Market-Consistent Embedded Values

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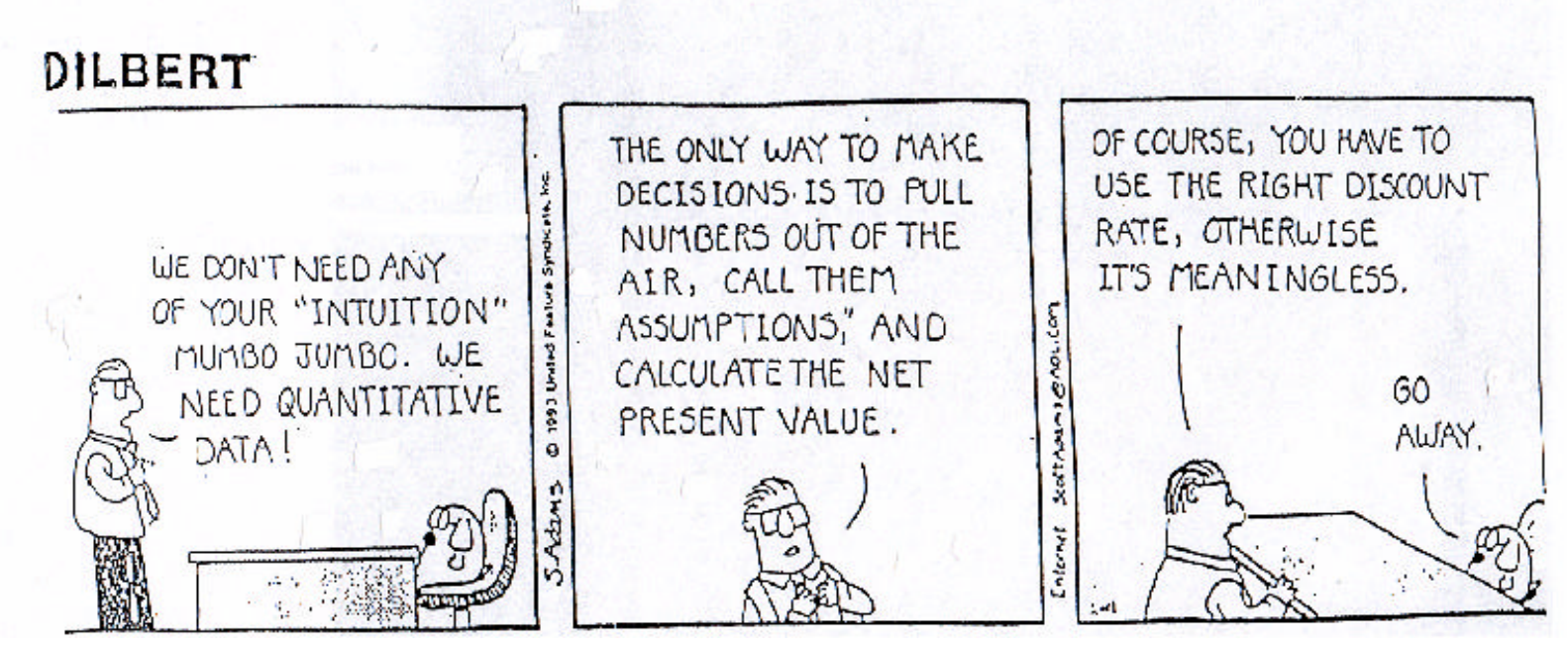
Traditional embedded value techniques have served the Wealth Management industry well for a number of years ....

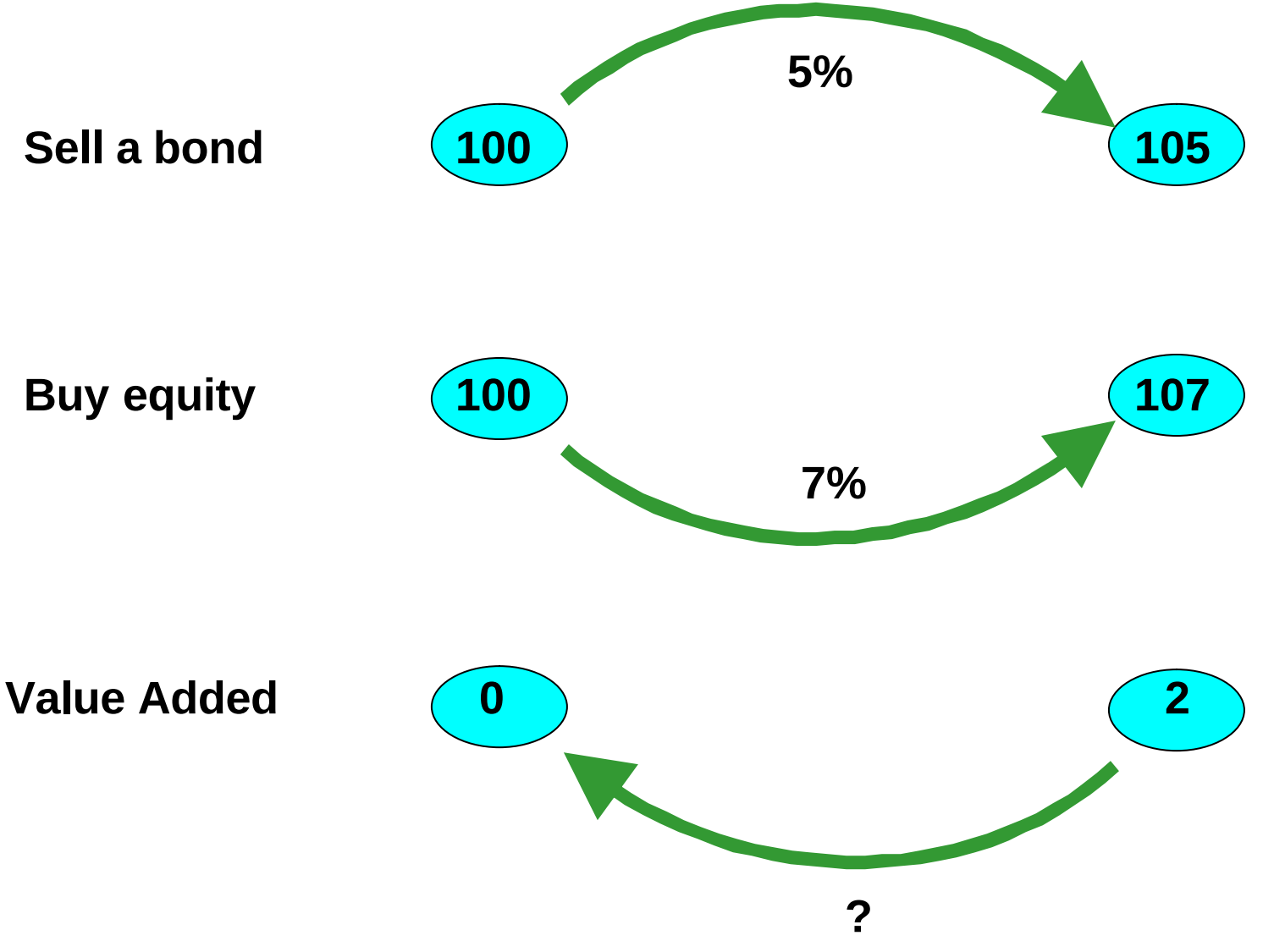
- Realistic and responsive to drivers of value
- Not distorted by accounting conventions
- Well understood

...But there are some real world issues with EV techniques.

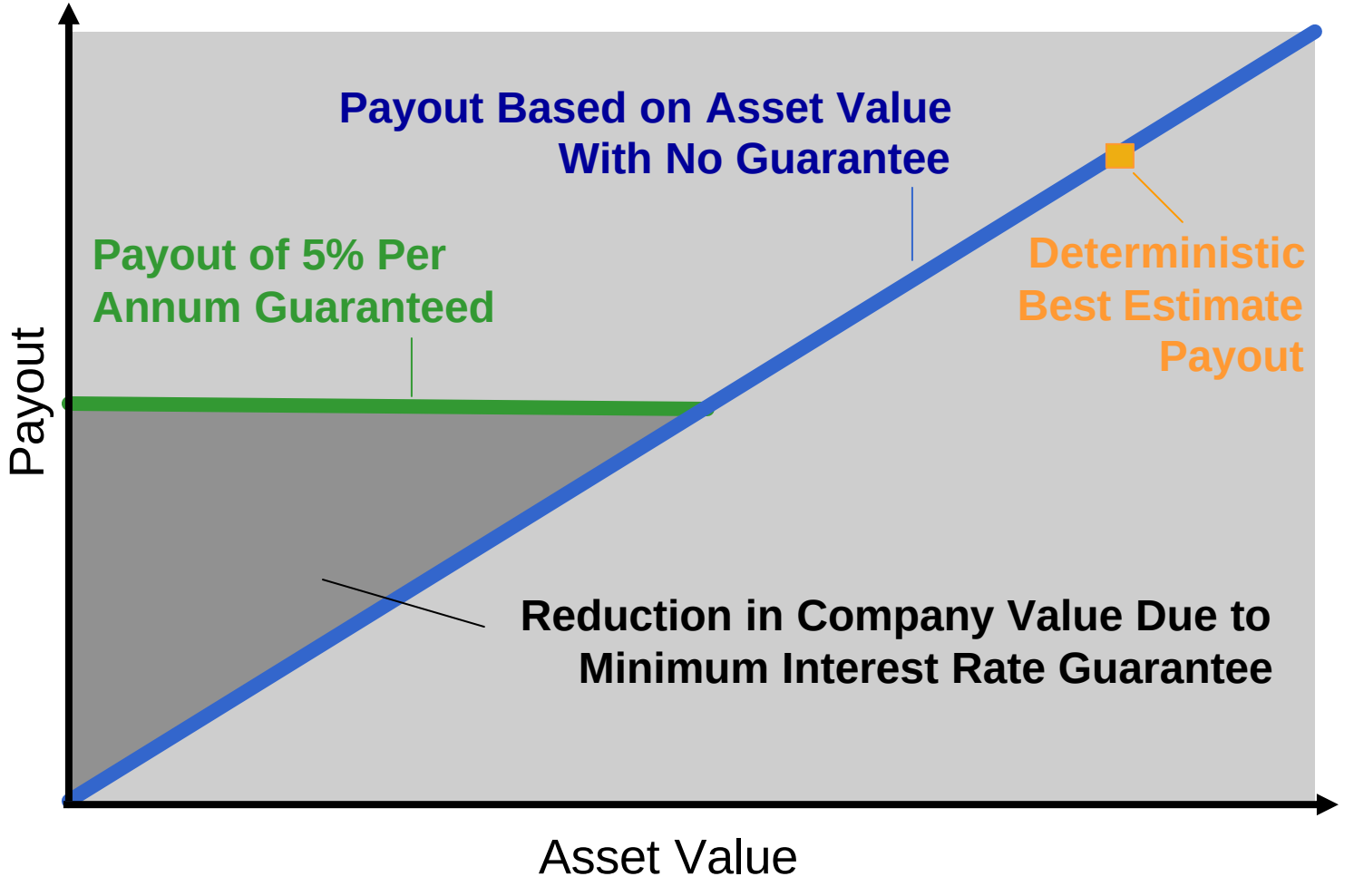
- No clear way to decide what discount rate should be used?



In the real world selling 100 of bonds and buying 100 of equities does not create value – but this can happen with traditional embedded values?



The real world also recognises that options and guarantees exist where there is an asymmetric pay off – i.e. share the profits but keep the losses



Modern Finance is based on real world concepts. What are these Modern Finance concepts?

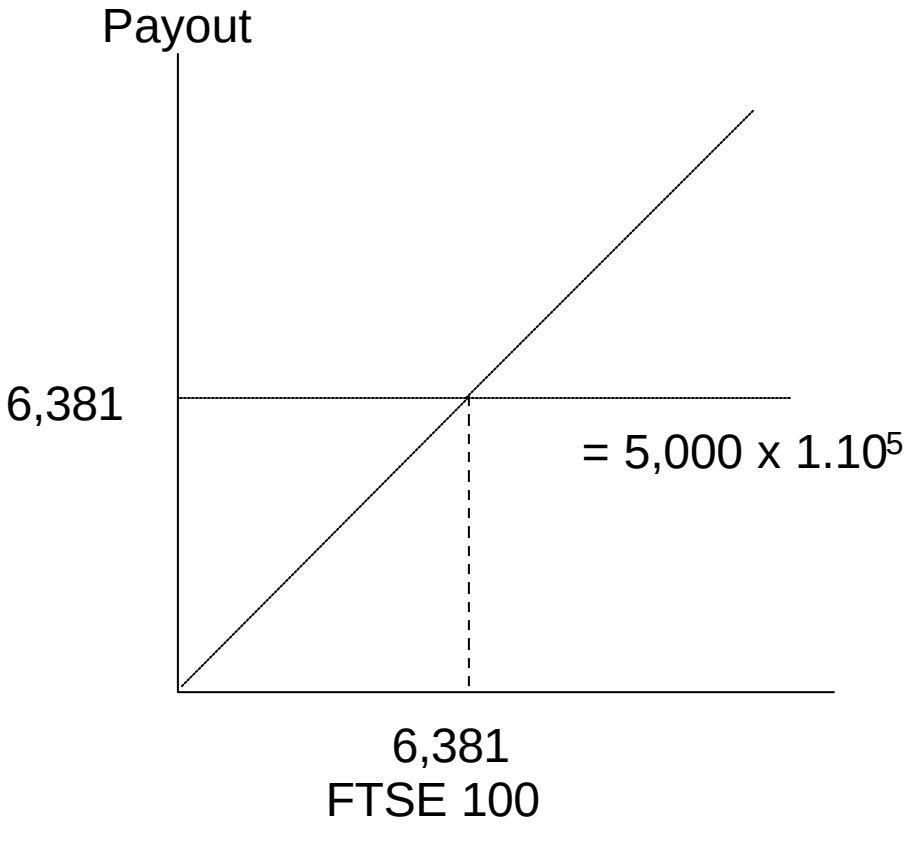
Diversification	Risks that can be diversified away do not command a premium
Replication	Systematic risks can be replicated through (dynamic) investment in traded assets
No Arbitrage	If Two portfolios have exactly the same payouts in all possible circumstances then they have the same value
Capital Structure Theory	The value of a company is more (or less) than the sum of its discrete parts

What is the forward price of an asset

- What price should be agreed for an asset in one year time if the expected return is 10% and cost of borrowing is 5%?
- If it is 110 then I will
  - Borrow 100 and buy the asset now
  - Sell for 110 in 1 year and repay my loan at 105 – profit 5
  - I will do this as often as I can
- If it is 104 then I will
  - Short sell for 100 now
  - Invest 100 in the market
  - At maturity receive 105, pay 104 for the forward
  - Or if I own the share, buy a forward
    - Sell the share I own for 100
    - Invest in the market
    - Receive 105 after 1 year, pay 104 for the forward

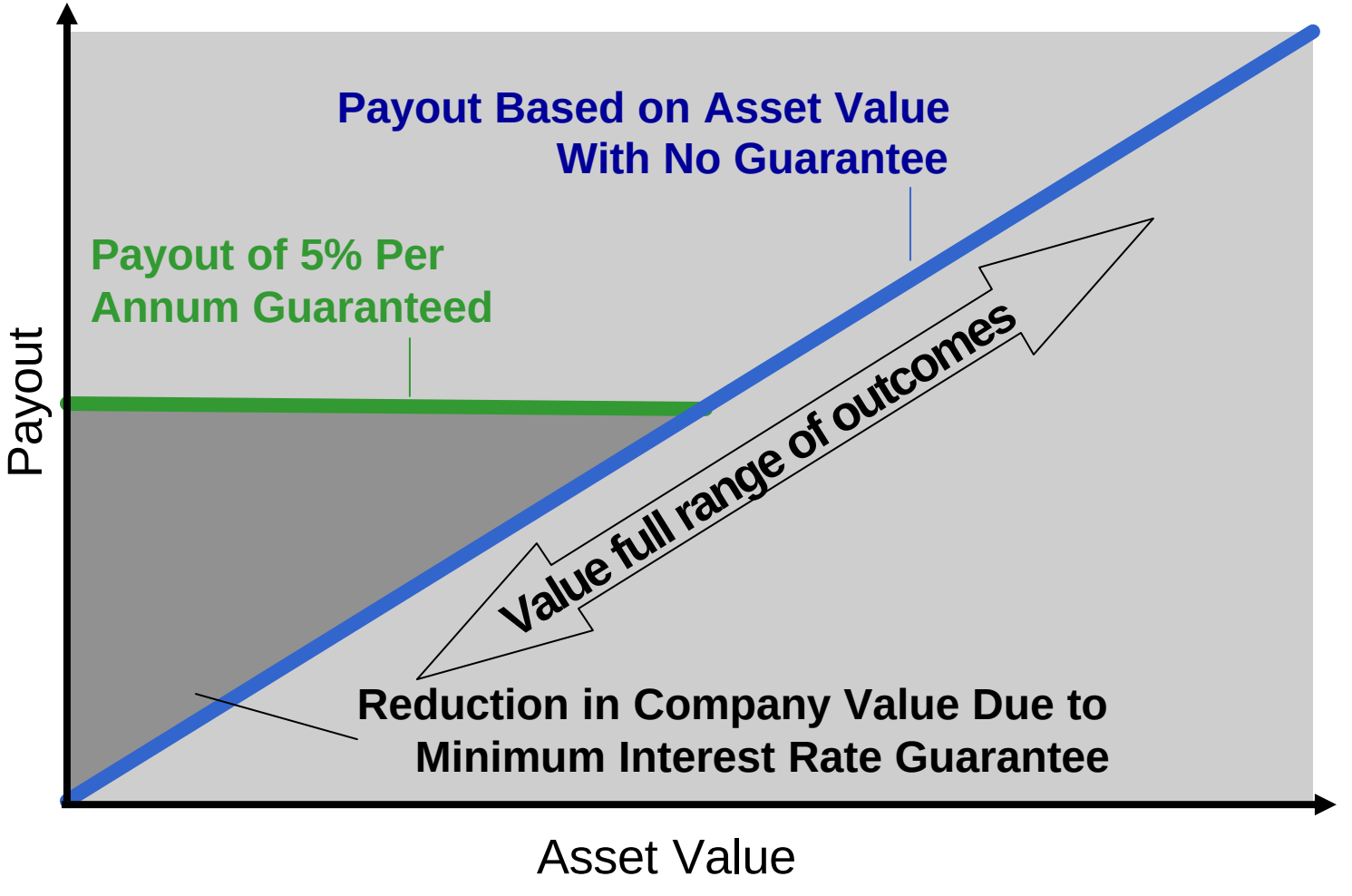
We can use replicating portfolios and option pricing techniques to place a value on embedded options

Value a bond paying the greater of the increase in the FTSE 100 index over 5 years or 5% per annum. Starting value is 5,000.



- Payout equals call option on FTSE 100 with a strike of 6,381 plus a zero coupon bond yielding 5% on nominal of 5,000
- Value of bond is 5,000
- Value of option (from market) is (say) 400
- Therefore value of liability is 5,400
- If we cannot find the right traded assets we need to use option pricing techniques or stochastic modelling

Or use stochastic modelling for more complicated options



Market-consistent valuations – key elements

- Value determined using risk neutral valuation techniques
- Explicit allowance for policyholder options and guarantees
- Recognition of the impact of corporate structure
  - tax
  - agency costs
  - limited liability
  - “goodwill”
  - costs of financial distress

Key features of market-consistent valuations

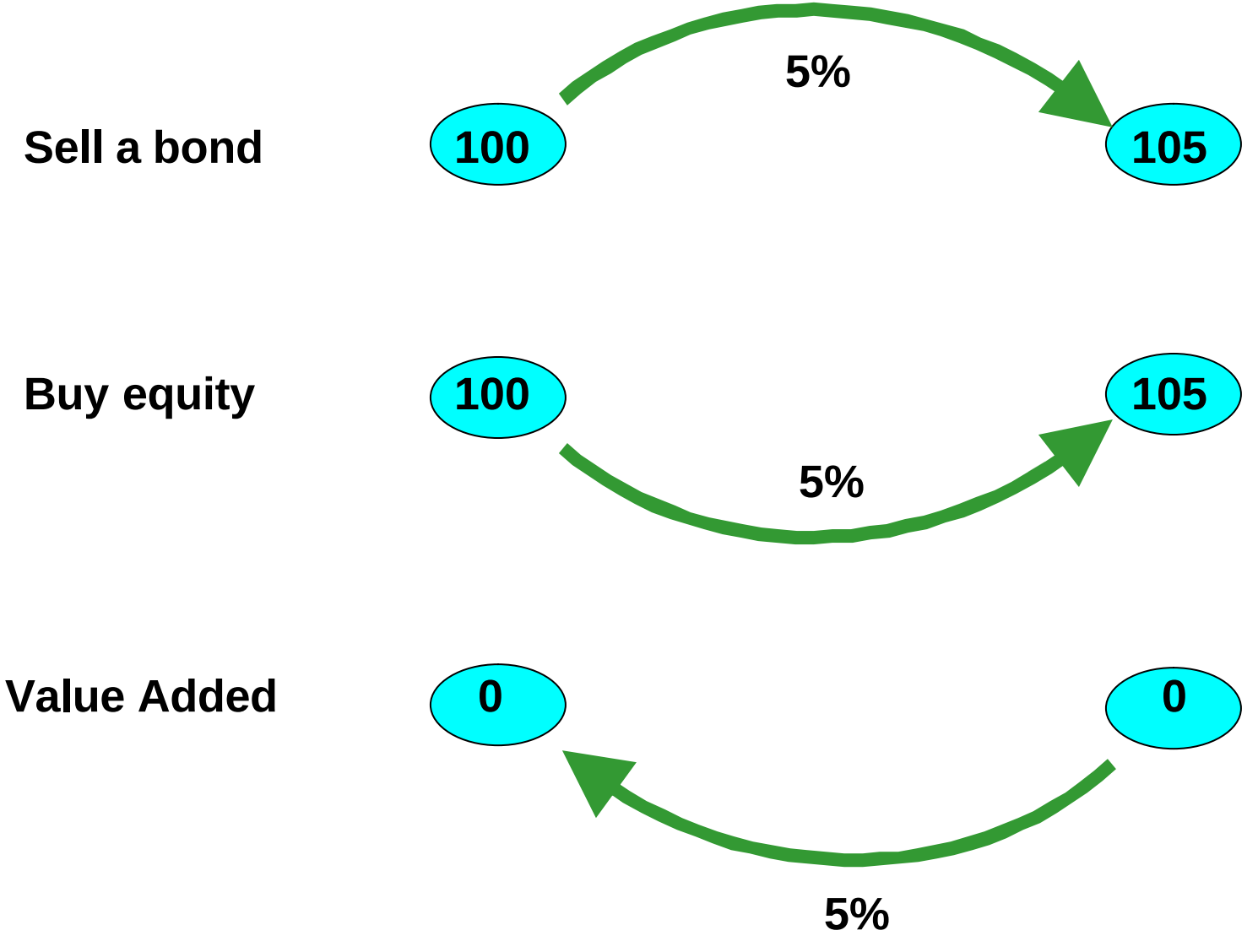
- Consistent with the way “the market” values other financial instruments
- Explicit allowance for risk, in particular:
  - policyholder options and guarantees
  - asset / liability mismatches
- No risk adjusted discount rate
- No traditional cost of capital
- Explicit allowance for corporate structure effects
- Automatically adjusts for changes in risk profile of business
- Better informs the risk management process

Market-consistent valuation of cashflows can be achieved through one of three approaches

Certainty Equivalent Method	Applicable to cashflows that are certain or which are uncertain but which do not contain systematic risk
Closed-form solution	Applicable where systematic risk exists, but where option features are such that a formulaic – i.e. closed-form – solution can be implemented, typically via construction of a replicating portfolio
Stochastic modelling	Applicable to products which contain systematic risk but for which a closed-form solution is not possible due to the complexity of the options.

- Systematic risk is risk that depends on market prices or interest rates

The certainty equivalent method solves our buy/sell arbitrage problem



Certainty-equivalent method

Products which can be valued (exactly)	Features which can't be valued (exactly)
Non-profit business Variable products without guarantees	Interest rate/asset minimum guarantees Interest rate/asset based profit sharing Interest rate/asset sensitive lapses

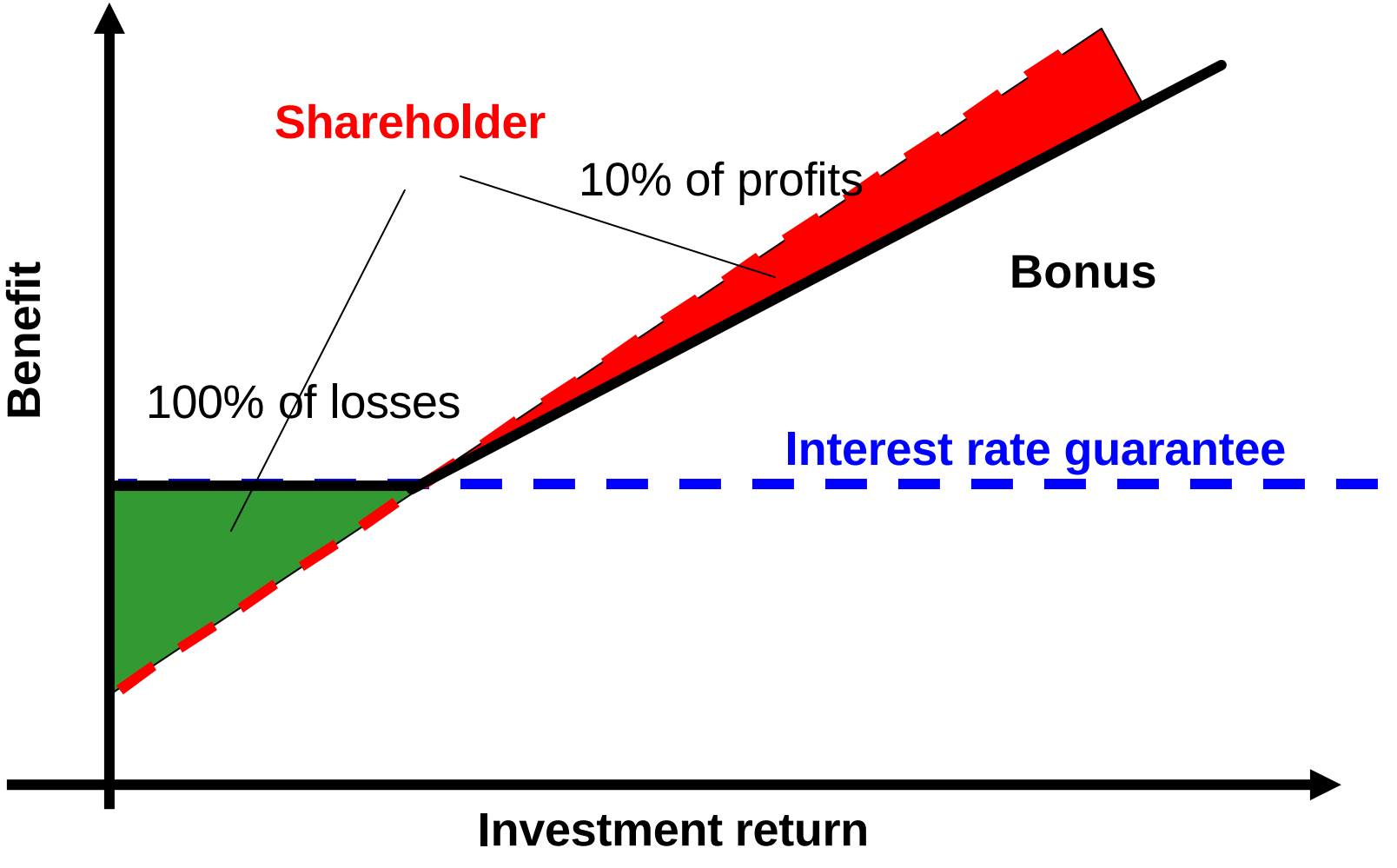
➔ *the common link - no significant non-linear relationship with risky assets*

- **Project all assets returns at risk free rate**
- **Set inflation equal to spread between fixed and index-linked bonds (if available)**
- **Discount at risk free rate**
- **Only applies to products without significant optionality. The cash-flows are not necessarily certain but risks are limited to non-interest rates risks i.e. non-systematic risks.**

Closed-form solutions

- Many insurance features have the characteristics of embedded options, eg
  - guaranteed minimum death benefits
  - return of premium guarantees
  - minimum guaranteed bonus rates
- The key features can sometimes be valued (or approximated) by relatively simple, closed form solutions.
  - Such solutions – for example the Black-Scholes solution - are available from published sources
  - Some intellectual investment is required in “decomposing” existing products into these options
- Tillinghast is conducting research into closed-form solutions, to reduce the need for stochastic modelling.
  - Many products are too complex for this approach, e.g. guaranteed surrender values

Participating products represent and embedded option because profits are shared 90/10 but losses are carried by the shareholder



Stochastic modelling

- Required when products feature complex optionality eg lapses depend on interest rates or bonus rates very complex
- Many different asset models, with differing degrees of realism
  - all must be arbitrage free and market-consistent
  - but none are perfect
  - need to pick a model which is sufficient for the purpose
- Liability model is crucial to results, should reflect impact of asset behaviour on
  - policyholder behaviour (eg lapses)
  - investment policy
  - bonus strategy
  - charging structure
- Trade-off required between realism and complexity
- The techniques used to value contracts must be chosen:
  - Risk - neutral or other market-consistent valuation
  - State price deflators

Comparison of Fair Value with Market Consistent Valuation

Differences between Fair Value Accounting and Market Consistent Valuation		
Item	**Market Consistent**	**ED5 "Fair Value"**
Certain intangibles (default option, costs of distress, tax shields and cost of double taxation, agency costs and franchise value)	Allowance made to ensure market consistency	No allowance
Policyholder liabilities	True fair value i.e. estimate of the price that an entity would be paid to be relieved of the liability in an arms-length transaction motivated by normal business considerations	Entity-specific value i.e. the present value of the cost to the enterprise of running off its policy liability in an orderly fashion over the lifetime of the liability
Discount Rate	Liquidity premium may be added to risk free rate to reflect illiquidity of liabilities	No addition
Market Value Margins on Non-Investment Assumptions	Excluded on basis that there is no reward for diversifiable risk	Permitted subject to certain conditions
Allowance for Future Renewals	No specific restrictions	Permitted only if the renewal is on onerous terms for the insurer, or if policyholders hold non-cancellable renewal options that are potentially valuable to them
Deferred Tax Assets	Discounted to ensure market consistency	Not discounted to ensure consistency with rules for other non-insurance entities

Results

- Annuities and Non Par savings often decline in value
- Risk business has much higher values
- Unit Linked business may go up or down – but usually up
- Par business depends on
  - Strength of guarantee
  - Asset Mix
  - Bonus flexibility
- Examples
  - AMP Australia
  - Sun Alliance UK
- To traditional actuaries, the method seems wrong but the answers seem right!

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