



Institute of Actuaries of Australia

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Innovation in Financial Markets

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Hedging Investment Guarantees: International Best Practice

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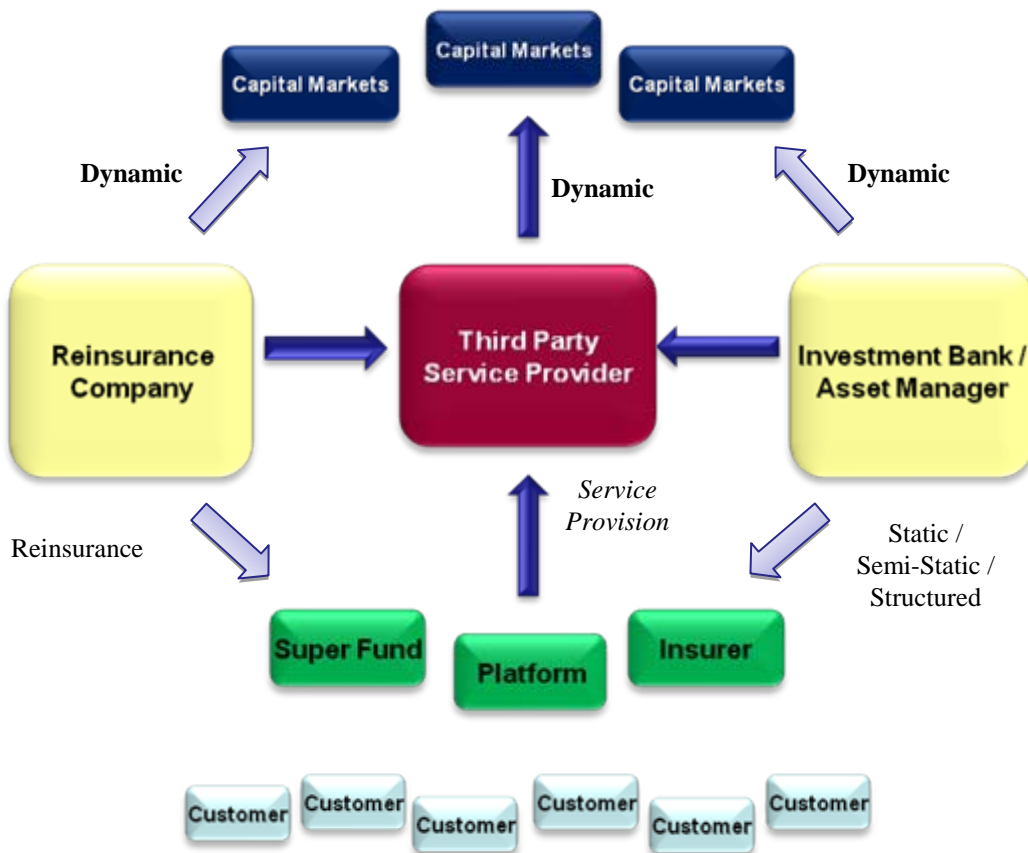


The re-emergence of products containing investment guarantees is well documented

- Overseas market developments
 - North American “Variable Annuities” = US\$1.5 trillion and growing
 - Japan market: US\$0 to US\$110bn over 6 years
 - Expansion in the UK, Europe and Asia
- Australian development is underway
 - Axa North: Super & Retail
 - Margin Lending Products
 - Other products in the pipeline
- Guarantees are made possible through the development of sophisticated hedging programmes & growth of risk transfer options
 - In house
 - Investment Banks
 - Re-birth of reinsurance market for guarantees
 - Assistance by independent third party providers



Risk management options vary, but ultimately most is transferred to the market



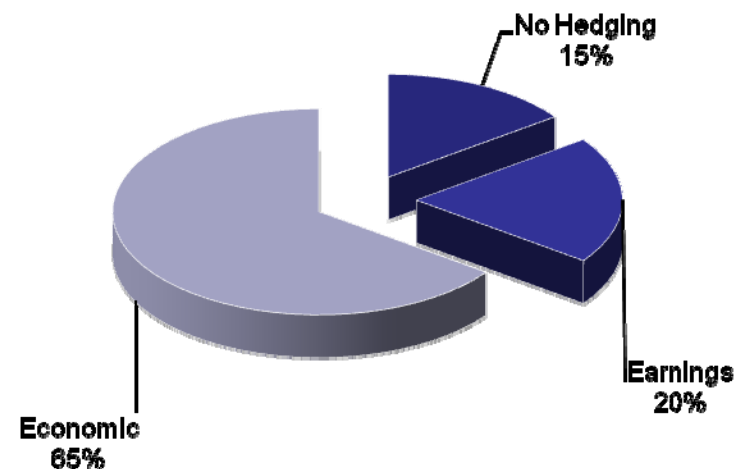
- The world of product structuring is changing
 - Alignment of regulation and economic theory
 - Technology levelling the playing field
- Transparency & flexibility has been introduced
 - The majority of risk is ultimately transferred to the market
 - Trend away from close-ended structures
 - Dynamic hedging of major risks is at the core of most hedging programmes
 - Focus is on risk tolerance, transfer options, efficient pricing and counterparty management



Hedging objectives are typically economic, but consideration of regulatory treatment is important

- **Economic Risk**
 - Long term guarantees
 - Hedge risks that impact actual claims
- **Accounting Risk**
 - Are regulations market consistent?
 - Depends on product features
- **Capital Reduction**
 - Management of capital position
 - Credit under resilience reserve?

Primary Objectives of the Hedge

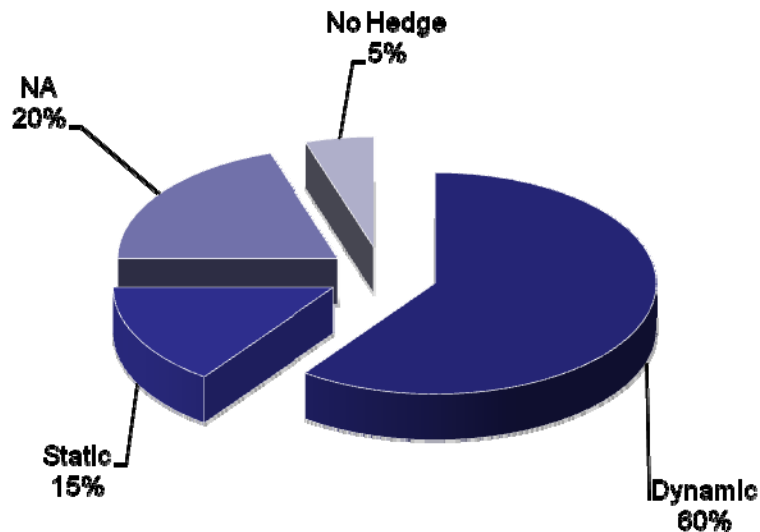


Source: Moody's Survey



Hedging strategies

GMWB Hedging Strategy By Type



Source: Moody's Survey

- **Naked**
 - Assume enough capital pays for claims
- **Static**
 - Exotic derivatives to manage capital market risk
- **Semi-static**
 - Buy and hold using a portfolio of options
- **Dynamic**
 - Manufacture internal risk management
- **Reinsurance**
 - Mitigate market and actuarial risks



Hedging objectives checklist

Clearly Defined & Documented

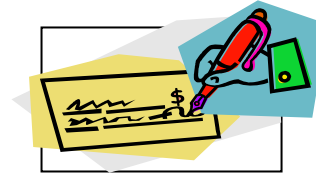
- Approved by the Board
- Precise and transparent
- Analyst, auditors, regulators

Accounting Treatment

- Impact to financial statement

Balancing Interests

- Economic
- Financial statement
- Capital requirements



Trading Strategy

- Hedge instruments
- Greeks: delta, rho, vega
 - Percentage hedge
- Rebalancing frequency

Capital Market View

- Real world
- Risk neutral

Financial Projections

- Determine the trading strategy
- Analysis of worst case scenario
 - Long-term financial impact



Market consistent valuation

- Scenarios / paths and discount factors used to value liabilities should replicate market prices of hedge assets (e.g. in risk-neutral Monte Carlo simulations)
 - Simple European equity option implied volatilities: vary with option maturity and strike
 - Swaption implied volatilities: vary with option maturity and swap maturity
 - Currency options: implied volatilities vary with strike
 - Reproduction of bond prices should not be sacrificed
- Applications
 - Hedging (frequent marking to market of illiquid liabilities)
 - Fair value financial reporting requirements (as interpreted by auditors)



Reasons for deviating from market consistency

- Focused on delta hedging using predictive market parameters
 - There may not be a liquid market for similar options
 - Current option prices may be high in a historical sense
 - Understand risk/return tradeoff
- Liability is long-term and illiquid
- Concerned with alternative liability valuations
 - Monte Carlo systems can be sufficiently flexible and efficient to evaluate from different perspectives



Strategy development & testing

- Companies should test strategies before implementing them
 - Hedging is not risk free. Each strategy has its own risk-reward profile. Testing helps develop this understanding.
 - Need to know what types of market environments will be problematic for any given strategy.
 - Stress Testing: Need to know how strategy will perform over extreme market scenarios
 - Senior management must be comfortable with the risk exposures associated with the strategy
- This requires developing strategy simulation capabilities
 - Stochastic on Stochastic
 - Short time-step – accurately reflect actual rebalancing approach
 - Full projection of liability evolution over time as well as hedge transactions



System requirements

- Insurance liability is a complex financial derivative
- Development of Analytical Tools is essential
 - Serves as backbone of the hedging program
- Liability Valuation Capabilities
 - Monte-Carlo simulation over large number of stochastic scenarios for risk neutral pricing
 - Value guarantees as financial derivatives
 - Calculation of liability valuation and Greeks
- Robust Fund Modeling
 - Ability to explain variability in fund returns
 - Map policyholder fund choices to hedgeable indices



Process best practice

- Independent check on Capital Markets and Trading Group
 - Risk Management and Reporting Group verifies trade blotters against brokerage account
 - Back Office and Cash Management Group prepares all margin cash requests
- Processes and Procedures Manual
 - Detailed documentation of all process and procedures (client specific)
 - Updated on a monthly basis (provided quarterly to clients)
- Disaster Recovery and Business Continuity Planning
 - Annual testing of Disaster Recovery and BCP
 - Test plan and results provided to clients
- Independent Audits
 - Client internal and external auditors



A hedging centre requires a diverse range of skills

- Dedicated staff for hedging activity
 - Capital markets professionals/traders
 - Actuarial modellers & students
 - Technology experts
 - Quantitative code developers
- Exact requirements depend on
 - size of block
 - scope of the hedging program
 - decision to develop internally or externally
- Third party management of the hedging / reinsurance administration activity might be an extremely cost effective solution from the following perspectives:
 - Expertise may not exist in-house
 - May not be able to dedicate or coordinate sufficient resources
 - Does not require investment in technology and infrastructure
 - Speed to market (go-live date)
 - Allows company to focus on marketing, distribution, and other core competencies and activities
 - Navigate the large number of potential risk transfer options whilst maintaining flexibility and control



Reporting is critical to monitor performance of hedging programmes

- Performance Attribution
 - Impact of Hedged Indices (delta hedging)
 - Performance of Unhedged Indices
 - Net Impact of Interest Rates (rho hedging)
 - Net Impact of Implied Volatilities (vega hedging)
 - Lapse/Death Impact
 - Withdrawal Impact
 - New Business Impact
 - Basis Mismatch
 - Transfer Impact
 - Hedge Premium
- Hedge Effectiveness
- Breakdown change in assets and liabilities due to changes in capital market factors
- Capital Market Factors
 - Equity Index Movements
 - Interest Rates
 - Implied Volatilities

Hedge Effectiveness Report

	Liability	Hedge Assets				Total Hedge Assets	Net P&L
		Index Futures	Options	Interest Rate	Swaps		
Change in Market Levels	\$ -	\$ -	\$ -	\$ -	\$ -		
S&P 500	\$ 720,345	\$ (270,088)	\$ 1,019,186	\$ -	\$ -	\$ 749,098	\$ 28,753
Russell 2000	\$ 132,903	\$ 137,100	\$ -	\$ -	\$ -	\$ 137,100	\$ 4,197
NASDAQ	\$ 34,135	\$ 31,856	\$ -	\$ -	\$ -	\$ 31,856	\$ (2,279)
EAFE	\$ (25,002)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 25,002
Change in Interest Rates	\$ 1,948,166		\$ 190,857	\$ 375,767	\$ 1,117,377	\$ 1,684,001	\$(264,165)
Swap & Int. Rate Futures	\$ 2,125,564		\$ 190,857	\$ 375,767	\$ 1,117,377		
Bond Index	\$ (177,399)						
Change in Implied Volatility	\$ 320,123		\$ 297,788			\$ 297,788	\$ (22,335)
Total Change	\$ 3,130,671	\$ (101,132)	\$ 1,507,831	\$ 375,767	\$ 1,117,377	\$ 2,899,843	(230,828)



Regular review and monitoring ensures hedging accuracy is maintained

- **Measurement & Attribution Analysis**
 - Tracking Income Slippage And Model Error
 - Granularity Of Attribution Analysis
- **Management Of Tracking Error**
 - Portfolio Level
 - Fund Level
 - Risk Driver (Greek) Level



Hedging infrastructure and process checklist

Dedicated Resource

- Actuarial
 - IT
- Investment
 - Legal
- Accounting

Computing Grid

- Dedicated grids
- Secured environment
- Auditable trail

Support Team

- Job monitoring
- Results retrieval & delivery
- Unexpected production events
 - data feed delay
 - ad-hoc valuation need

Capital Planning

- driven by hedge instruments
- margins for unexpected events

New Business Planning

- expected sales: capital planning
- pre-hedging planning

Trading Facility

- Trading desks
- Risk monitoring tools



Management Approval

Risk Control Measures

- Emergency trading approvals
- Disaster recovery procedure
- Geographically load rebalance

Reporting and Audit

- Monthly reserves
- Effectiveness measures
- Audit robustness





International implications

- Hedging guarantees involving foreign assets adds another layer of complexity
- Currency risks
 - An example is Japanese guarantees invested in US funds
 - Both the US indices and FX exposures need to be hedged
 - Multiplicative risk
 - Often means more frequent trading
- Interest rate modeling
 - Japan's interest rate environment is fundamentally different from that in other markets
 - Need an interest rate model that can reflect current low interest rate environment, and yet accommodate the possibility of future interest rate increases
 - Interest rate model should drive the currency projections



International implications

- Regulatory issues
 - Local laws may require hedging to be conducted locally. Cross-border reinsurance discouraged.
 - Capital requirements may not recognise benefits of hedging strategies in full
- Time zone and timing considerations
 - Need to produce trading recommendations when all major financial markets are closed
 - New York, Tokyo, London, Europe, Sydney
 - Need to be sure of the timing of the valuation



Survey results

- Milliman surveyed clients to identify the performance of hedging programmes in light of recent market volatility
- 16 respondents covering North America, Asia-Pacific, UK & European operations
- Responses were largely positive, with hedging programmes withstanding recent market conditions
 - Half recorded no unexpected profit or loss over the period
- Full report to be published on the website



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Thank You

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