The Actuarial Profession
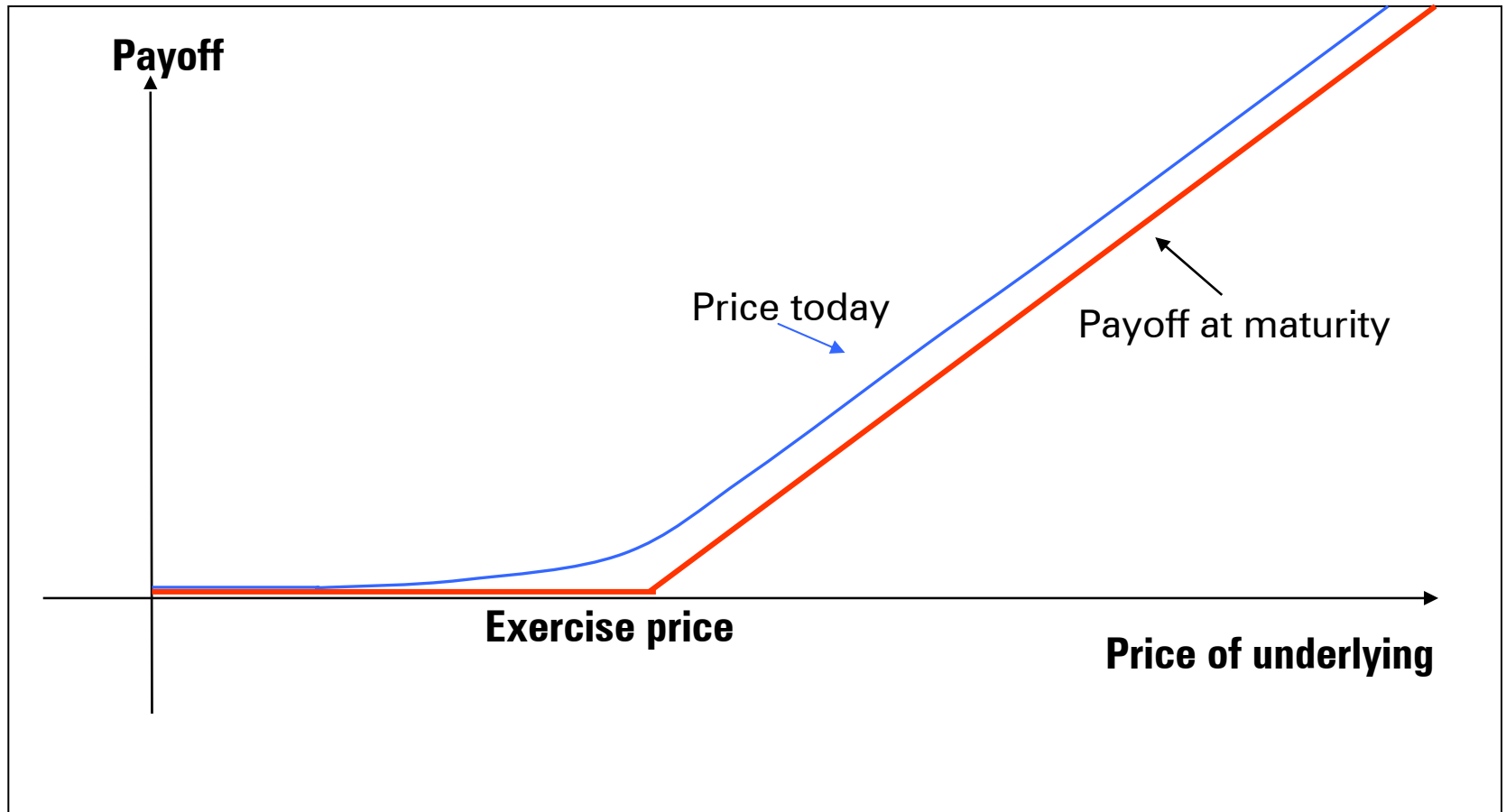making financial sense of the future

From Traditional to
Market-Consistent Embedded Values

Kamran Foroughi

Faculty and Institute of Actuaries
The 2nd Younger Members Convention
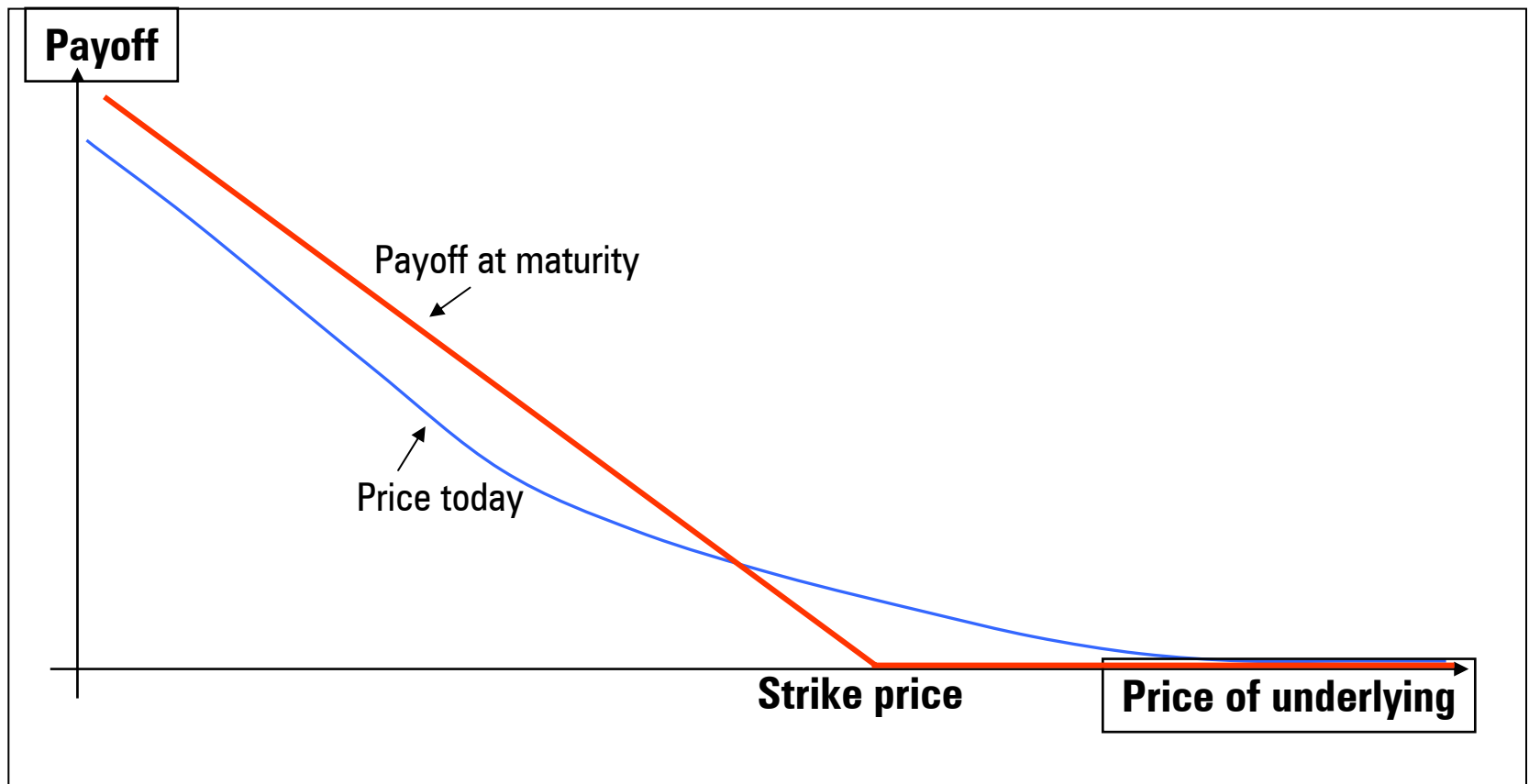1-2 December 2003
The Glasgow Moat House

European call option

Payoff

Price today

Payoff at maturity

Exercise price

Price of underlying

European put option

Payoff at maturity

Price today
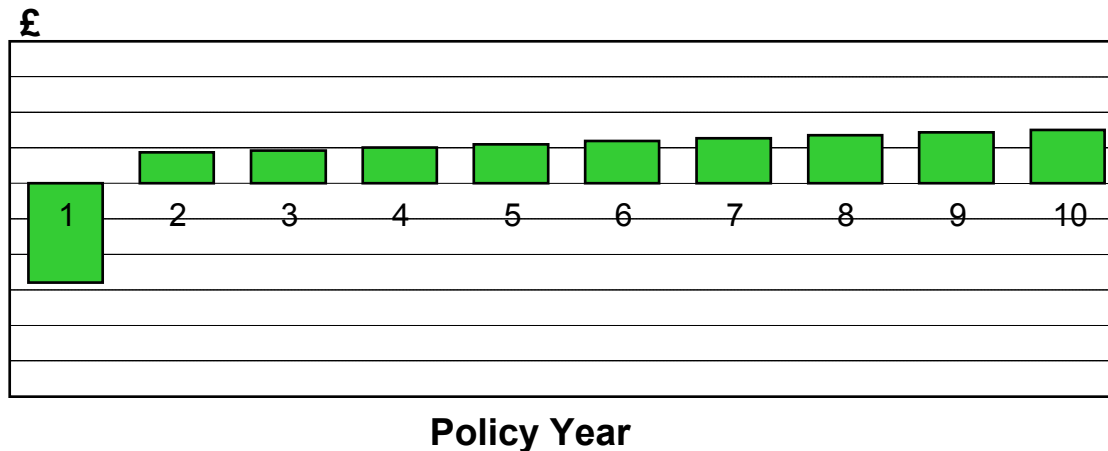
Payoff

Strike price

Price of underlying
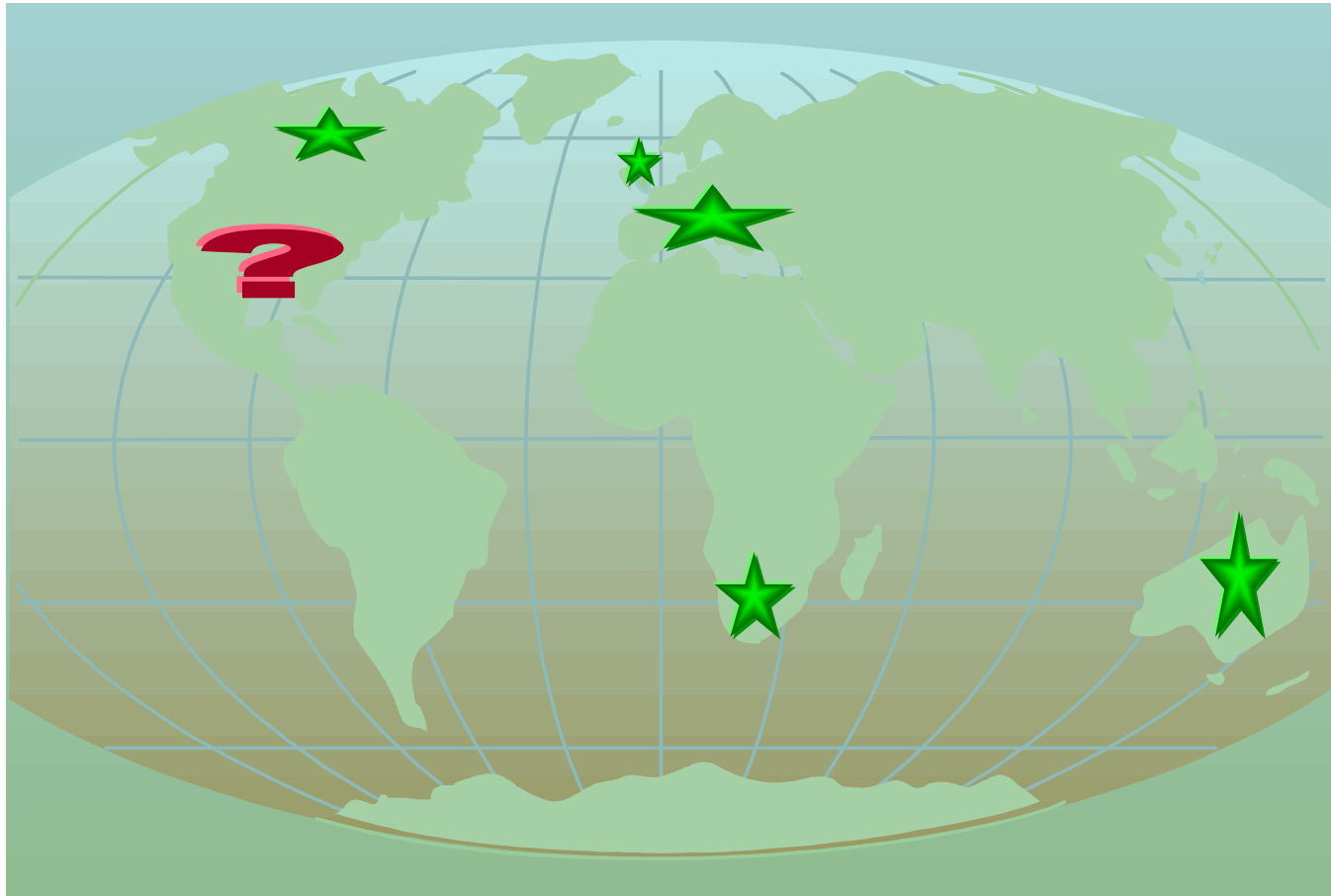
What is Traditional Embedded Value?

- Shareholder net worth
- PLUS Value of in force

Policy Year

- LESS cost of capital adjustment

Use of published Embedded Values globally

Embedded Value - a success story!

Statutory　　　　**GAAP**　　　　**Embedded Value**
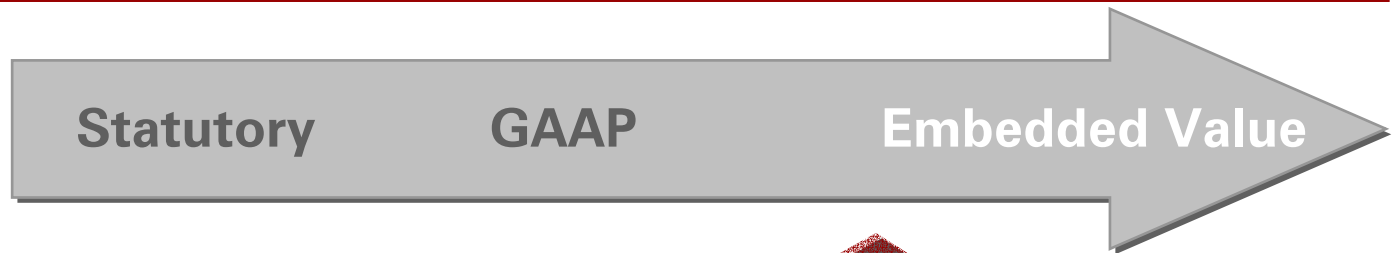
- Widely used, well understood, robust

- Clear view of new business value and development of in-force value

- Attributes business performance to correct time period

- Links pricing, performance and return on capital

So why the criticism?

As companies start to reconsider some aspects of their existing embedded value methodology, three key questions remain

1. How should we set the Risk Discount Rate?
2. How should we allow for financial options and guarantees?
3. How should we allow for the "cost of capital"?

Market-Consistent Embedded Values ("MCEV") can address these problems in a robust manner

- **An objective solution to the Risk Discount Rate dilemma**

- **Options and guarantees are valued consistently with the pricing of options in financial markets**

- **Allowance made for cost of corporate structure of company**

What do we mean by Market-Consistent Embedded Values?

An "Economic Balance Sheet" (excluding some items):

Assets		Liabilities	
MV tangible assets	XXX	MCV liabilities	XXX
		Cost of capital	XXX
		Economic value	XXX
	___		___
Total assets	XXX		XXX

A "Market-Consistent Embedded Value" Balance Sheet

Assets		Liabilities	
MV tangible assets	XXX	Statutory liabilities	XXX
Market-Consistent VIF	XXX	Cost of capital	XXX
		"MCEV"	XXX
	___		___
Total assets	XXX		XXX

Traditional vs Market-Consistent Embedded Value

	Traditional Embedded Value	Market-Consistent Embedded Value
Net worth	Market Value of assets	Market Value of assets
Value of in force	Deterministic	Market Value of replicating portfolio
Cost of capital	Generally applied to Solvency Margin only	Applied to all capital, different rationale
Embedded Value	Sum of above	Sum of above

Case study – life company XYZ

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                    ┌─────────────────┐
                    │                 │
                    │       XYZ       │
                    │                 │
                    └────────┬────────┘
              ┌──────────────┴──────────────┐
    ┌─────────────────┐           ┌─────────────────┐
    │    NP FUND      │           │  WP 90:10 FUND  │
    ├─────────────────┤           ├─────────────────┤
    │ • annuities     │           │ • CWP 90:10     │
    │ • term assurance│           │ • estate        │
    │ • UL pensions   │           │                 │
    │   (with GAR)    │           │                 │
    └─────────────────┘           └─────────────────┘
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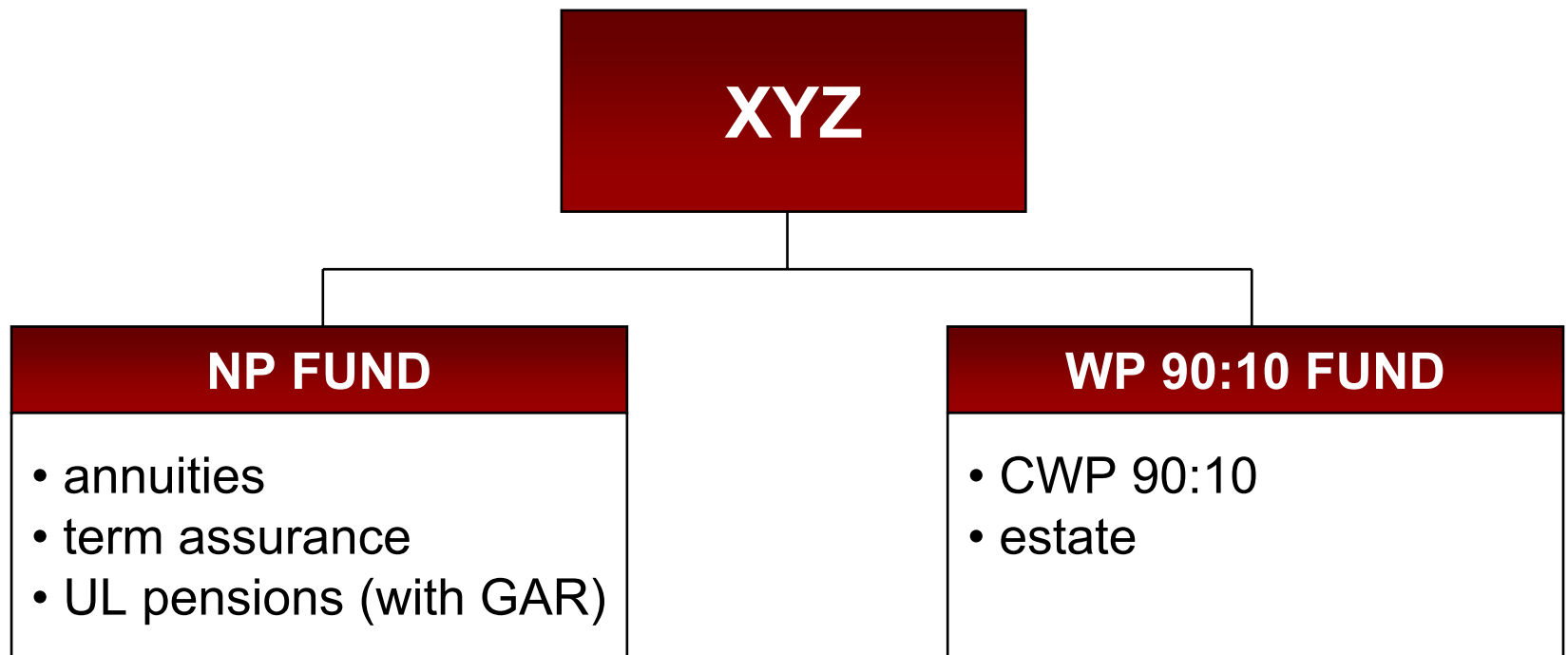
In-force business of XYZ at 31 December 2002

Product	Annualised Premium (£m)	Reserve (£m)	VIF (not MC) (£m)
Annuities	-	1,000	50
Term assurance	50	200	75
UL pensions (with GAR)	100	2,000	175
CWP 90:10	50	4,800	100
Total	**200**	**8,000**	**400**

In addition, the adjusted shareholder net worth is £250m

All values in this presentation are illustrative!

Market-Consistent option pricing techniques

| Closed-form solutions | **VS** | Stochastic simulation |

?

Calibrating the stochastic option pricing model

To be Market-Consistent, the option pricing model must:

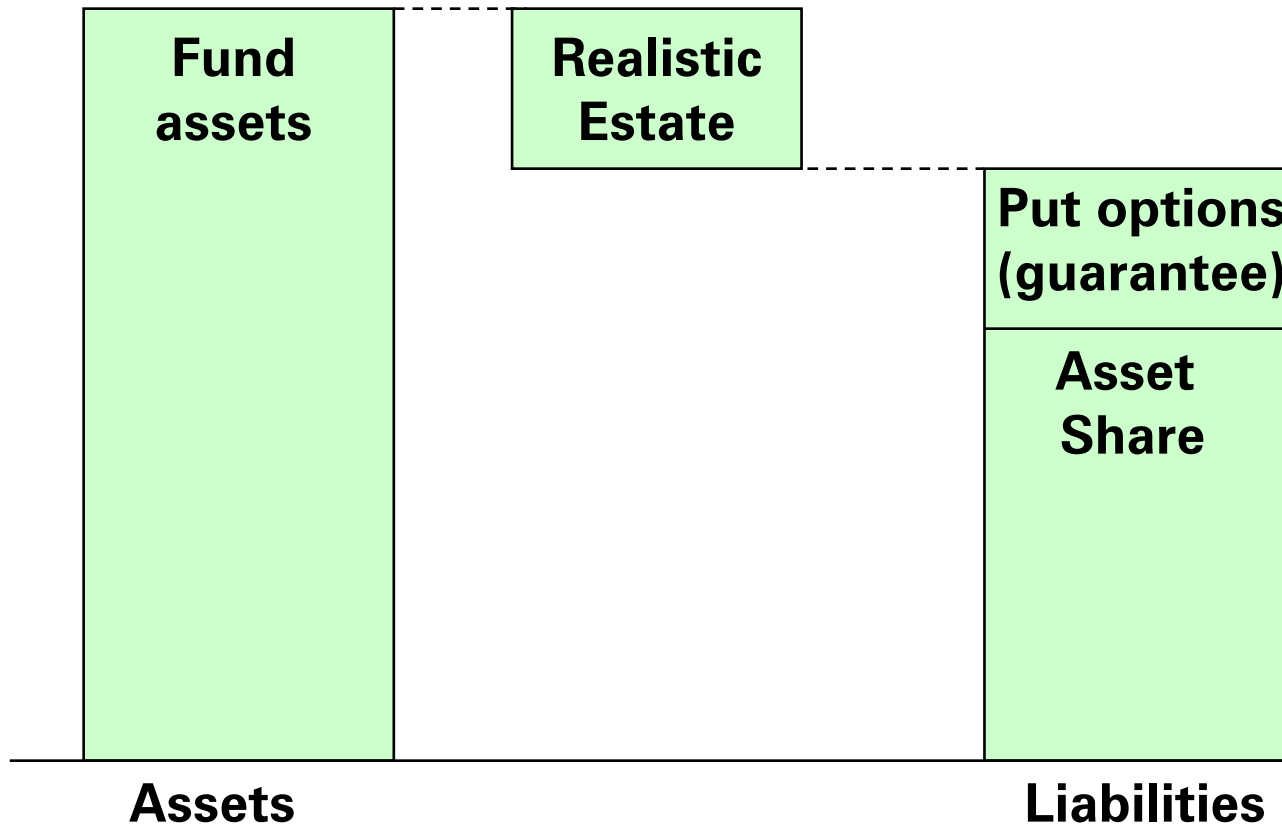■ Be arbitrage free

■ Reproduce the market prices of options

Valuing cost of GAR in non-profit fund

- Decompose UL product with GAR into GAR and stand-alone UL

- GAR resembles series of interest rate swaptions
  - option to purchase bond at fixed price (defined at option purchase) at specified time in future rather than purchasing bond at then market price (which depends on yield curve at that time)

- Co. XYZ – cost of GAR to shareholders is £35m
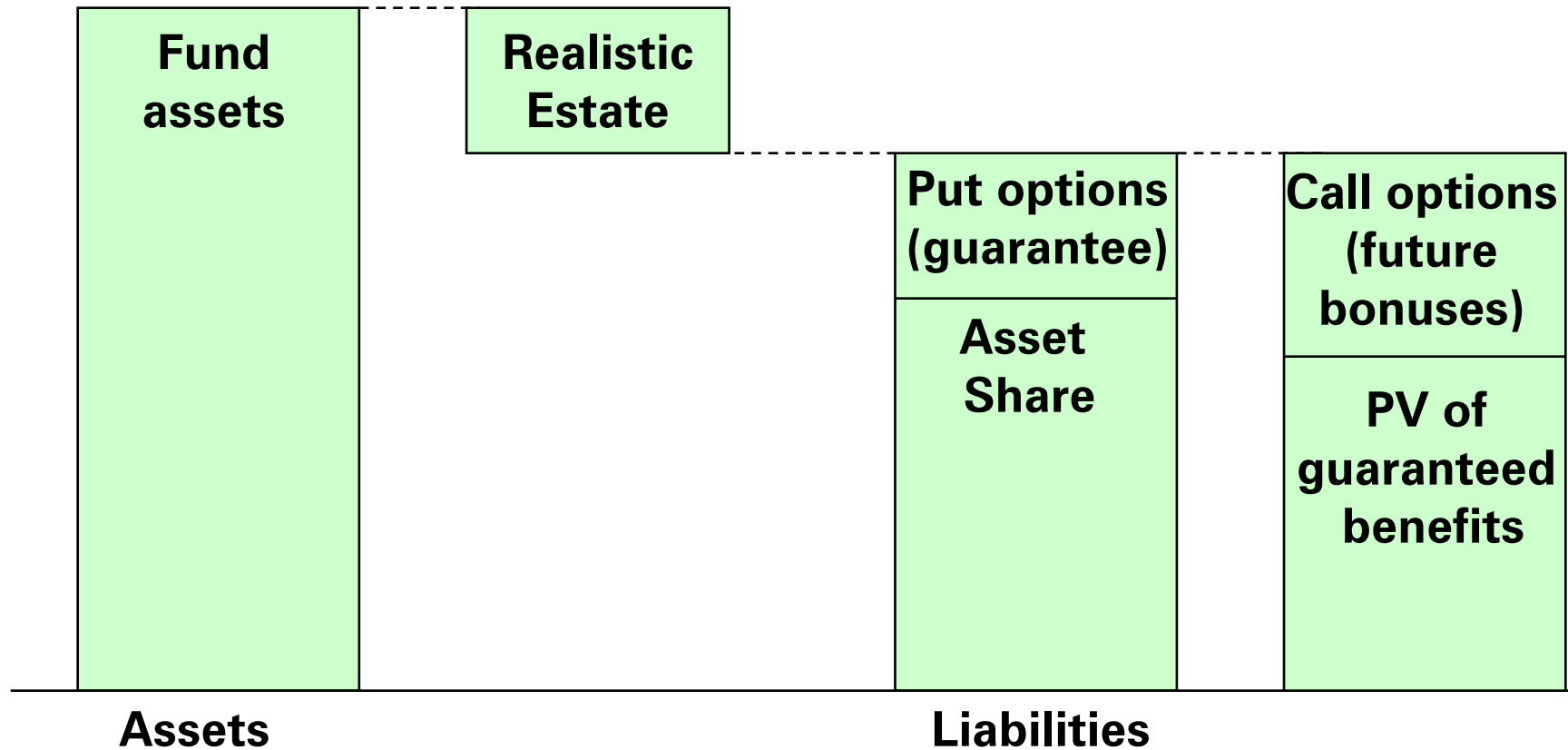
15

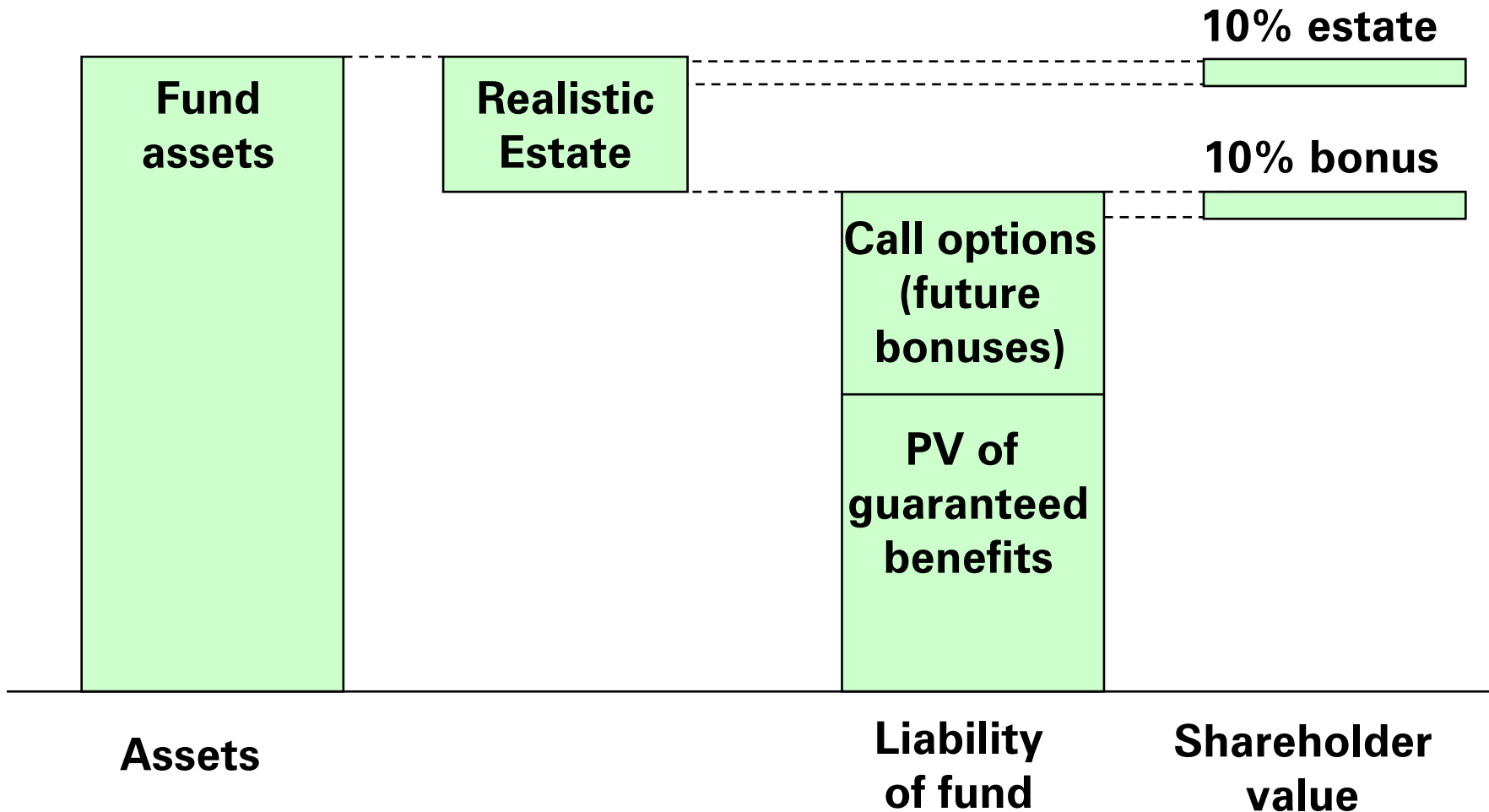# 90:10 With Profits business - fund view

Fund assets

Realistic Estate

Put options (guarantee)

Asset Share

Assets

Liabilities

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90:10 With Profits business - fund view
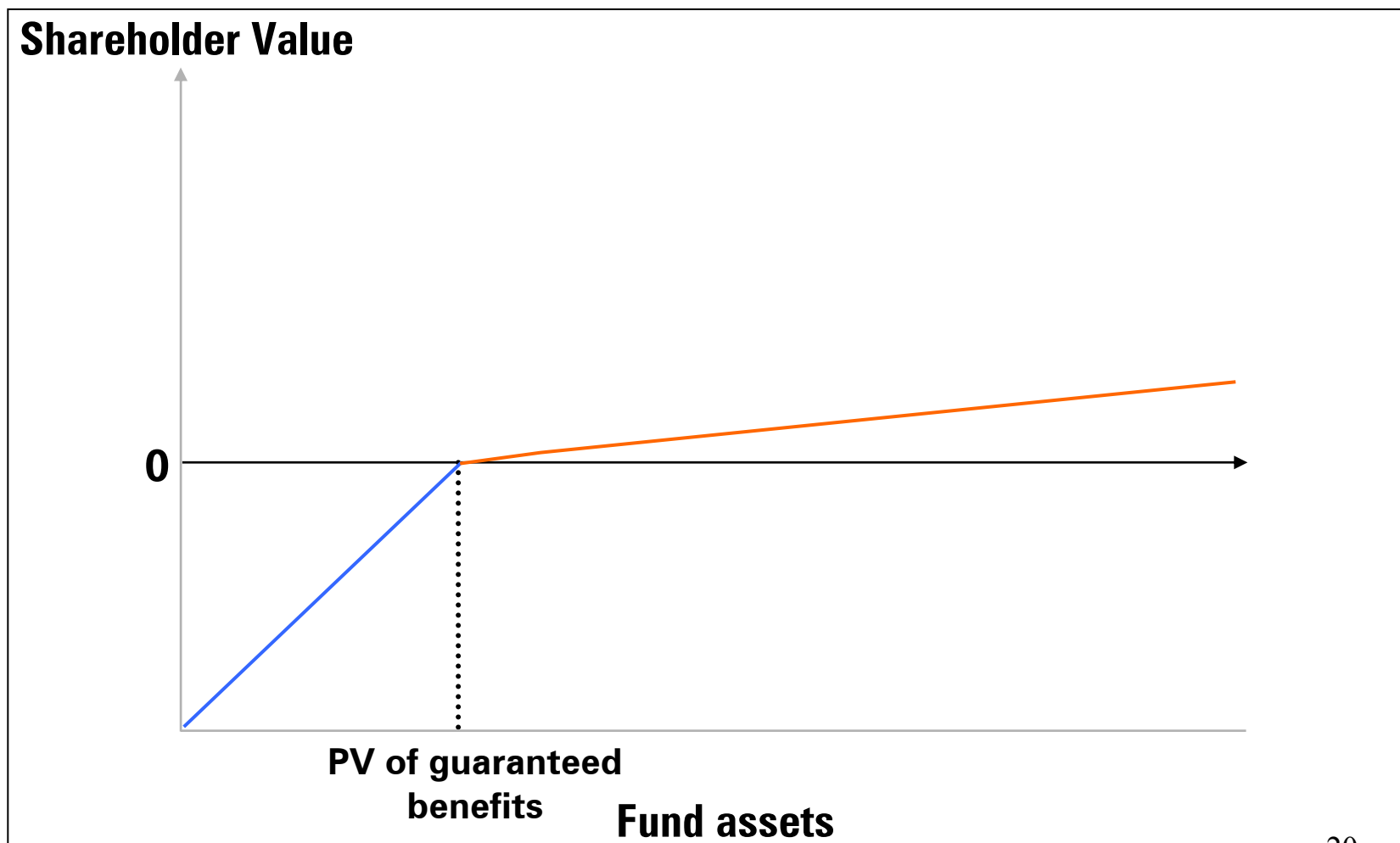
90:10 With Profits business - the shareholder view

10% estate

Fund assets

Realistic Estate

10% bonus

Call options (future bonuses)

PV of guaranteed benefits

Assets

Liability of fund

Shareholder value

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Who pays when the realistic estate runs out?

Shareholder Value

0

PV of guaranteed benefits

Fund assets

The shareholders!

Shareholder Value

0

PV of guaranteed benefits

Fund assets
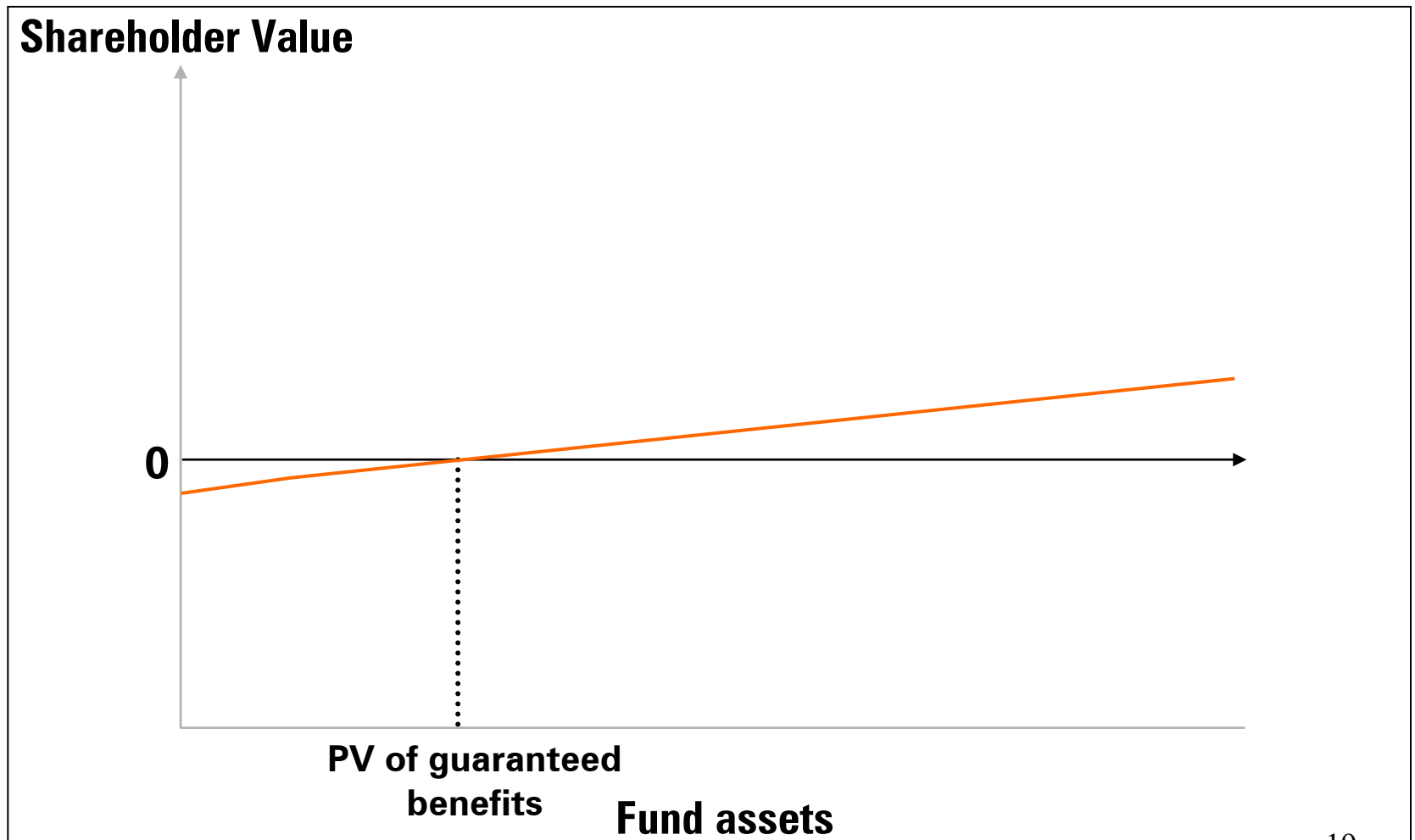
Market-Consistent Value of In Force ("MC VIF") of guarantee products of XYZ at end 2002 (£m)

■ **WP Fund**

MC VIF of SHT (exhausting estate)	95
MC VIF of estate burn-through	(25)
Total MC VIF of 90:10 business	**70**

■ **NP Fund**

MC VIF of stand-alone GAR	(35)

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Practical approach to valuing cash flows with no optionality

The "Certainty Equivalent" approach:

1. Project using risk free rate

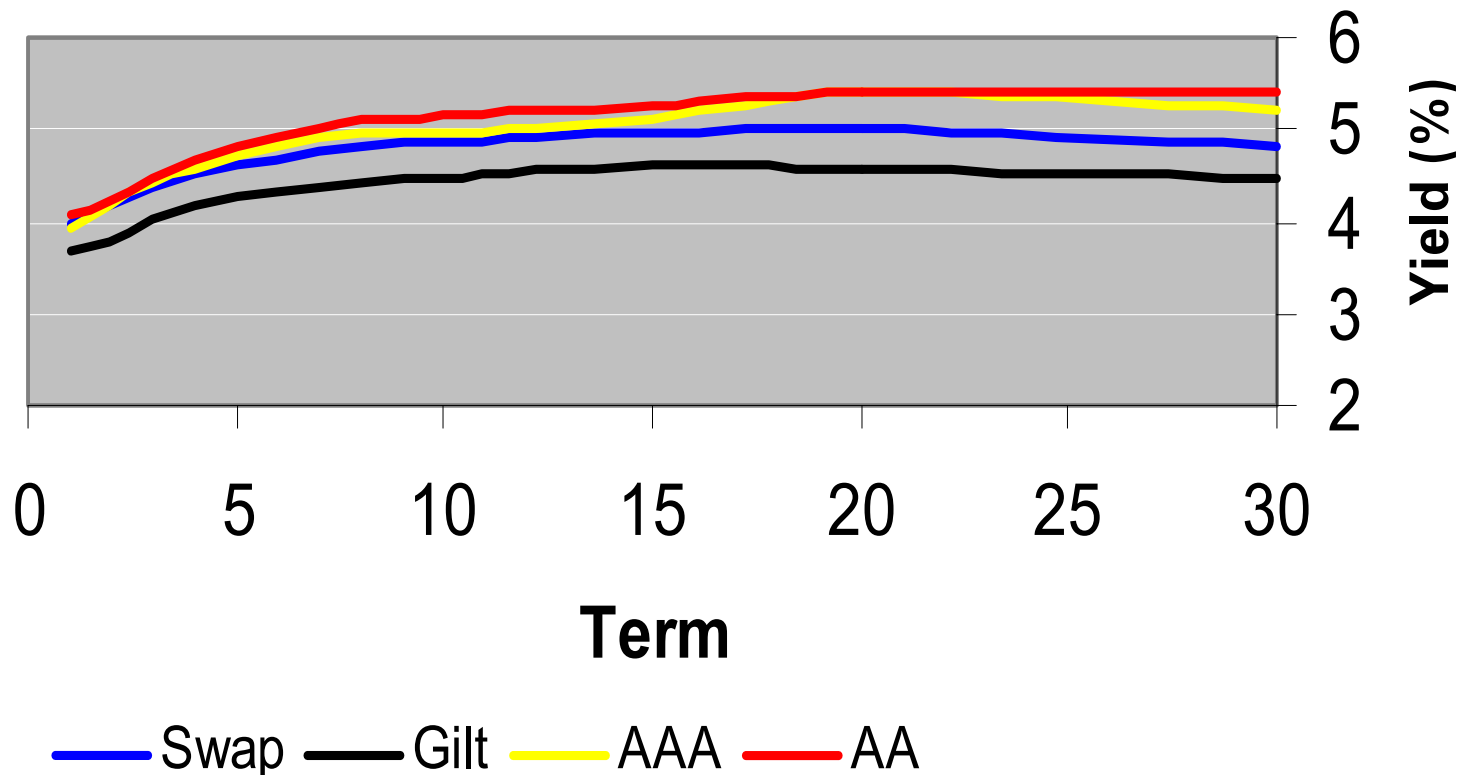2. Discount using risk free rate

This ensures asset risk premia are not capitalised

This approach works with existing EV models

What is an appropriate risk free rate?

Zero Yield curves as at 31 December 2002

Source: Bloombergs

Summary of Market-Consistent Value of In Force of XYZ at 31 December 2002 (£m)

Product	VIF (not MC)	Market-Consistent Cost of Options	MC VIF before option cost	Market-Consistent Value of In Force
Annuities	50	-	5	5
Term assurance	75	-	90	90
UL pensions (with GAR)	175	(35)	195	160
CWP 90:10	100	(25)	95	70
Total	**400**	**(60)**	**385**	**325**

■ Shareholder net worth unchanged at £250m

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In an MCEV framework, why hold additional capital?

- **Regulatory requirements**

- **Rating agency pressures**

- **Desire to write new business**

- **Buffer against risks:**

  - Asset liability mismatch risk, given company does not hedge market risk

  - Insurance risk that actual experience differs from mean best estimate

  - Operational risks, including Compliance and Mis-selling risks

- **Holding capital has associated cost**

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What are the frictional costs to holding capital?

■ Corporate finance theory tells us there are two main costs to holding capital

  ■ Cost of Double Taxation

  ■ Agency Costs

  Note: Allowing for this replaces the need to allow for a "Cost of Solvency Margin"

Deducting a cost of capital to allow for Double Taxation

- Rationale?

- Assumption required: tax status of typical shareholder

- Allowance already in MC VIF (assuming surpluses are paid out as dividends as they arise)

- Haircut required on shareholder net worth

NET WORTH

Considerations around Agency Costs?

- Agency Costs relate to investors' perceptions
- Purpose of valuation
  - need to calculate Agency Costs?
  - accuracy required?

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Balance Sheet of XYZ at end 2002 and end 2003

Asset	Value at end 2002 (£m)	Value at end 2003 (£m)	Change (£m)
Shareholder net worth	250	275	25
Market-Consistent VIF	325	360	35
Cost of Double Taxation	(30)	(35)	(5)
Market-Consistent Embedded Value	545	600	55
Agency Costs at 1% p.a.[1]	**(50)**	**(55)**	**(5)**

Note:

[1] The impact of agency costs on the value is shown at an illustrative figure of 1% p.a. of shareholder capital. This allows the user of the information to quantify their own assessment of the quality of management and the associated risks, without prejudicing this assessment by suggesting a level.

The Analysis of MCEV profit (£m)

- **Value created through insurance management**

  - Experience Variances   xxx
  - Assumption changes   xxx
  - Value of new business written   xxx

- **Value created through investment management**

  - Investment return on net worth   xxx
  - Investment return on value of in-force

    - Return on assets backing in-force   xxx
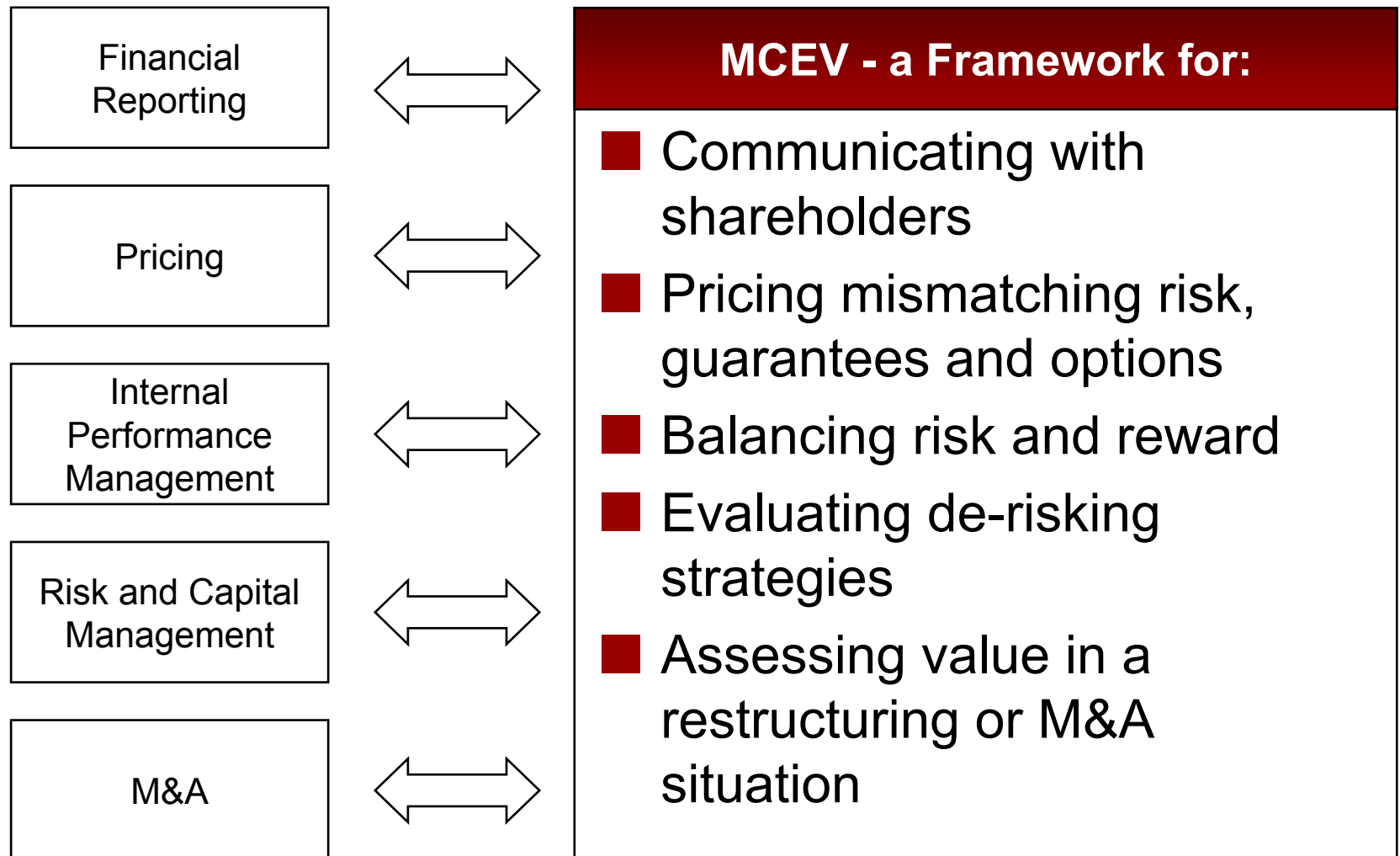   - Mismatch profit (or loss)   xxx

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Total Value created   **55**

MCEV provides new insights for management

Financial Reporting	⟷	**MCEV - a Framework for:**

- Communicating with shareholders
- Pricing mismatching risk, guarantees and options
- Balancing risk and reward
- Evaluating de-risking strategies
- Assessing value in a restructuring or M&A situation

Financial Reporting ⟷

Pricing ⟷

Internal Performance Management ⟷

Risk and Capital Management ⟷

M&A ⟷

# There are four steps to calculating MCEV:

1. Value cost to shareholders of options using market-consistent option-pricing techniques

2. Discount non-option cash flows using discount rate reflecting market risk in that cash flow

3. Allow for Double Taxation

4. Consider allowance for Agency Costs

Still interested?

- Further reading:
  - "Market-Consistent Economic Valuations for the Wealth Management Industry" available on actuaries.asn.au
  - "Market-Consistent Embedded Values: Allowing for risk within an Embedded Value framework" available on tillinghast.com
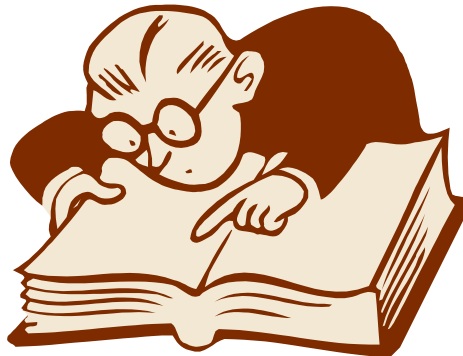
- Questions and feedback? Contact details:
  - Email: kamran.foroughi@tillinghast.com