

Biennial Convention 2007

Adventures in Risk

23-26 September 2007 • Christchurch, New Zealand



Institute of Actuaries of Australia



A Review of Design and Hedging Strategies for Modern Australian Investment Guarantee Products

Patrick Brennan
John Nicholls
Zac Roberts



Australian super environment

The Australian super system is the envy of the world, but any back-slapping should be tempered by the realisation that the fate of most people's retirement savings is now increasingly linked to world stockmarkets.... Despite the system's grandiloquent title of Superannuation Guarantee, most members don't have any guarantee on their payouts if markets turn nasty – and after they retire most will still rely on market-based investment accounts to pay their funded pensions.

Super reality check overdue

Opinion Editor, Australian Financial Review, 5 January 2007



Australian super environment

Super assets now are slightly larger than the national GDP figure and also exceed the total market value of the Australian stockmarket.... Gary Weaven (chairman of Industry Funds Management) has forecast further spectacular market growth, predicting that total assets will quadruple from \$1 trillion now to \$4 trillion in just 13 years.

A 2020 vision for super amounts to \$4 trillion

Barrie Dunstan, Australian Financial Review, 27 March 2007



Contents

1. Current Investment Guarantees in Australia
2. Simple Accumulation Phase Investment Guarantees
3. Simple Draw-Down Phase Investment Guarantees
4. Investment Risk Management Strategies
5. Benefit to an Investor
6. Conclusions



Current guarantees are limited

Investment Guarantee Complexity

**Conservative
capital guaranteed
funds**

**What is
missing?**

**Complicated “limited entry”
capital guaranteed
investments**

**Products that give investors a
choice of funds and provide
simple investment guarantees
over those funds**

- Suitable for the average individual to invest the majority of their retirement savings
- In US, Japan and recently introduced in Europe

- Generally open for a limited time
- Limited or no investment choice
- Single fixed maturity date
- Initial capital guaranteed at the maturity date only



Increasing demand for guarantees

Legislative Changes

- Increase in super assets
- Pre and post retirees

- Increasing proportion of individuals determining their own superannuation investment decisions
- Average account size for industry, public sector and retail fund members has increased by 43% over the five years to 30 June 2006
- Likely to keep increasing
- Removal of tax on super earnings and withdrawals from age 60

Demographic Changes

- Ageing baby boomers
- Increasing life expectancy
- Increasing health costs

- Population aged 65 or above increased from 11.4% to 13.4% in the 15 years from 1991 to 2006
- Projected to reach 18.7% by 2021, 23.4% by 2036
- 65 year old life expectancy increased by approx. 2 years in the 10 years from 1995 to 2005

Attractiveness of modern investment guarantee products

- Current retirees have become accustomed to higher “market-linked” returns
- Adding an investment guarantee can result in higher average returns and superior returns under poor scenarios than moving to a conservative asset mix



Will the supply be created?

Factors that have limited supply

- Investment Account experience has left low appetite for the associated investment risk
- Ownership structure of the Australian wealth management industry
- Australian insurance industry has developed in a manner that sees individuals buy separate insurance and savings products



Factors that may drive an increase in supply

- Increasing investor demand
- Improvements in financial hedging and modelling techniques
- Ability of multi-nationals to adapt successful product designs across countries
- Increasing sophistication of the superannuation industry



Contents

1. Current Investment Guarantees in Australia
2. Simple Accumulation Phase Investment Guarantees
3. Simple Draw-Down Phase Investment Guarantees
4. Investment Risk Management Strategies
5. Benefit to an Investor
6. Conclusions



Guarantee design terminology

Guarantee Term	At the end of the guarantee term, the investor is entitled to the greater of the actual account and the notional account
Actual Account	Managed in much the same way as a unit-linked account
Notional Account	Opening account plus future contributions less future withdrawals, accumulated at a predetermined "Guaranteed Interest Rate"
Guarantee Reset Frequency	The notional account may be reset at fixed intervals to be the greater of the actual account and the notional account immediately before the reset date



Sample guarantee designs

6 guarantee designs that could be sold to an individual before retirement

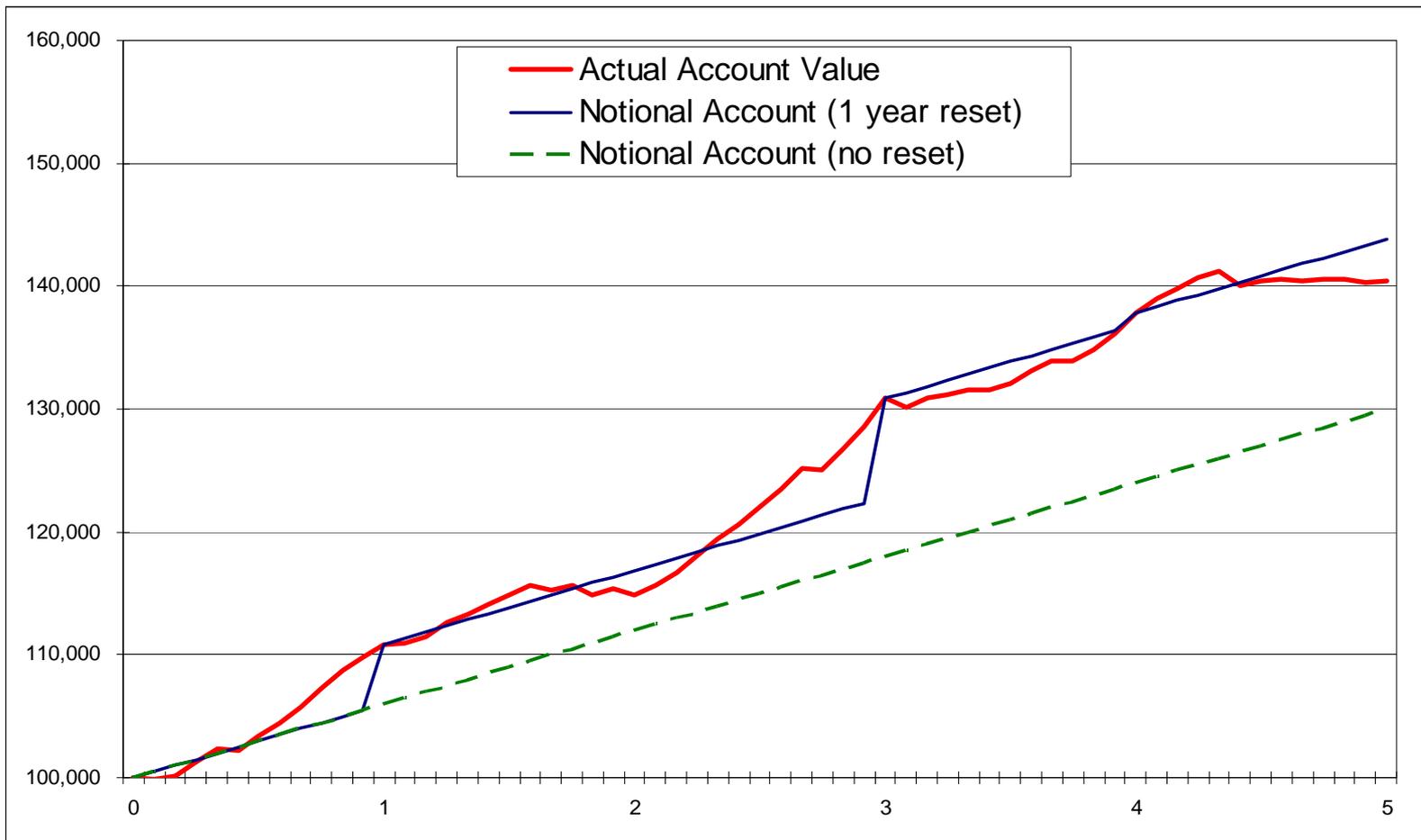
- Opening account balance of \$100,000
- Annual contributions of \$6,000 (\$500 at the start of each month)

Guarantee Term	5 yrs					
Interest Rate	-3%	-3%	0%	0%	+3%	+3%
Reset Frequency	None	1 yr	None	1 yr	None	1 yr



Illustration of 0% guarantee

Evolution of actual & notional accounts in a single scenario





Theoretical guarantee cost: process

Project account balance under a set of stochastic MC economic scenarios

For each scenario, calculate the PV of the guarantee amount paid

Calculate the average of these PVs over the set of stochastic scenarios

Calculate an annual guarantee charge (express as % of account balance)

Over the entire set of stochastic scenarios the average of the PV of the guarantee charges deducted from the account balance is equal to the average of the PV of the guarantee amount paid (from the previous step)

- Limitations
 - No allowance for a profit margin for the guarantee provider
 - No allowance for actual costs of hedging the investment risk
- Guarantee charge is likely to be more than the theoretical cost



Theoretical guarantee cost: results

Guarantee Term of 5 years

Interest Rate	Reset Frequency	Theoretical Cost
-3%	No reset	0.16%
-3%	1 year	0.85%
0%	No reset	0.58%
0%	1 year	1.74%
+3%	No reset	1.92%
+3%	1 year	3.95%

Show of hands, which is the best guarantee design (most likely to sell)



Contents

1. Current Investment Guarantees in Australia
2. Simple Accumulation Phase Investment Guarantees
3. Simple Draw-Down Phase Investment Guarantees
4. Investment Risk Management Strategies
5. Benefit to an Investor
6. Conclusions



Sample guarantee designs

6 guarantee designs that could be sold to an individual at retirement

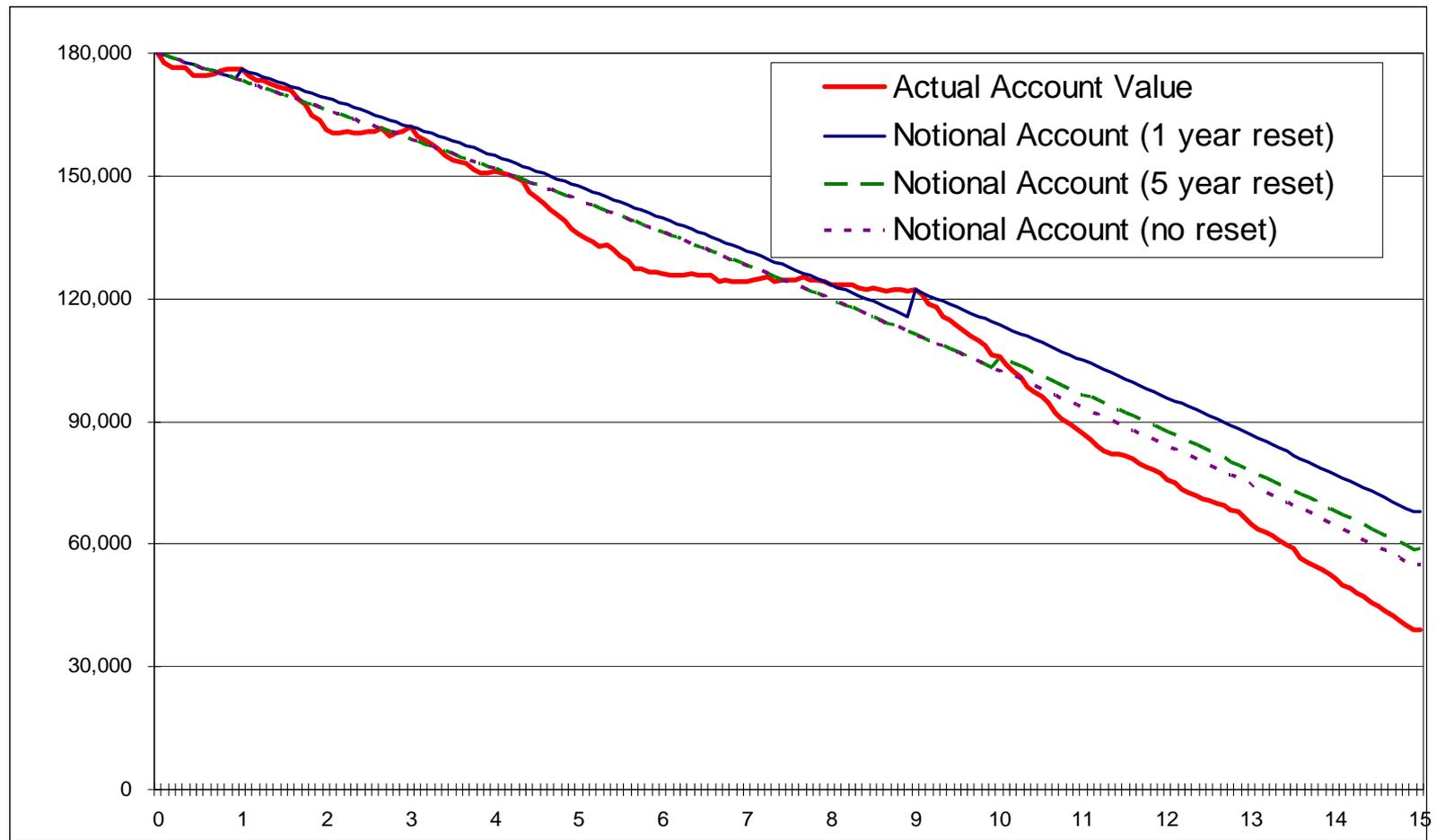
- Opening account balance of \$180,000
- Annual draw-downs of \$12,000 for 15 years (\$1,000 per month)
- Investor continues to receive these guaranteed draw-downs even if the actual account balance is zero.
- At the end of the guarantee term, the investor receives the maximum of the actual account and the notional account.

Guarantee Term	15 yrs					
Interest Rate	0%	0%	0%	+3%	+3%	+3%
Reset Frequency	None	5 yrs	1 yr	None	5 yrs	1 yr



Illustration of 3% guarantee

Evolution of actual & notional accounts in a single scenario





Theoretical guarantee cost: results

Guarantee Term of 15 years

Interest Rate	Reset Frequency	Theoretical Cost
0%	No reset	0.10%
0%	5 years	0.31%
0%	1 year	0.62%
+3%	No reset	0.57%
+3%	5 years	1.07%
+3%	1 year	1.72%

Show of hands, which is the best guarantee design (most likely to sell)



Contents

1. Current Investment Guarantees in Australia
2. Simple Accumulation Phase Investment Guarantees
3. Simple Draw-Down Phase Investment Guarantees
4. Investment Risk Management Strategies
5. Benefit to an Investor
6. Conclusions



Risk management strategies

Stay Naked	Not recommended for companies that wish to participate in this market in the long term
Purchase Static Protection	Investment banks could tailor protection to the particular needs of an investment guarantee provider
Internal Dynamic Hedging	Regular (daily) monitoring of the hedge position against pre-defined limits
Outsource the Hedging	Outsource the hedging process to a specialist
Outsource the Guarantee	Use an investment bank to provide the investment guarantee
Reinsure	May be a viable way of transferring any unwanted risk
Hold Capital	Cover residual risk or risk that cannot be hedged

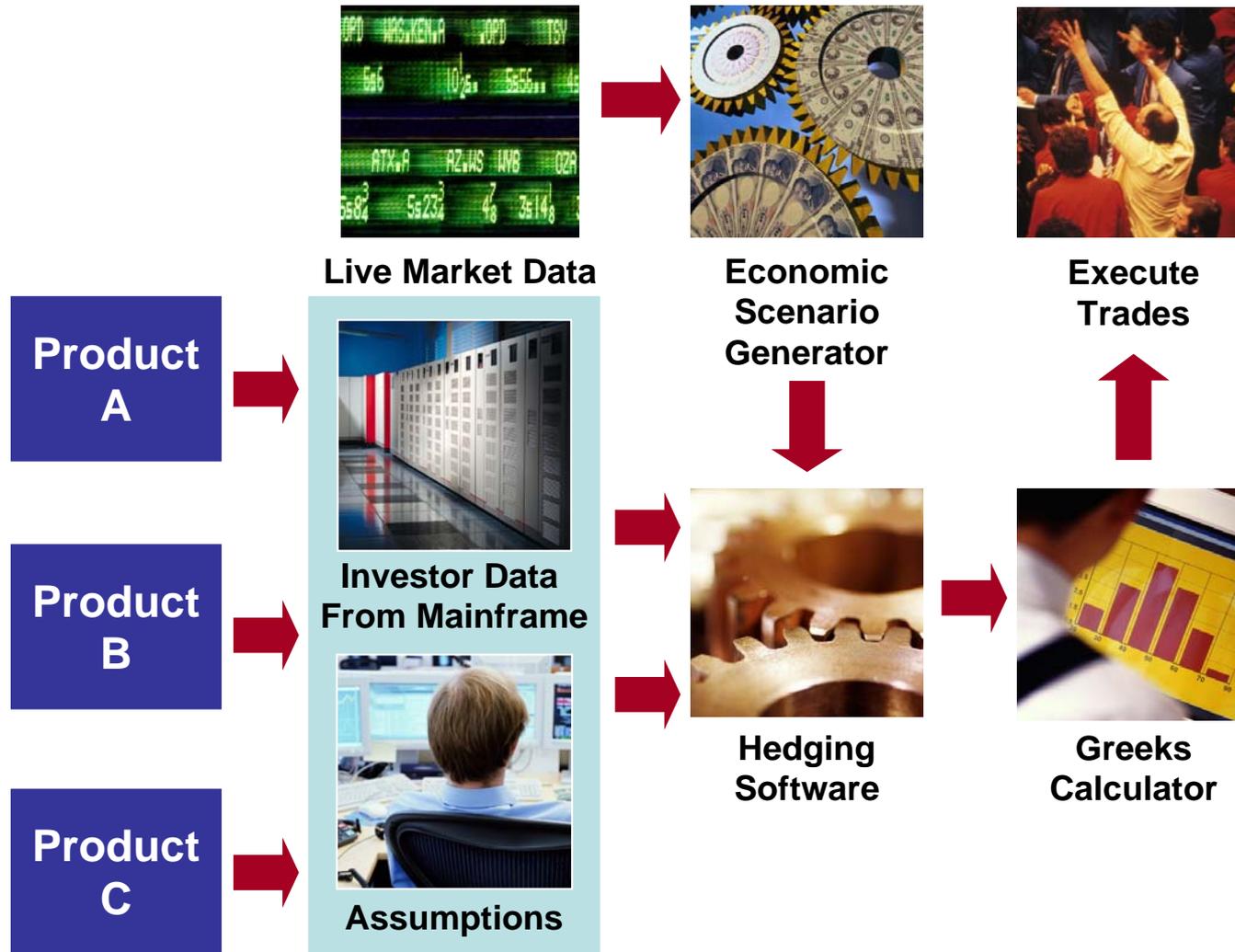


Dynamic hedging process





Dynamic hedging process





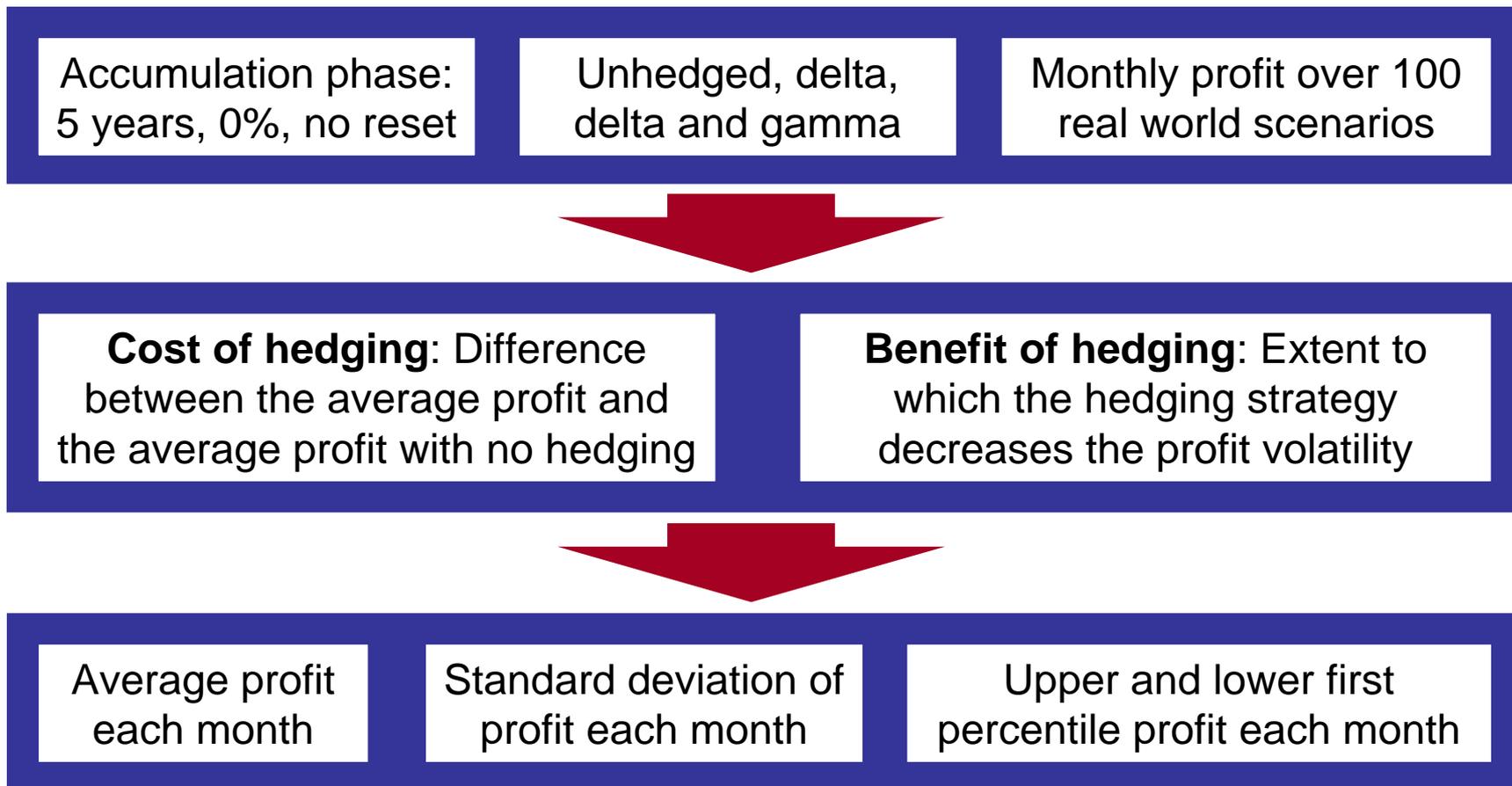
Hedging decisions required

- What should be hedged?
- How should it be hedged?
- At what level should the risk limits be set?

Hedge Strategy	What is being hedged?	How can it be hedged?
Delta	Sensitivity to changes in the price of equities	Equity futures
Gamma	Sensitivity to changes in delta	Equity options
Rho	Sensitivity to changes in interest rates	Interest rate swaps
Rho Convexity	Sensitivity to changes in rho convexity	Interest rate caps and floors

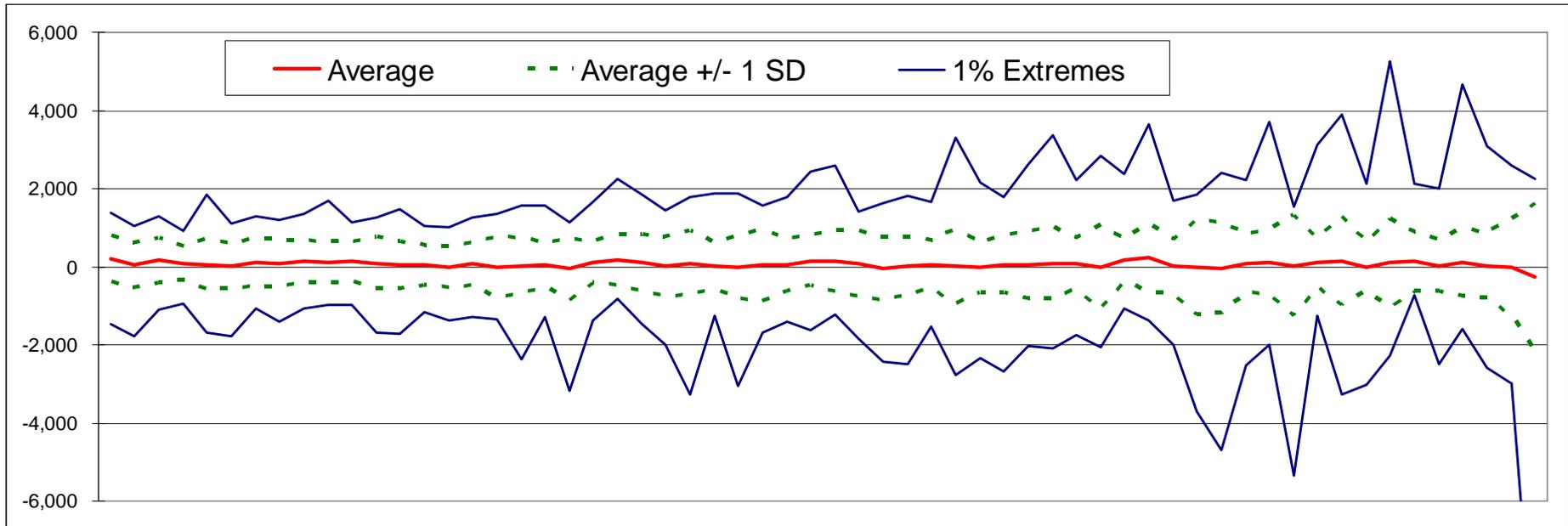


Comparison of hedging strategies





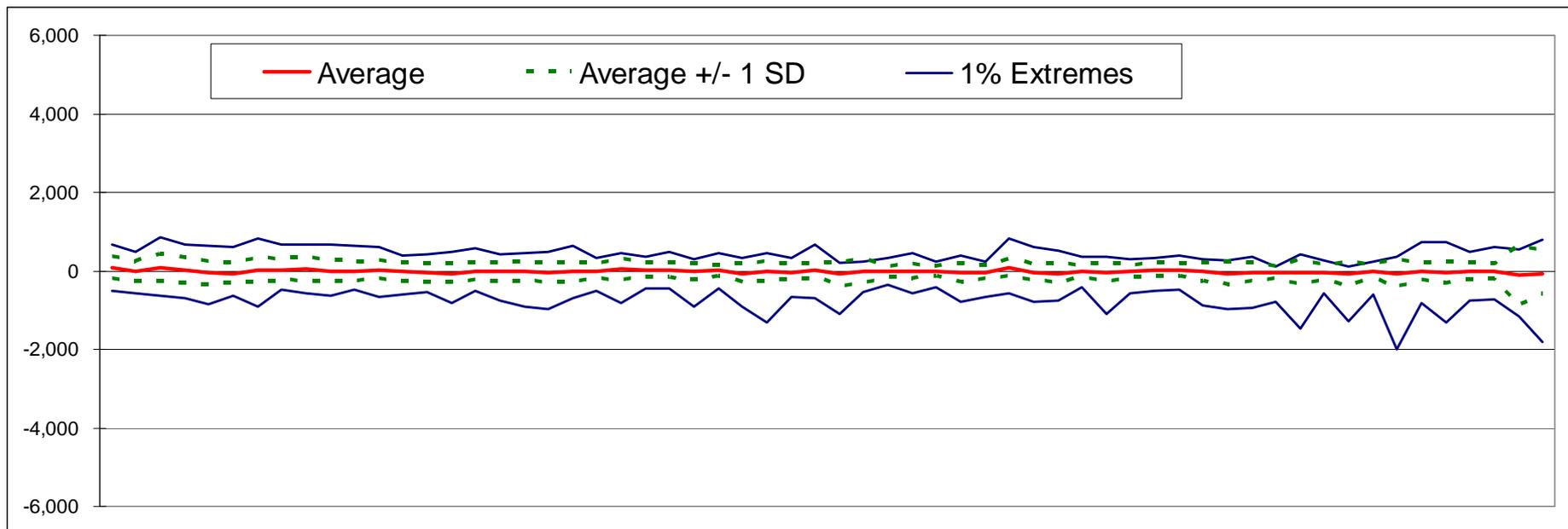
No hedging



■ Profit is extremely volatile



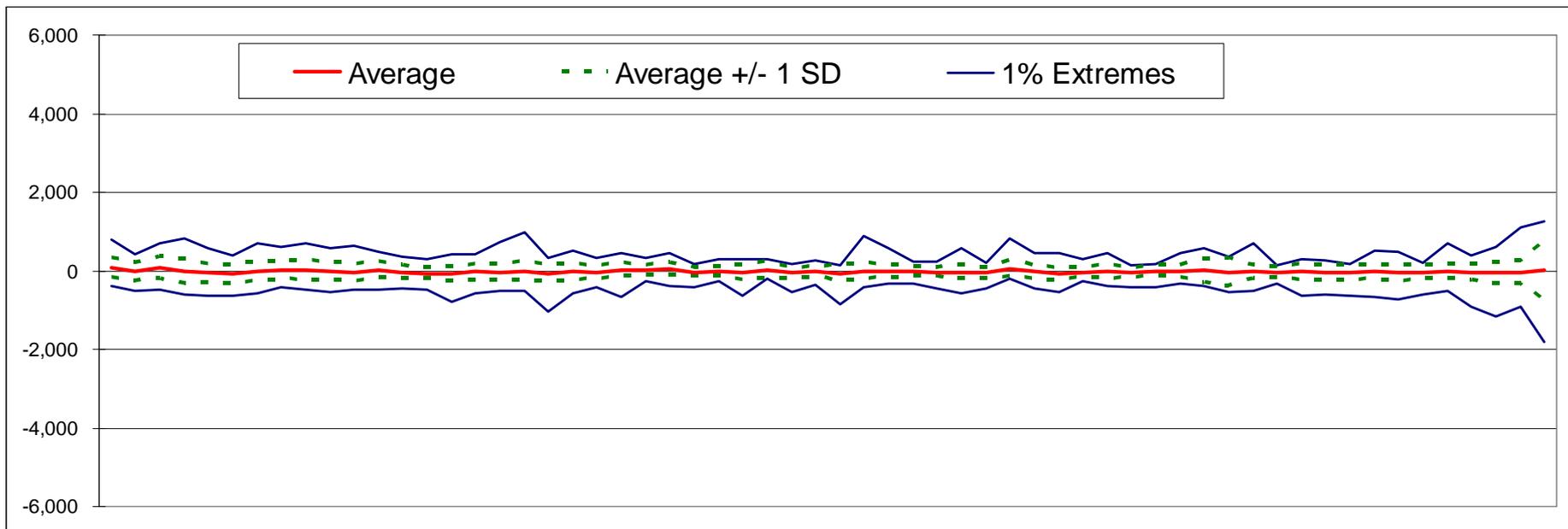
Delta hedging



- Significant reduction in the volatility of the monthly profit
- Over all months the average difference between the upper and lower first percentile profit reduces by 70%



Delta and gamma hedging



- Compared to delta hedging, over all months the average difference between the upper and lower first percentile profit reduces by 18%
- This is driven by a 30% increase in the lower first percentile, with little change in the upper first percentile



Comparison of hedging strategies

Monthly Profit	No Hedging	Delta	Delta & Gamma
Average	56	-22	-24
Standard Deviation	622	220	176
Upper 1% Level	2,278	610	596
Upper 5% Level	1,025	299	255
Lower 5% Level	-906	-401	-314
Lower 1% Level	-2,369	-865	-632

- Annual guarantee charge of 0.7% is insufficient to cover the cost of the investment guarantee and the associated hedging strategies
- We did not allow for the costs associated with holding capital to cover residual risks, which would be greatest under no hedging



Contents

1. Current Investment Guarantees in Australia
2. Simple Accumulation Phase Investment Guarantees
3. Simple Draw-Down Phase Investment Guarantees
4. Investment Risk Management Strategies
5. Benefit to an Investor
6. Conclusions



Guarantee or go conservative?

- We projected the maturity benefit received by an investor over 2,000 real world stochastic scenarios
- An alternative to investing aggressively and paying for an investment guarantee is to invest more conservatively, with no guarantee
- To explore this alternative we compared the distribution of the maturity benefit for four investment strategies
- Assumed a guarantee charge of 0.7% pa of the account balance

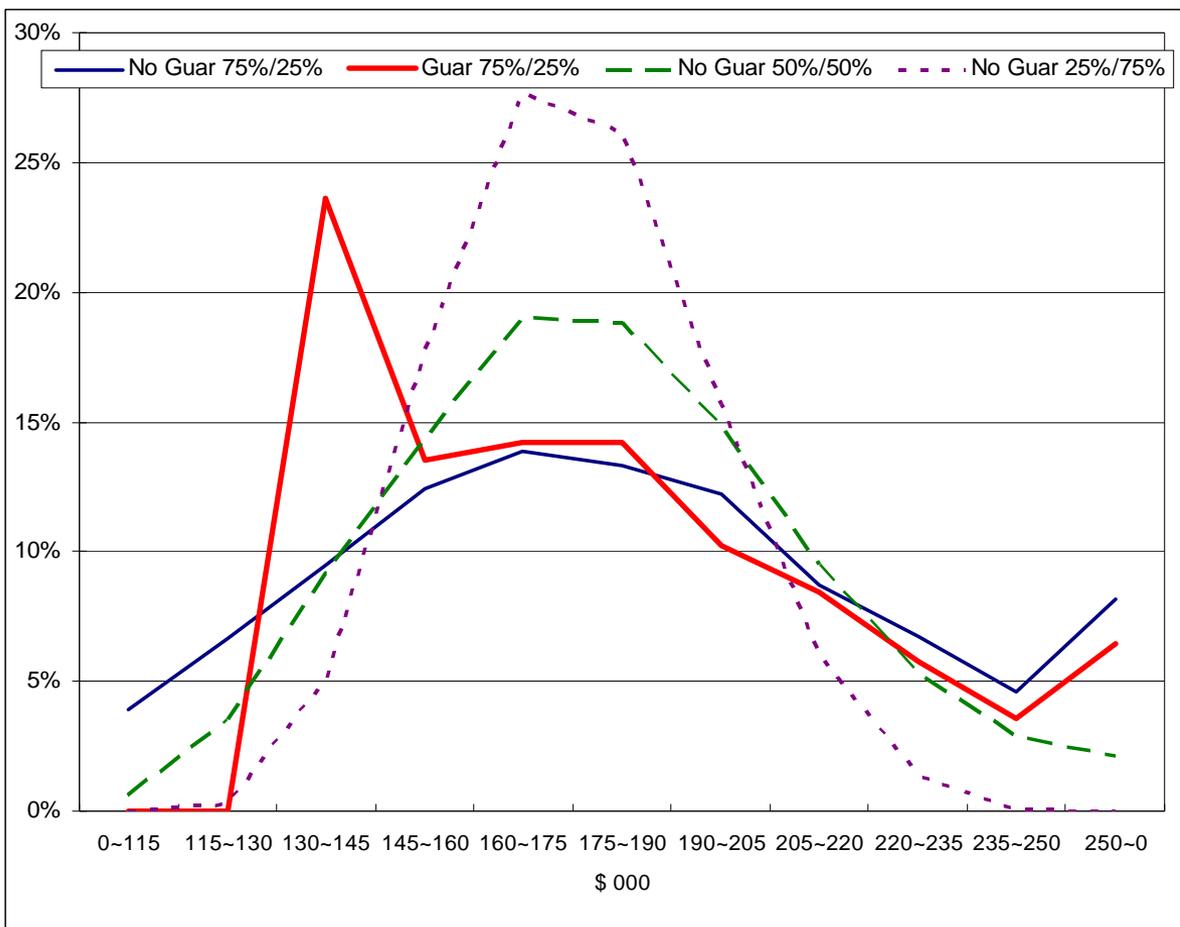
Equities	Bonds	Guarantee
75%	25%	No
75%	25%	Yes
50%	50%	No
25%	75%	No

Term	Rate	Reset
Accumulation phase (cost 0.58%)		
5 years	0%	No
Draw-down phase (cost 0.57%)		
15 years	3%	No



Accumulation: stochastic analysis

Probability distribution function of the maturity benefit

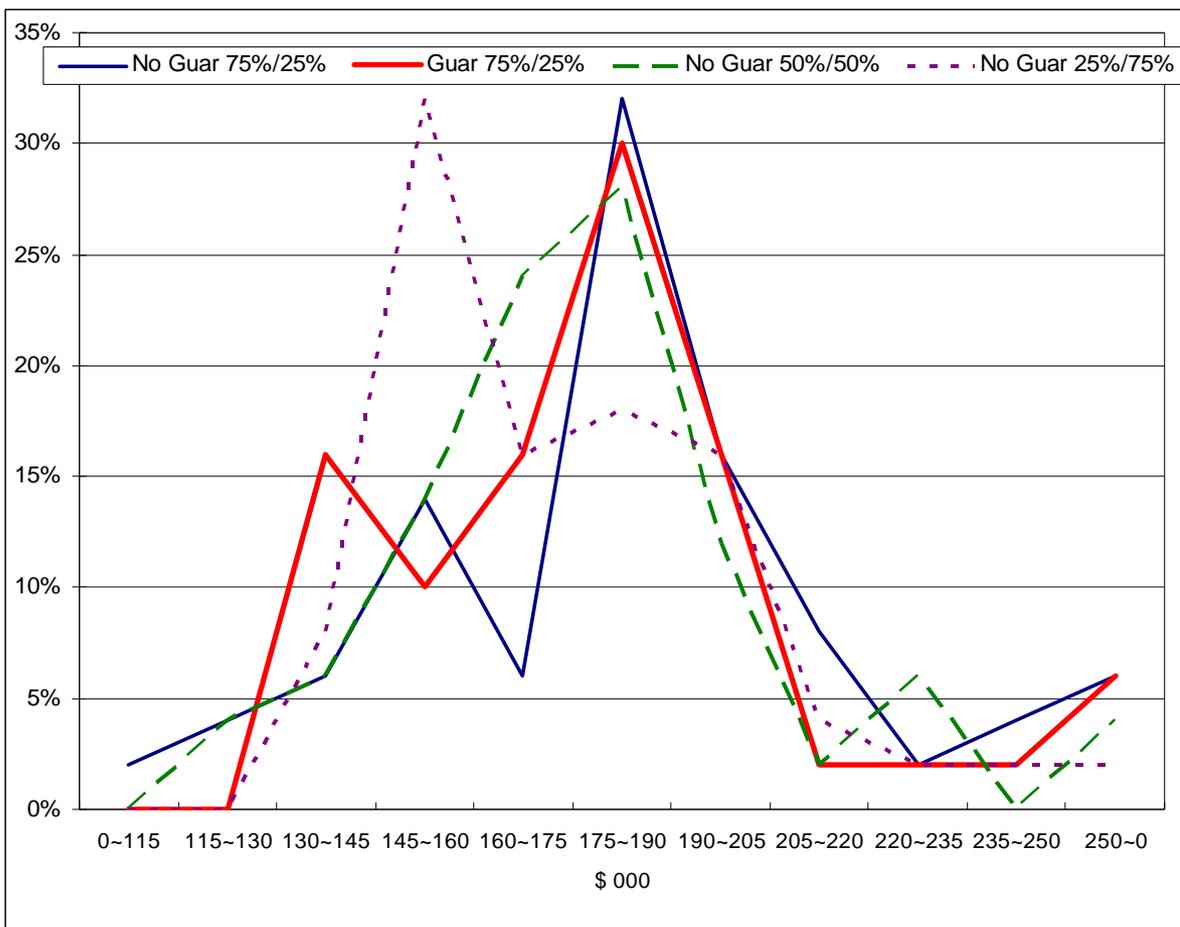


Average return	% of total negative returns
75% equities, no guarantee	
8.00%	10.6%
75% equities, with guarantee	
7.50%	0%
50% equities, no guarantee	
7.46%	4.2%
25% equities, no guarantee	
6.91%	0.3%



Accumulation: back-test

Back-testing: 50 sets of actual 5 year investment returns

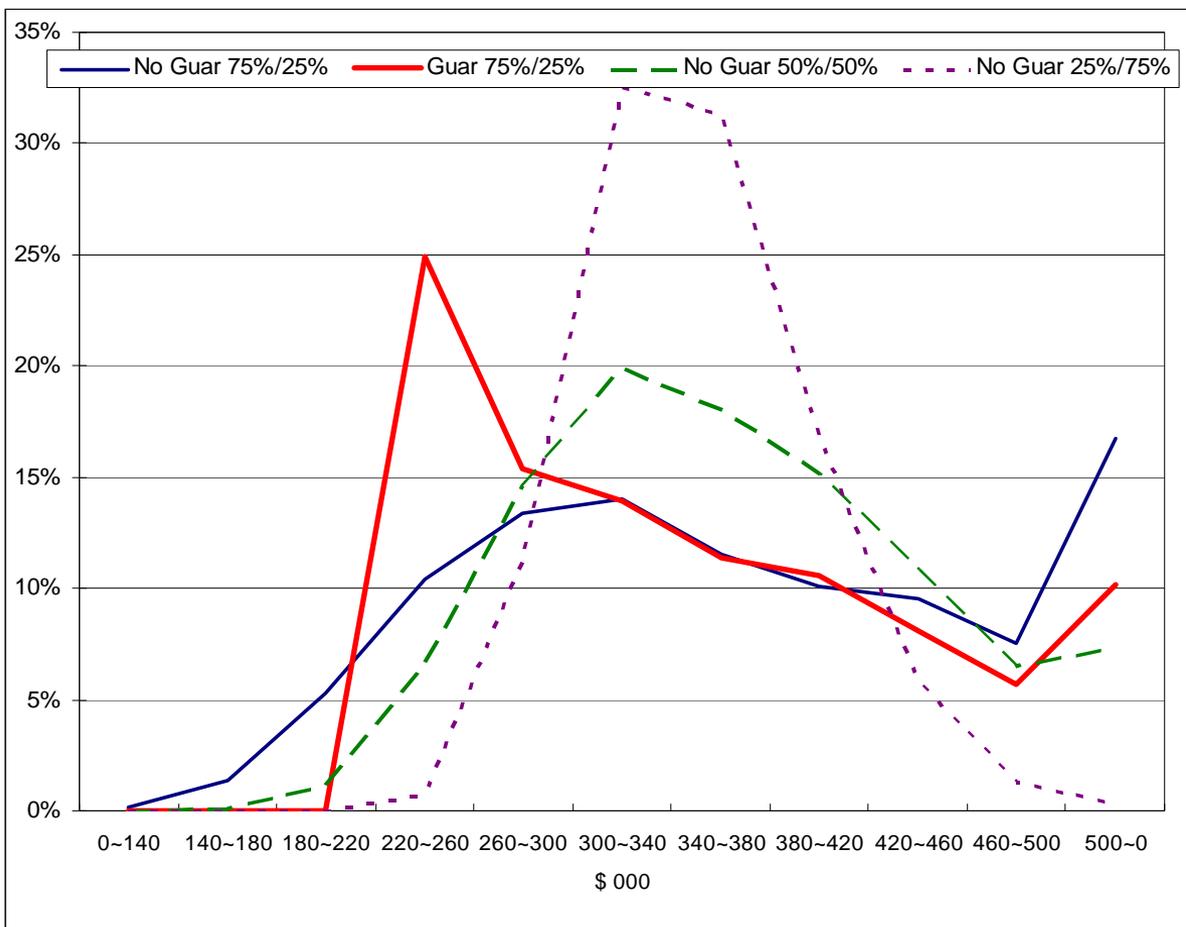


Average return	% of total negative returns
75% equities, no guarantee	
8.25%	6%
75% equities, with guarantee	
7.61%	0%
50% equities, no guarantee	
7.48%	4%
25% equities, no guarantee	
6.81%	0%



Draw-down : stochastic analysis

Probability distribution function of the total benefit



Average total benefit	% of total negative returns
75% equities, no guarantee	
\$ 382,193	10.3%
75% equities, with guarantee	
\$ 353,816	0%
50% equities, no guarantee	
\$ 367,709	2.5%
25% equities, no guarantee	
\$ 350,591	0.1%



Contents

1. Current Investment Guarantees in Australia
2. Simple Accumulation Phase Investment Guarantees
3. Simple Draw-Down Phase Investment Guarantees
4. Investment Risk Management Strategies
5. Benefit to an Investor
6. Conclusions



Increasing demand for guarantees

“When the baby boomers start to understand that they will live a long time, there will be a clamour for products that can sustain a high living standard, but have some kind of guarantee as well. My observation is that most people don’t know a lot about investments, so they want security more than anything else”, Monaghan (Intech) says. The post-retirement products currently on the market will not be acceptable to most baby boomers, he believes. Baby boomers want the high returns which market-linked allocated pensions currently offer, but will not want to bear their downside risk, or the risk they may outlive them.

Trading Up: investment banks court the wholesale funds management business
Investment & Technology, July 2006



Conclusions

Growing demand for investment guarantees

- Australian market is relatively underdeveloped
- Legislative changes
- Demographic changes

Guarantees can be attractive

- Possible to design guarantee with $< 0.7\%$ charge
- Regular resets can make product more attractive
- Adding a guarantee to an aggressive investment strategy can result in superior risk and return expectations than switching to a more conservative investment strategy

Supply should follow demand

- Improvements in financial hedging and modelling
- Multi-nationals can import successful products
- Increasing sophistication of the super industry



Manufacturer keys to success

Attractive Product	Manageable Investment Risk
Identify the price the market is willing to pay for an investment guarantee	Scale to implement appropriate hedging systems and processes
Explore methods of limiting the cost of the guarantee	Ability to calculate net greek position on a regular basis
Flexibility helps customers feel that they are receiving value	Calculations adequately reflect the characteristics of the assets
CPI indexation, or a guarantee or pooling of the longevity risk, e.g. guaranteed draw-down for life	Guarantee charge covers all hedging, administration and capital costs

Distribution

Profitable product that should sell well



Contact Details

Patrick Brennan

patrick.brennan@towersperrin.com

02 8198 9083

John Nicholls

john.nicholls@towersperrin.com

03 9674 7162

Zac Roberts

zac.roberts@db.com

02 8258 2838



A quick survey

What is the likelihood of the superannuation industry developing guaranteed investment options over growth assets in the next 5 years?

Unlikely

Neutral

Likely

How many years before a member's expected retirement do you think a member should start to consider this type of guarantee?

< 5

5 - 10

> 10

What annual fee (percentage of account balance) do you think a typical member would be prepared to pay for this type of guarantee?

< 0.4%

0.4% - 0.6%

0.6% - 0.8%

0.8% - 1.0%

> 1.0%

What percentage of your post-retirement members or your members approaching retirement do you think would find this benefit attractive?

0% - 20%

21% - 40%

41% - 60%

61% - 80%

81% - 100%