correlations



Examples:

- Policyholder Behavior
- Mortality Improvement
- Operational Failure
- Transaction Costs
- Counterparty Exp.
- Accounting
 - Ex: Currency Translation

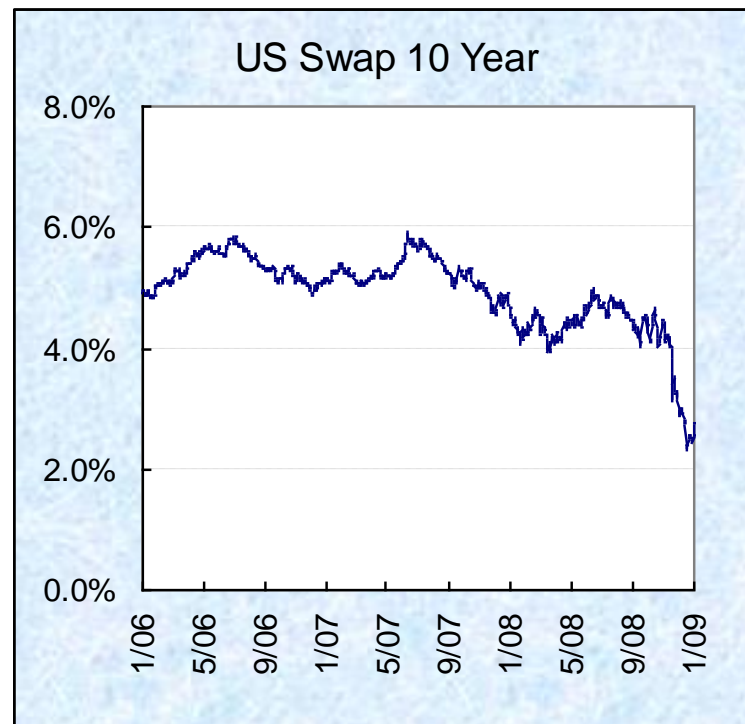
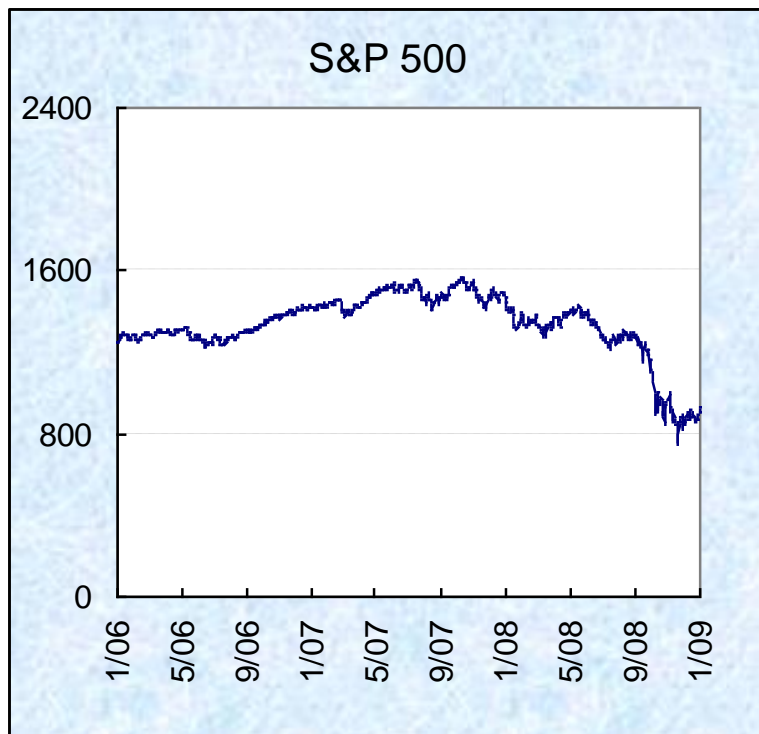
VA Riders – Value Drivers of Hedgeable Risk



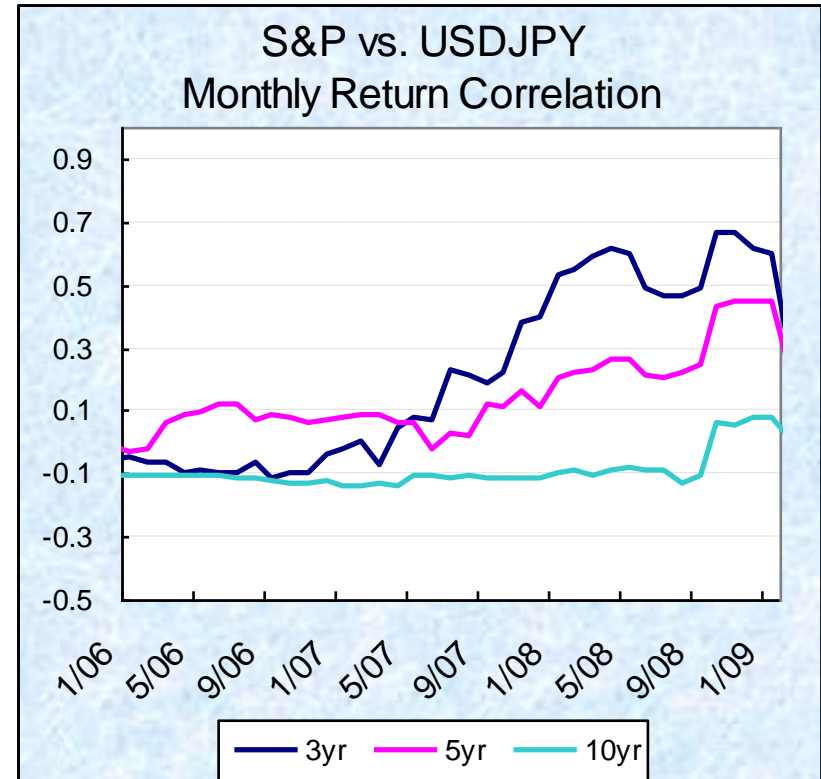
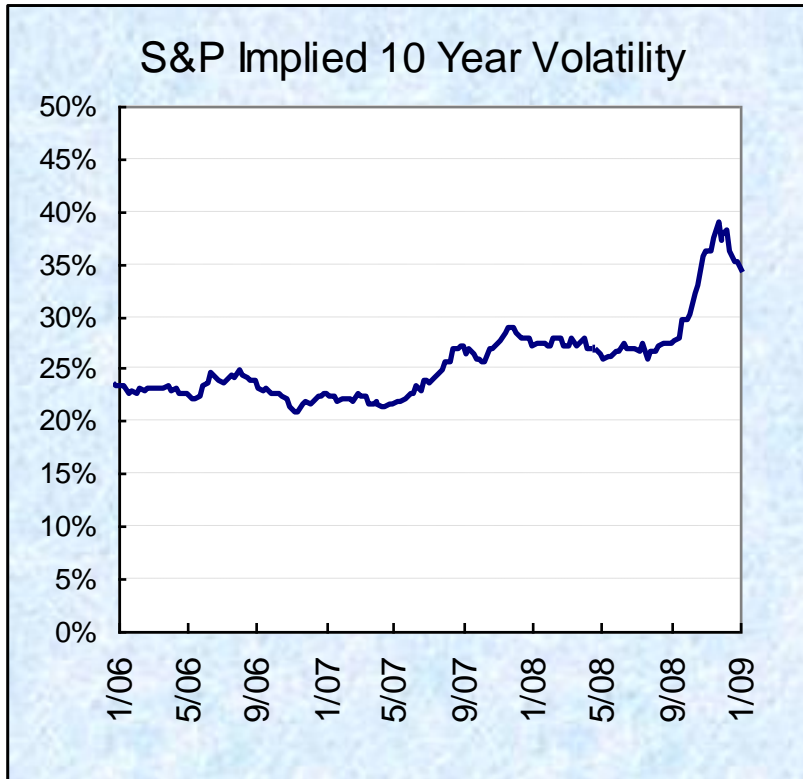
VA Hedging: Examples of Products Used

Product Covered	Risk Covered	Cost
Equity Futures	<ul style="list-style-type: none"> Equity 	<ul style="list-style-type: none"> Negligible Upfront, Embedded carry cost, Quarter roll cost
Treasury Futures	<ul style="list-style-type: none"> Interest Rate 	<ul style="list-style-type: none"> Negligible Upfront, Embedded carry cost, Quarter roll cost
Interest Rate Swaps Total Rate of Return Swaps	<ul style="list-style-type: none"> Interest Rate & Equity 	<ul style="list-style-type: none"> Bid/ask per tenor and type Carry emerges over time
Equity / Interest Rate Options	<ul style="list-style-type: none"> Equity & Interest Rate, Equity & IR Volatility 	<ul style="list-style-type: none"> High upfront or over time
Interest Rate / Equity Variance Swaps	<ul style="list-style-type: none"> Equity & IR Volatility 	<ul style="list-style-type: none"> No upfront Carry emerges over time
Hybrids Capital Market Reinsurance	<ul style="list-style-type: none"> Combination of market risks and cross-terms 	<ul style="list-style-type: none"> High upfront or over time

“Recent” Market Trend -- Equity and Interest Rate

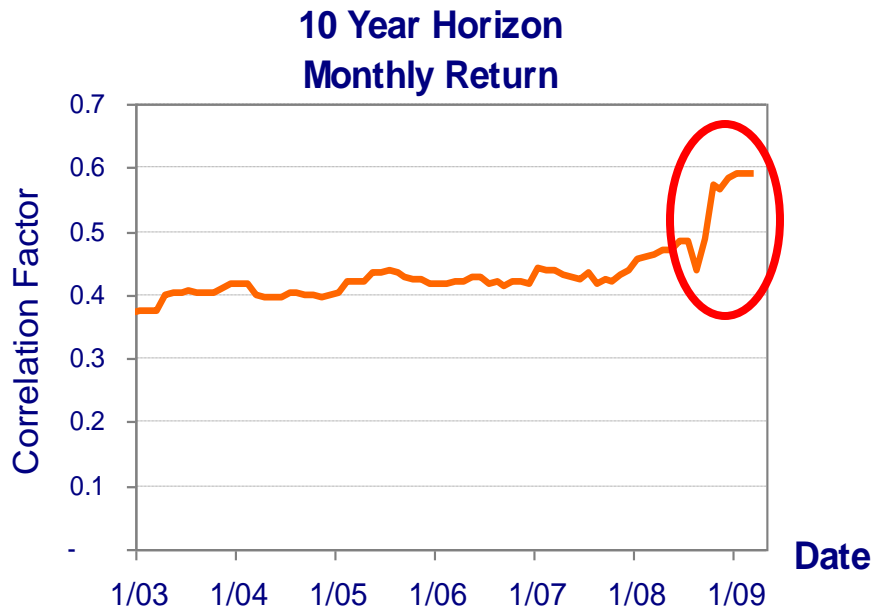


“Recent” Market Trend – Volatility and Correlation



“Recent” Market Trend – Correlation → Volatility

S&P and Topix



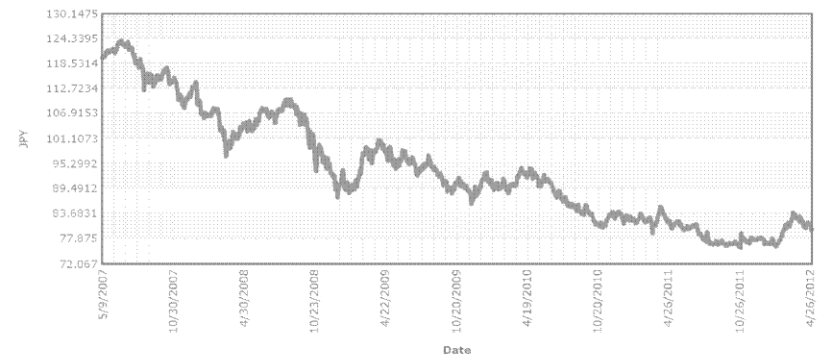
S&P and USD/JPY



Correlation↑ → **Basket volatility**↑ → **Option value**↑

“Recent” Market Trend – F/X and Basis Risk

- Japanese Yen Strengthening vs US Dollar
 - US Companies with Japanese Yen Exposure
 - Yen Liabilities / Dollar Investments
 - Will we see ¥/\$ at 100 again?
- Basis Risk
 - Always present
 - Active Fund Management / Tradable Index Mapping
 - Significantly Increased During Crisis



“Recent” Trend – Regulators/Rating Agencies

- US and Foreign Regulators
 - US Regulators: Solvency Concerns
 - Better understanding of business
 - » Questions on Hedging at any sign of Market Disruption
 - » SocGen Rogue Trader: Jan 2008
 - » May 2010 Flash Crash
 - » Early August 2011 Equity Volatility
 - Foreign Regulators Very Cautious
- Rating Agencies
 - Need to “Get it Right”
 - Active Monitoring with Willingness to “Pull the Trigger”
 - More Stringent Requests Every Year

“Recent” Trend – Analysts/Investors/Policyholders

- Analysts

- Issuing More Analysis and Reports on VA Writers
- Questions During Earnings Calls

- Investors

- Paulson at Hartford
- Equity Hammered at Any Sign of Trouble
 - Perceived or Real

- Policyholders

- Will React with Market and Trust/Distrust a Brand
- Will Lapse policies
 - Could be Good or Bad



VA Hedging: Reactions

- Increase in Guarantee Charges
 - Immediate Reaction: Reflect increase in Hedging Costs
- Product Design Changes
 - Good Risk Management: First Step
 - Some Product Features are Difficult to Mitigate
 - Product De-Risking
 - “Feature Creep” Disappeared
 - Restriction on Funds
 - Limited Movements/Transfers
 - Actively Managed → Index Fund
 - Reduce/Eliminate Foreign Currency Exposure
 - Managed Volatility Funds
 - CPPI
 - Guarantee Based on Market Indicator



Reduction in Capital
Markets Exposures

VA Hedging: Reactions

- Start/Increase Hedging Coverage
 - When to Start? At any Cost?
 - Increase Number of Greeks Covered. How About Cross-Greeks?
 - Delta + Gamma + Rho + Vega
 - Short Dated Gamma Hedging as Vols Came Down from Market Highs
 - Refine (Add) Hedging Indices (Reduce Basis Risk)
 - Increase Universe of Hedge Assets Used
- Hedge Against Capital Increases
 - Disconnect Between Accounting Bases
 - Highlighted at Distribution Tails
 - Macro Hedge Programs
 - Put-Spread Collars Around Year End
 - Need to Monetize Positions with Certain Market Conditions/Liquidity Concerns
 - Usage has Reduced Since 2008

VA Hedging: Reactions

- **Tightening Hedging Guidelines**
 - Tighter Required Rebalancing Range
 - More Frequent Access to Capital Markets
 - Transaction Costs?
 - Maybe more Flexibility Needed
 - Requires Increase in Tolerance with High Volatility Markets
 - Active Trader Instead of Program Trades → Move with Market Dislocations
- **Counterparty Diversification**
 - Reduce Credit Risk Exposure
- **Systemic Risk Reduction**
 - Federal Regulator
 - Interrelated Parties
 - Systemically Significant Financial Institution

VA Hedging: Reactions

- Use of Basket Hedges

- Long Term or Rolling Short Term
- Target Overall Tail Risk
 - Or Specific Risk: Manager Basis Risk, Credit Risk in U/lying Funds
- Structure with Broker/Dealer
 - Costly/Time Consuming
 - Traditional Reinsurers Still Out

- Abandon the Market

- Place Business in Runoff
 - Still Need to Manage/Hedge Closed Block
- Put Business up for Sale
 - Find a Buyer
 - Realize Current Losses

MetLife