



Institute of Actuaries of Australia

**4th Financial Services Forum**

*Innovation in Financial Markets*

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# **Beyond the Greeks: Managing Unhedgable Risk**

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## The re-emergence of guaranteed products 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 has begun
  - Axa North: Super & Retail
  - Margin Lending Products
  - Other products in development
- Their success is attributable to a number of key features
  - General demographic trends of western markets, combined with dominance of DC pension plans
  - Management of investment and longevity risk
  - Flexible product design avoiding pitfalls of annuity style products
    - Ability to participate in market performance
    - Retain flexibility of existing account based pension products



## There are two major product opportunities in Australia

- Vanilla Capital Protection (GMAB)
  - Generally the first guarantee type considered
    - Easy to understand and market
    - Natural when considering capital protection
    - Does not address income needs
  - Claim =  $\text{Max}(0, \text{Guarantee Amount} - \text{Account Value})$  – i.e. A Put Option
  - Expensive relative to other guarantee types
    - Common terms between 7 & 10 years
    - Restrictions may be applied to exclude high volatility funds or require a minimum fixed interest content
- Capital protection combined with income needs (GMWB)
  - Currently most popular guarantee in overseas markets
  - Meets regular income needs, whilst retaining flexibility of current account based pension products
  - Policyholder retains control over the underlying assets – no need to annuitise
  - Term or lifetime versions available
  - Can span both accumulation and pension
    - Potential to improve retention



## Flexible products require deep understanding of potential risks

- **Hedgeable**
  - Majority of market risk can be managed through the use of sophisticated hedging practices
  - Nightly valuation of guarantee liabilities and live mark-to-market
  - Utilise liquid exchange traded instruments such as futures, options and swaps
- **Unhedgeable**
  - Market risk for which no suitable instruments are available (or can be obtained at an appropriate cost)
    - Basis mismatch
    - Correlation
  - Demographic and behavioural risks
    - Lapses
    - Mortality
    - Behavioural: asset allocation, switching, withdrawal patterns, utilisation rates
  - Other risks
    - Counterparty
    - Operational



## **Understanding the risks is instrumental in developing a sustainable product**

- Products are new
  - Credible experience difficult to come by
- Product design can largely mitigate or manage risk
  - Stabilise cost of hedging – e.g. loyalty bonus
  - Impose restrictions – e.g. cap ratchets
  - Exclude unacceptable risks – e.g. long / short funds
- Risk transfer alternatives are numerous
  - Ultimately all hedgeable risk is transferred to the market
  - Demographic risk is core competency for insurers
  - Beware of potential conflicts and counterparty issues



## Lapses

- Policyholders can exit without penalty, under standard product terms
- Lapses subsidise guarantee cost – irrational policyholders
  - Secondary market issues
- Does the presence of a guarantee significantly alter this behaviour?
  - Investor has selected guarantee at inception; does base lapse rate change?
  - Investors less likely to surrender when guarantee is valuable
  - Does benefit design encourage persistency; Lapse and re-entry issues
- Lapse Assumptions
  - Where to start? Distribution channels, product designs, ...
  - Dynamic function?
- Structure product to remain relevant over policy term
  - Ratchets automatically reset guarantee in “up markets”
  - Link guaranteed withdrawal rates to interest rates
- Consider interactions between base product and guarantee
  - Increased persistency raises guarantee costs but profit on underlying product may more than offset it



## Mortality

- Lifetime withdrawal benefits particularly sensitive to mortality assumptions
- Mortality / longevity risk is core to insurance business
  - Do guarantee costs allow for mortality improvements
  - Similar to annuities
  - Argument that self selection is less relevant given the broad appeal of hybrid income products
- Longevity risk generally factored into pricing
- Potential development of mortality derivatives market
  - Currently no liquid market, but potential for growth
  - Developing mortality swap market
    - Basis risk still an issue
- Natural hedges with other products
  - Existing insurance products
  - Death benefit riders



## Withdrawals

- Product flexibility allows policyholders to select when withdrawals begin
  - Setting assumptions?
- Delayed withdrawals will lower cost of guarantee
  - Claims occur later on average
  - Longevity exposure may be reduced
  - Not an issue for APs
- Excess withdrawals
  - Should dilute guarantee without incentivizing excess withdrawals
- Cohort approach
  - Split each policy into multiple cohorts and project separately
- Product designs to encourage policyholders to delay income
  - Loyalty bonus
  - Annual ratchet
  - Age dependent guarantee rate
- Savings often greater than cost of delay incentive





## Single vs Regular Premium

- Guarantees in other markets are generally single premium
  - Does not fit with Australian superannuation contribution patterns
- Regular premiums introduces uncertainty
  - Each successive contribution purchases shorter-term option
  - Potential anti-selection when rates rise via premium “dump-ins”
  - Future contributions not guaranteed, but need to be priced
- How should future contributions be hedged?
- Guarantee each contribution at the same cost
- Limit future contributions
  - Cap relative to initial investment; e.g. Axa North
- Give policyholder option to contribute, but retain pricing flexibility
  - Differential price for future contributions
  - Admin and communication issues
- Forward hedge for expected contributions
  - Hedge positions disproportionate to premiums collected



## Asset Allocation

- Pricing in other markets does not usually differentiate by asset allocation
  - Aim to “keep it simple”
  - Assumed fund distribution
  - Single guarantee fee results in cross subsidy between low risk and high risk investors
  - Policyholders to date have not recognised the value of the guarantee, but this is changing
- New markets have a “clean slate”
- Differentiated pricing
  - Avoid complexity
  - Fund “risk” level; High, Med, Low
- Restrict the equity portion of the funds offered
- Limit number of transfers
- Require a specific asset allocation model and charge accordingly



## Basis Risk

- Basis risk equals mismatch between underlying and hedge instruments
- Investment guarantee underlying is managed fund, hedged via liquid exchange traded derivatives
- Zero on average if index weight estimators are unbiased
- Driver of fund selection process
- Use of passive funds
  - Removes basis risk, decreases guarantee cost
- Diversification benefits across block of business
- Example
  - Five managed funds selected
  - Fit global equity indices with liquid derivatives
  - Compare average  $R^2$  to that of an equally weighted portfolio of the five funds

Fund	$R^2$ (Fit to Hedging Indices)
ABN AMRO - Australian Equity Fund	94%
BNP Paribas - MFS Global Equity Trust	91%
Fidelity Global Equities Fund	94%
GMO Australian Equity Trust	93%
Platinum International Fund	86%
<b>Average <math>R^2</math></b>	<b>92%</b>
<b><math>R^2</math> of Portfolio</b>	<b>98%</b>



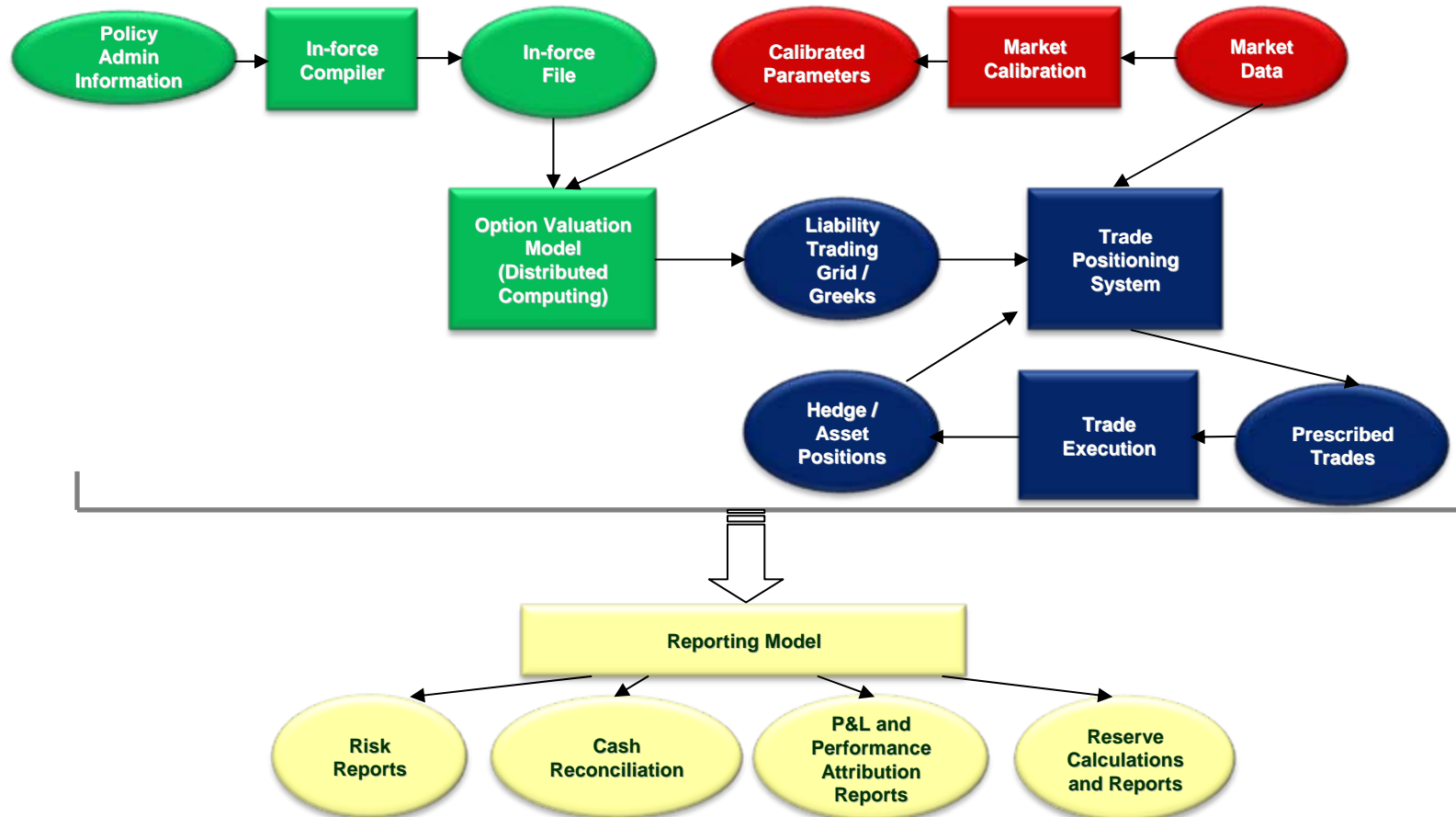
## Asset Correlations

- Difficult to estimate, judgment required
- No liquid market for correlation exposure
- Factors in constructing statistical estimate:
  - Length of observation
  - Time between observations (daily, weekly, etc.)
  - Frequency of updating parameters
- Determine appropriate margin in pricing
- Example:
  - 10 Year GMAB with annual ratchet
  - 6% for-life GLWB with annual ratchet
  - Funds equally weighted in ASX, S&P, FTSE, DJ Euro, and Nikkei indices
  - Priced assuming 1,5,10 year correlation estimates along with 0% and 100% correlations

Index		10 year	5 year	1 year
ASX Correlation	S&P 500	42%	58%	22%
	Nikkei	37%	42%	25%
	DJ Euro	46%	64%	40%
	FTSE	35%	60%	29%
GMAB Hedge Cost		1.16%	1.22%	1.23%
GLWB Cost Hedge Cost		1.06%	1.12%	1.13%



## Operational Risk





## Counterparty / Credit Risk

- Highlighted by “subprime”
- Counterparty risk exists via;
  - OTC derivative instruments
  - Risk transfer parties
- Potential conflicts
  - Market making, front-running, etc.
- Guarantees are generally long term
  - Conservative investors looking for comfort that guarantee obligations will be met
- Overwhelming use of exchange traded instruments where possible
  - Low cost
  - Structured solutions can be expensive
- Development of reinsurance pool for risk transfer
  - Administered centrally by internal / independent party
  - Promote transparency
  - Daily collateralisation of guarantee
  - Covenants in the event of corporate downgrades



## **Intelligent product design and pricing mitigates the impact of unhedgeable risk**

- Understand the risks
- Look at products on an holistic basis – base + guarantee
- Design the product to minimise variability or create incentives for desirable policyholder behaviour
- Transfer risk if uncomfortable
  - Wide range of options available
  - Beware of costs
  - Does not eliminate all risk



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# Thank You

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