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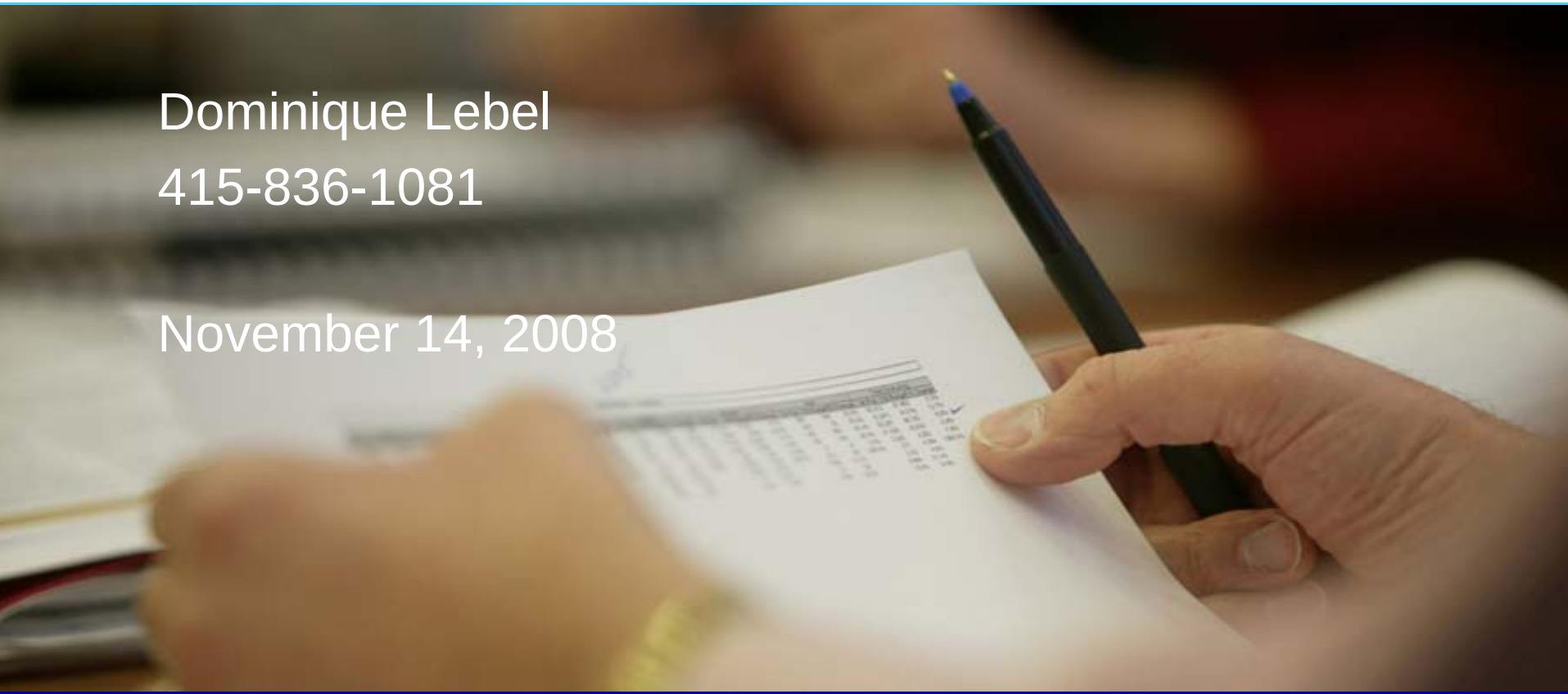
Market Consistent Embedded Value



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Agenda

- Introduction to MCEV
- Time Value of Options and Guarantees
- Frictional Costs of Capital
- Non-Hedgeable Risks
- Analysis of Earnings
- Credited Interest Rates
- MCEV Implications for North American Products

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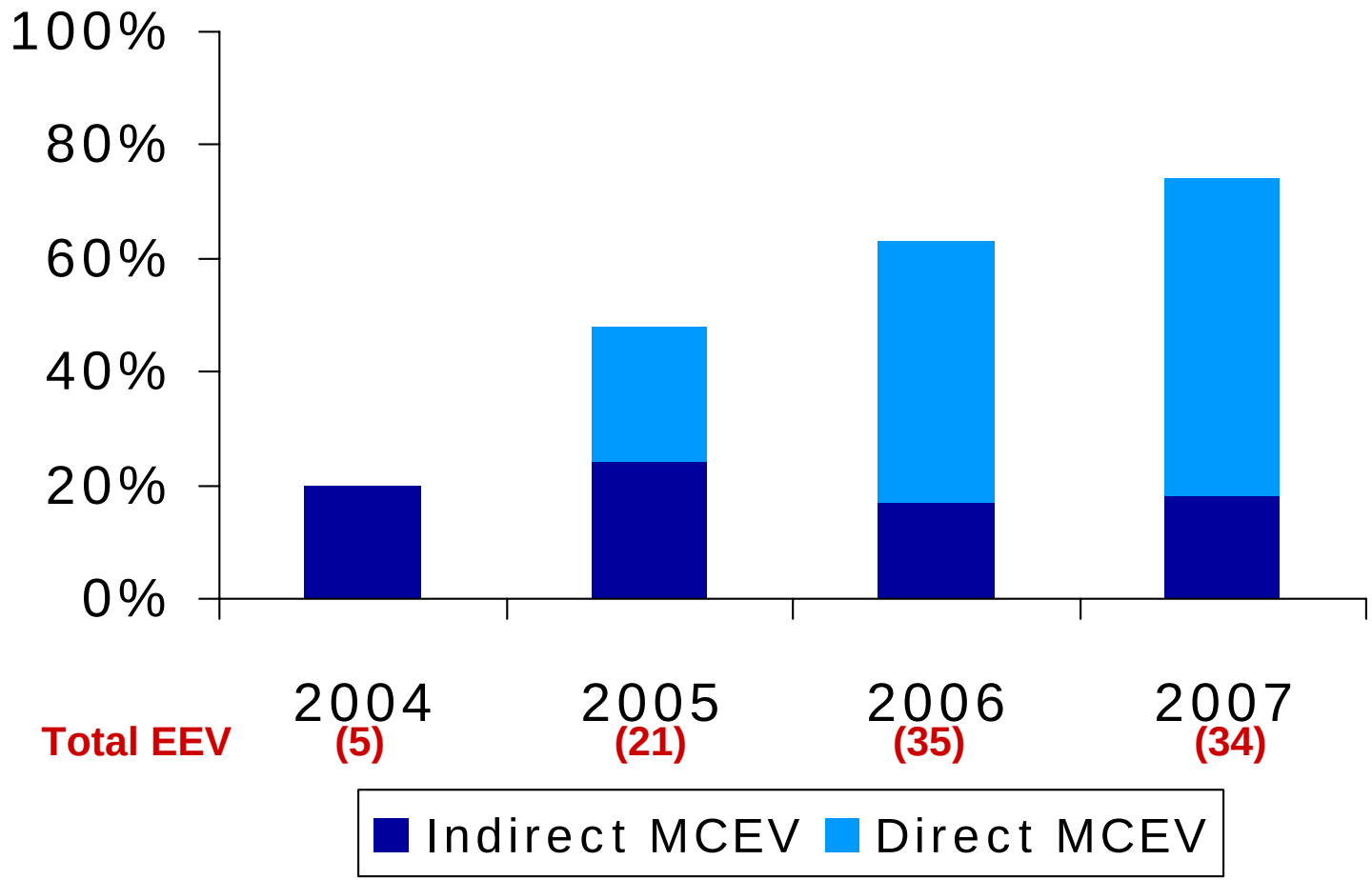
Within EEV publications, there is a continuing trend towards MCEV



Source: Company publications, Towers Perrin EEV *Update* May 2008

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What is MCEV?

MCEV attempts to give a robust answer to the allowance for market risk within the EV framework. The approach …

- **Provides an objective method for setting the risk discount rate at both the product line and company level**
- **Ensures that options and guarantees are priced in a way which is consistent with the financial markets**
- **Reflects the frictional costs of holding assets in an insurance company structure**

… and therefore gives new insights to management of the risks in the business and how they can be managed to maximise the value of the entity

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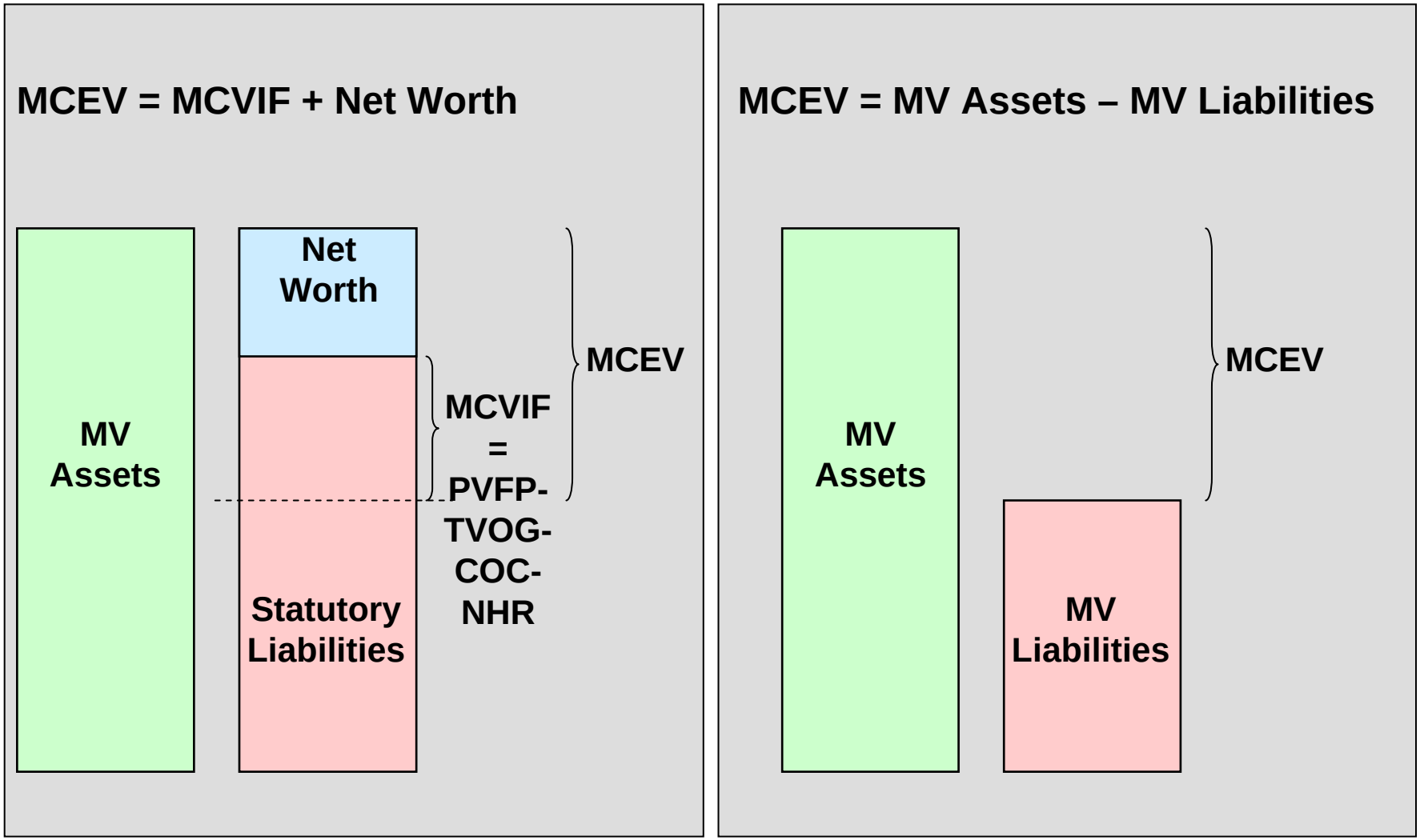
We can think of MCEV in two equivalent ways



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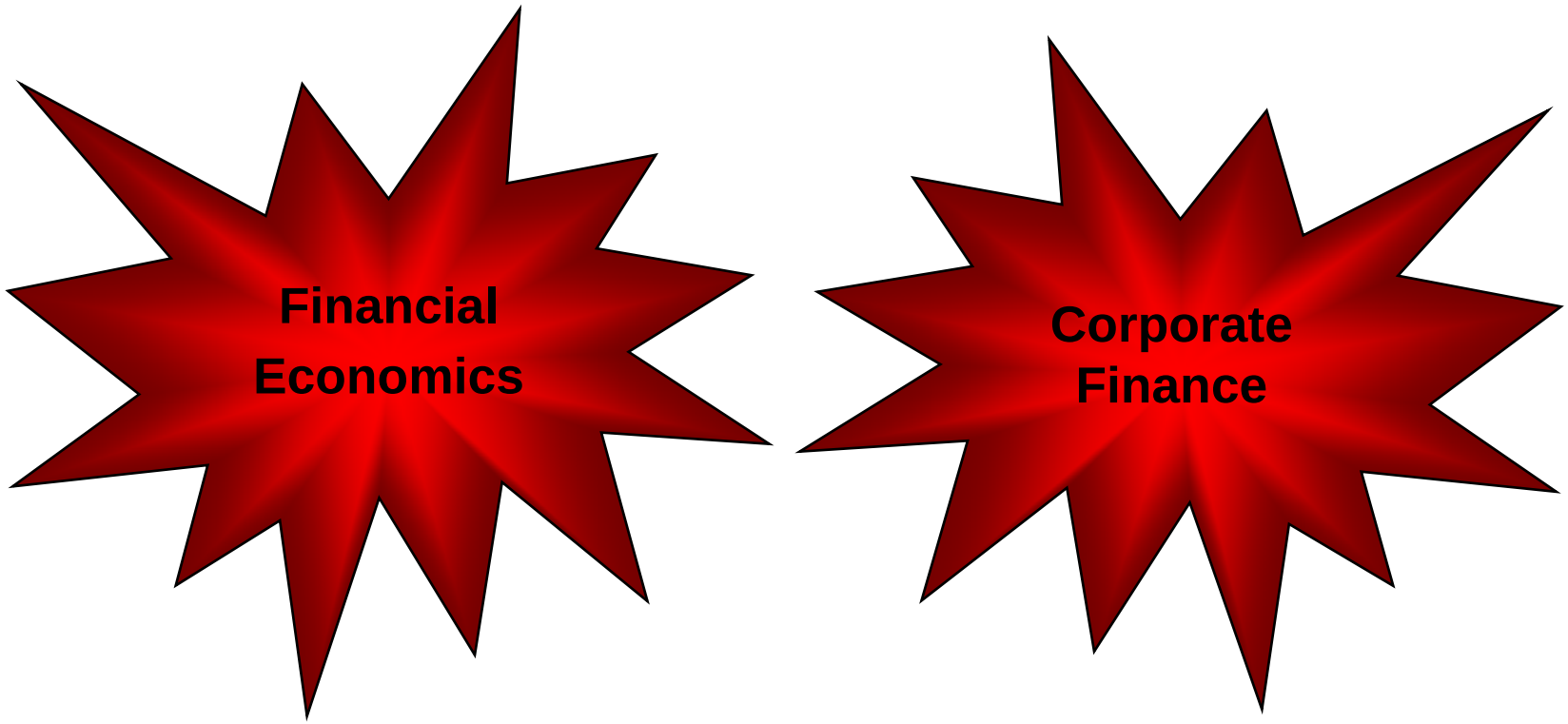
What do we mean by Market-Consistent Valuation?



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What are these Modern Finance concepts?

Diversification	Risks that can be diversified away do not command any risk premium
Replication	Systematic risks can be replicated through (dynamic) investment in a portfolio of 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 impacted by its risk and capital structure

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Diversifiable Risk

	Coupon	Volatility	Price today	Return
Risk-free investment	5%	0%	100.0	5.0%
Single risky diversifiable inv.	5%	20%	84.8	23.9%
Portfolio of two risky div. inv.	5%	14%	92.4	13.7%
Portfolio of ten risky div. inv.	5%	6%	98.5	6.6%
Portfolio of 1000 risky div. inv.	5%	1%	99.8	5.0%

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Why use these concepts?

By using the techniques which build on these concepts, we can go a long way towards solving some of the well-known problems with traditional valuation approaches:

- **What discount rate should be used?**
- **How do we allow for options and guarantees?**
- **What is the equity risk premium?**
- **How does risk impact value?**

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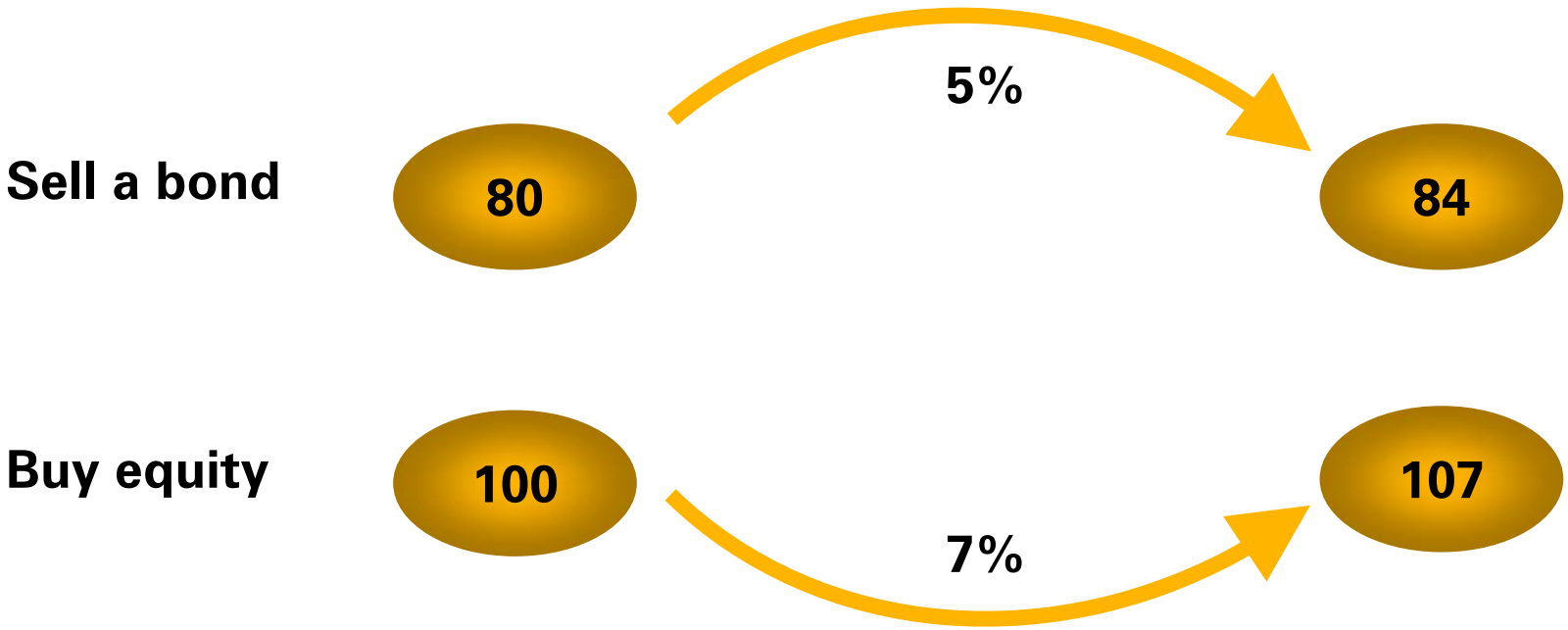
Valuing simple securities



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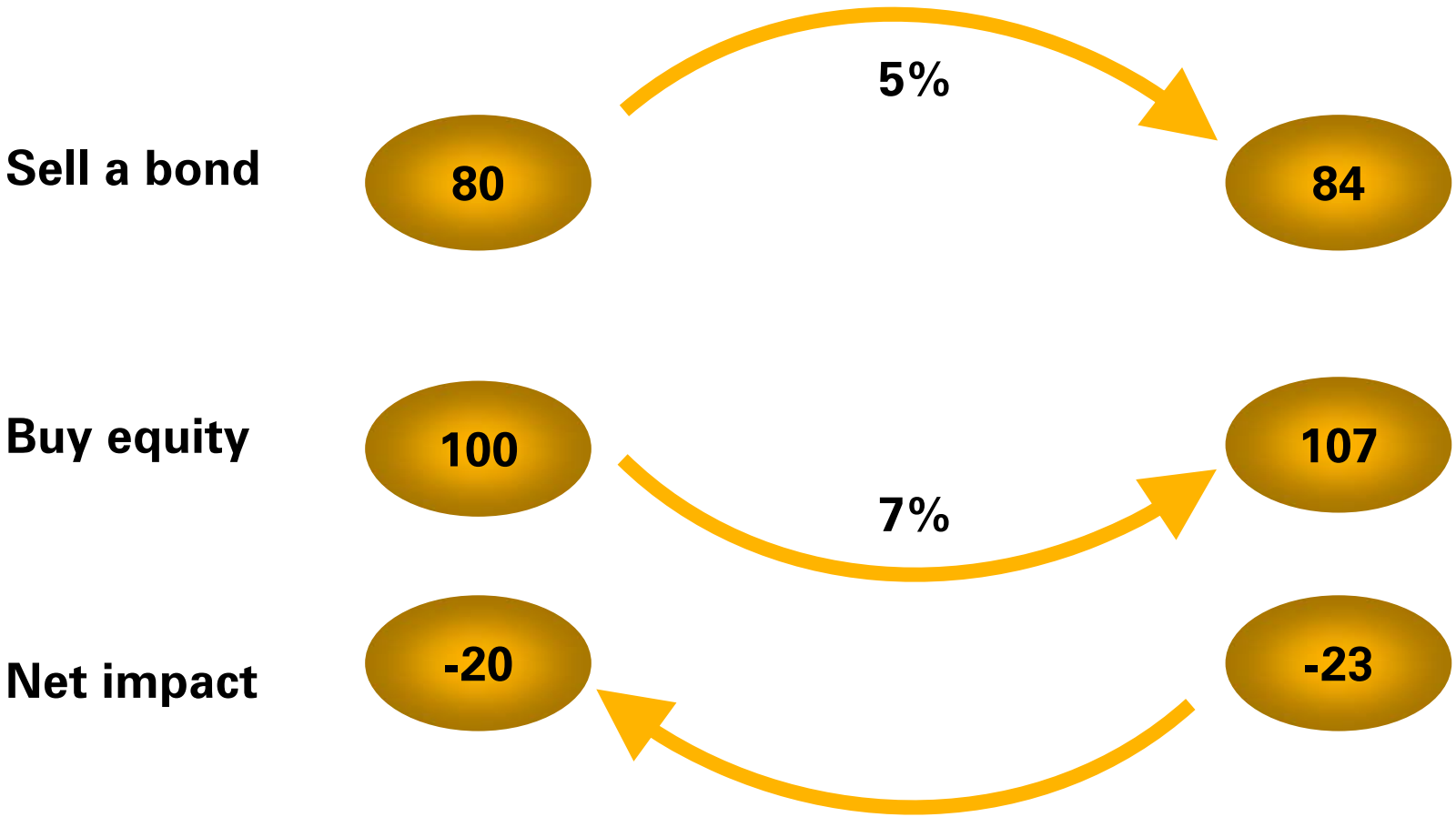
What discount rate should we use?



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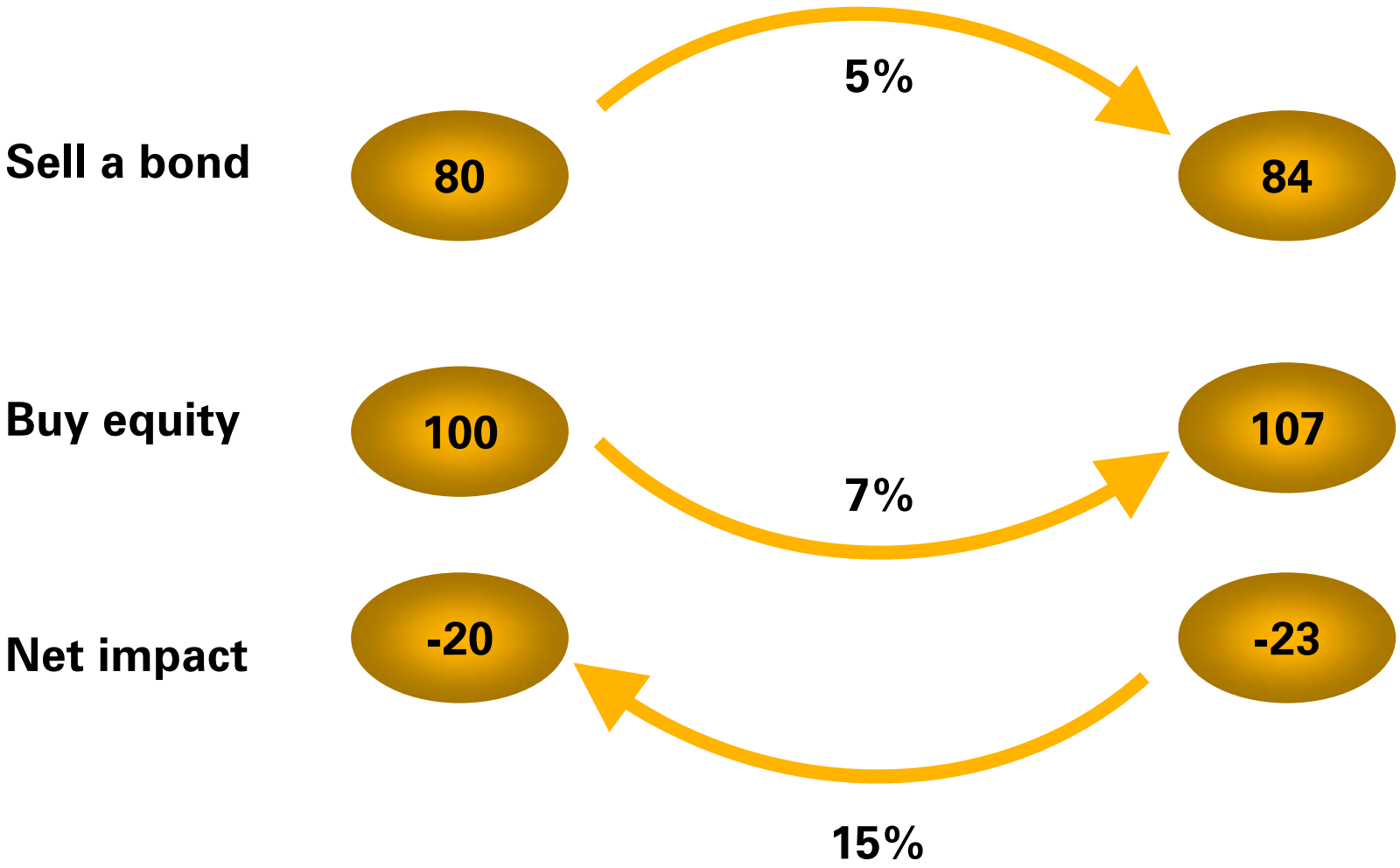
The discount rate reflects the market price for risk in the net cash flows



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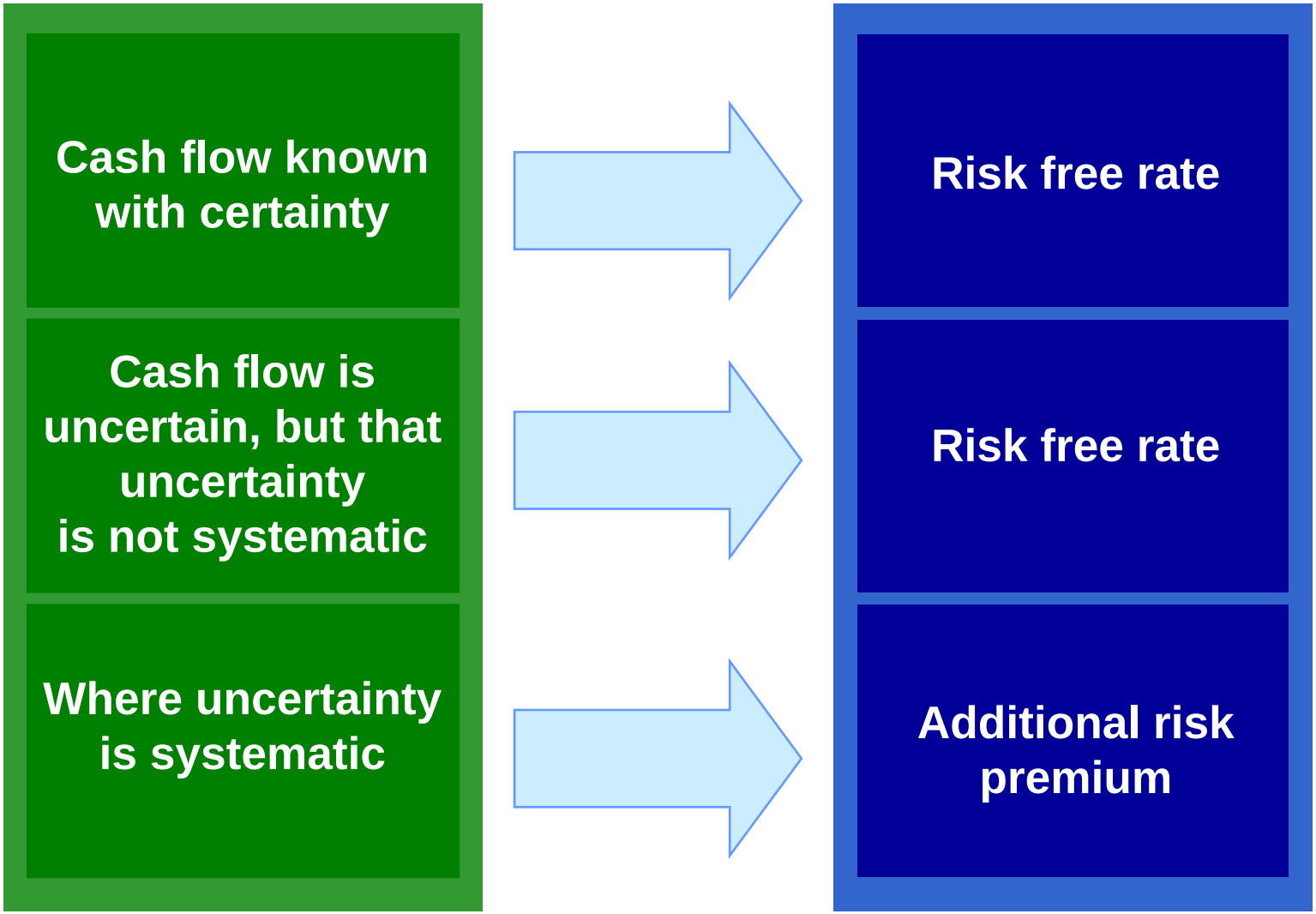
The risk discount rate needs to reflect each product's or product line's risks



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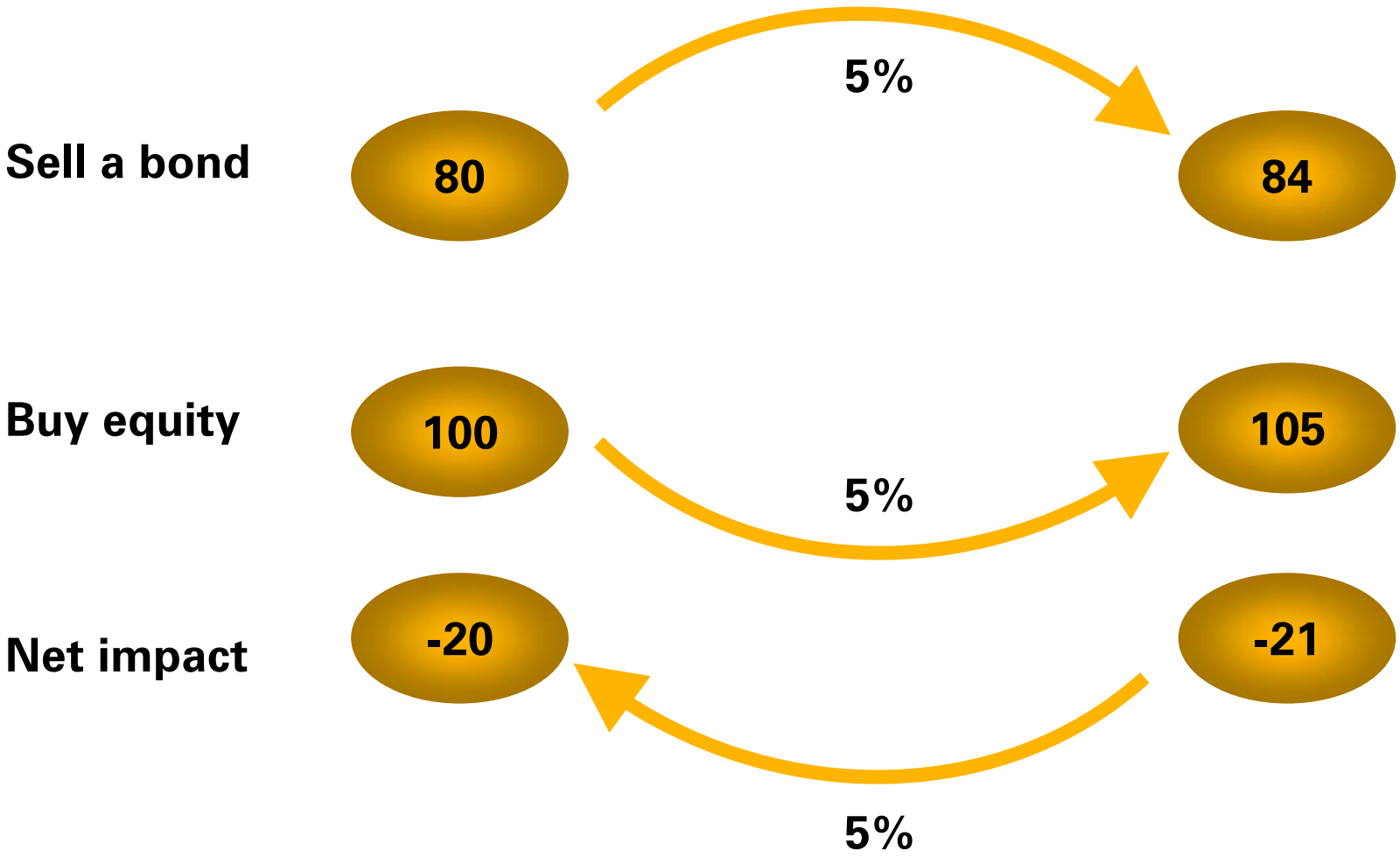
We can also risk-adjust the cash flows



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An example: valuing an immediate annuity

- **No link between assets and liability cash flows**
- **Future policy cash flows are exposed to non-market risk only**
  - **Mortality**
- **These two properties allow us to carry out a deterministic valuation by discounting the expected policy cash flows at the appropriate risk-free rate**
  - **“Expected cash flow” refers to the mean of the distribution of possible cash flows, not the median**

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An example: valuing an immediate annuity

Expected payments	**(100)**	**(80)**	**(60)**	**(40)**	**(20)**
Change in reserve	**110**	**88**	**66**	**44**	**22**
Interest (5% on corporate bonds)	**16.5**	**11.0**	**6.6**	**3.3**	**1.1**
Net cash flow	**26.5**	**19.0**	**12.6**	**7.3**	**3.1**
Reserve at b.o.y. = MVA	**330**	**220**	**132**	**66**	**22**

Assuming the traditional EV discount rate is 7%, the EV is 59.43

If risk free rate = 3.5%, what is the market consistent value?

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Valuing individual cash flows

	Value
Payments are uncertain, but are unsystematic so discount at 3.5%	-277.11
Discount interest and asset proceeds at 5.0%	330.00
Net value (MVA – MVL)	52.89

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Certainty equivalent approach

Expected payments	(100)	(80)	(60)	(40)	(20)
Change in reserve	110	88	66	44	22
Interest (3½%)	11.5	7.7	4.6	2.3	0.8
Net cash flow	21.5	15.7	10.6	6.3	2.8
Reserve at b.o.y. = MVA	330	220	132	66	22

Discounted value at 3.5% = 52.89

Discount rate required to make traditional EV = MCEV is 13.4%

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Limitations of deterministic valuations

Products which can be valued deterministically	Product features which cannot be valued
Immediate annuities Term insurance Segregated fund products without guarantees	Interest rate/asset guarantees Interest rate/asset based profit sharing Interest rate/asset sensitive lapses

The common problem: non-linear relationship with risky assets

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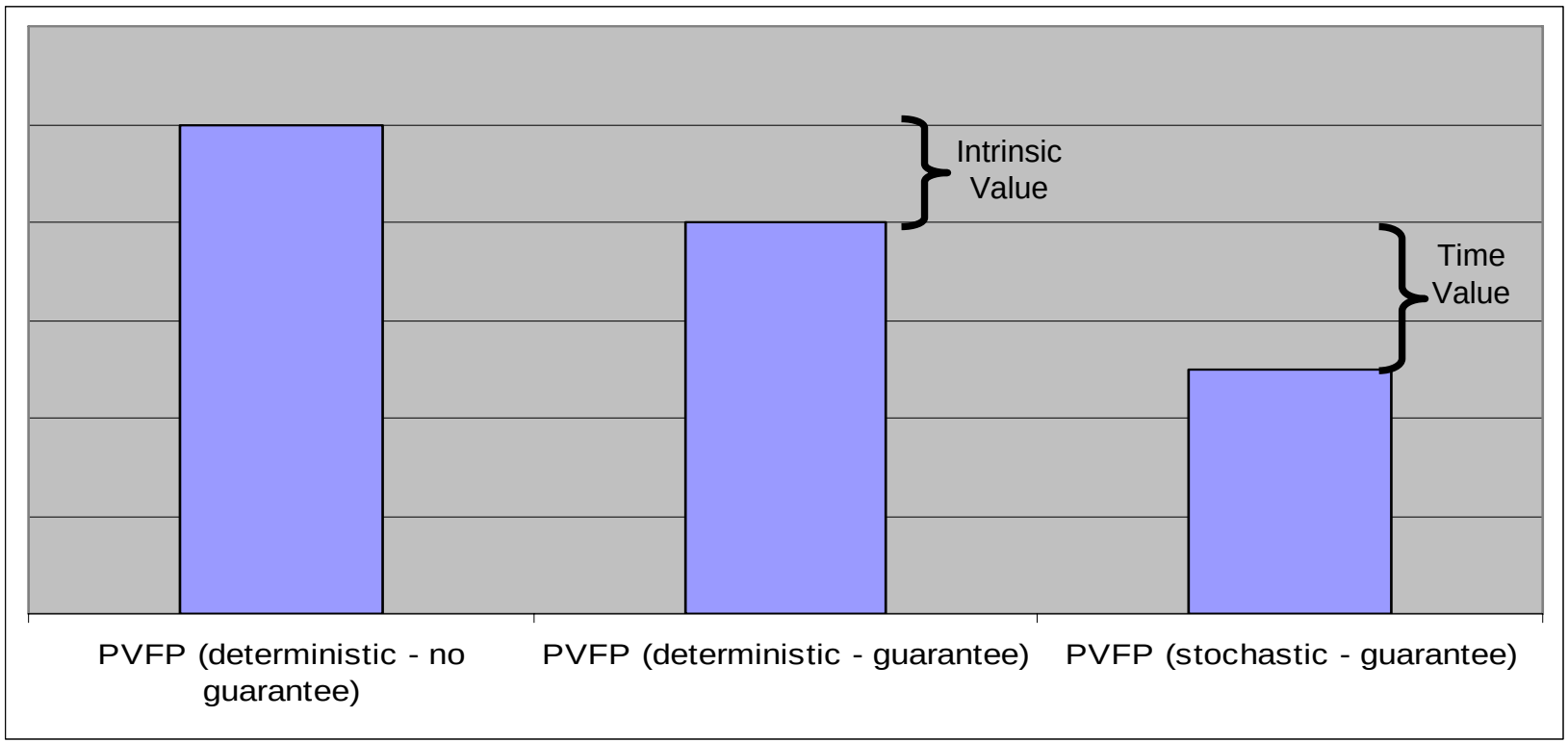
Time Value vs. Intrinsic Value

- Total value of options and guarantees = Intrinsic value + Time value
  - Intrinsic value already captured in the certainty equivalent PVFP
  - Time value = PVFP (certainty equivalent) – PVFP (stochastic)



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Examples of options and guarantees

- Guaranteed minimum credited rates
- VA guarantees
- Par burnthrough
- Guaranteed insurability riders are not considered an option or guarantee because the value of the rider to the policyholder does not change with changes in financial markets

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Stochastic Modeling

- Generally, risk neutral valuations
  - Economic scenarios are derived from swap rates such that, on average, all assets follow the forward rates
- Model should be calibrated to market values
  - Equity option implied volatilities
  - Swaption implied volatilities
  - Initial swap rate curve
- Market consistency is tested by checking that initial asset market value = mean present value of asset cash flows discounted at risk free rate (1 = 1 test)
  - Purpose is to ensure that the asset model is simulating risk free returns for all assets
- Assumptions used for stochastic models should be consistent with deterministic models
- Allowance should be made for dynamic management actions and policyholder behavior

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What to do if there is a lack of market data?

- Where the available swap yield curve is shorter than the projected liability cash flows, the swap curve should be extended using an appropriate methodology
- Volatility assumptions should be based on the most recently available information as at the valuation date. Where there are concerns over the depth or liquidity of the market then less recently observed measures and expert opinion should be considered.
- The duration to maturity and the “moneyness” effect on the market implied volatilities should be taken into account where material and practical.

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Frictional costs should reflect the tax and investment expenses on the assets backing required capital

- Relative to “real world” EV, the cost of capital will decrease
- Additional frictional costs include agency costs and the cost of financial distress, but the CFO Forum decided to exclude these
  - General corporate risks that individual investors should assess
- Approximate methods to project the required capital are often used

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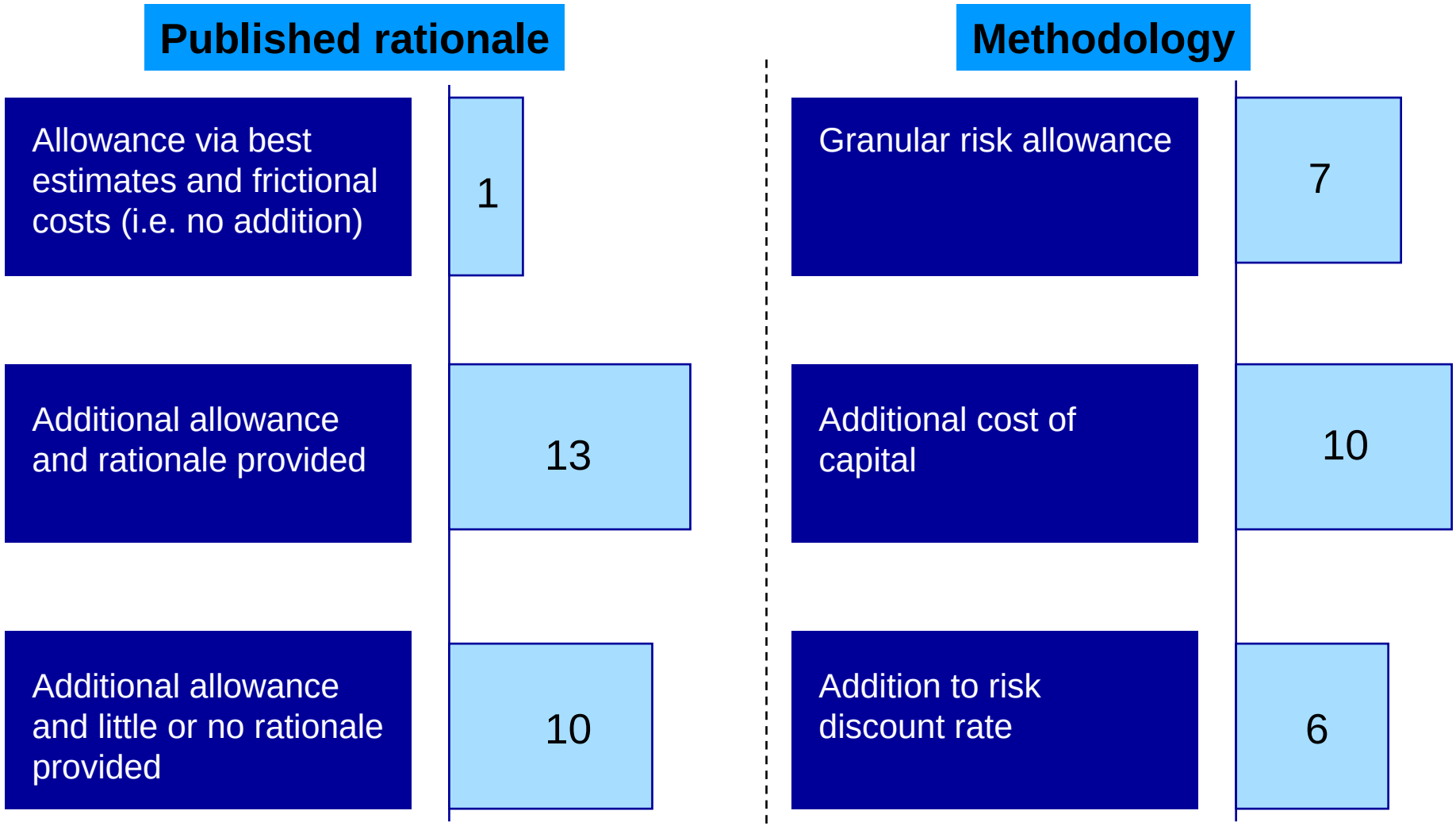
Existing MCEV publications: Allowance for non-market risk



Source: Company publications, Towers Perrin EEV *Update* May 2008

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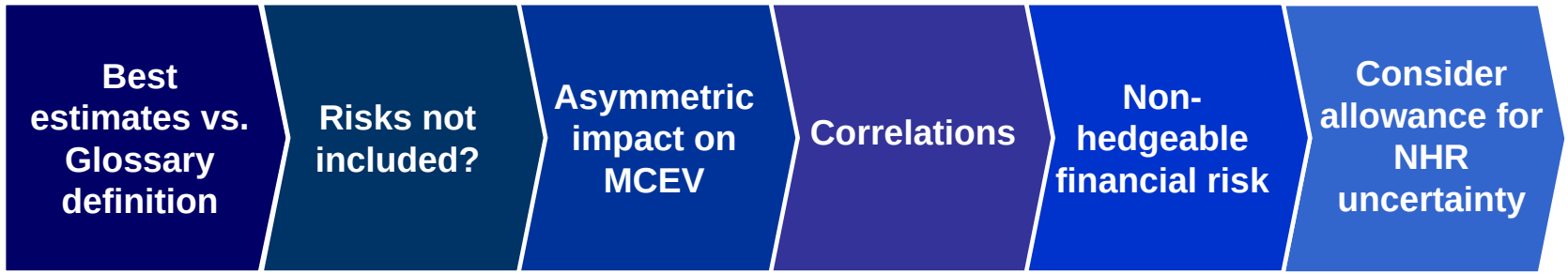
Compliance with MCEV Principles for non-hedgeable risk – a six step process



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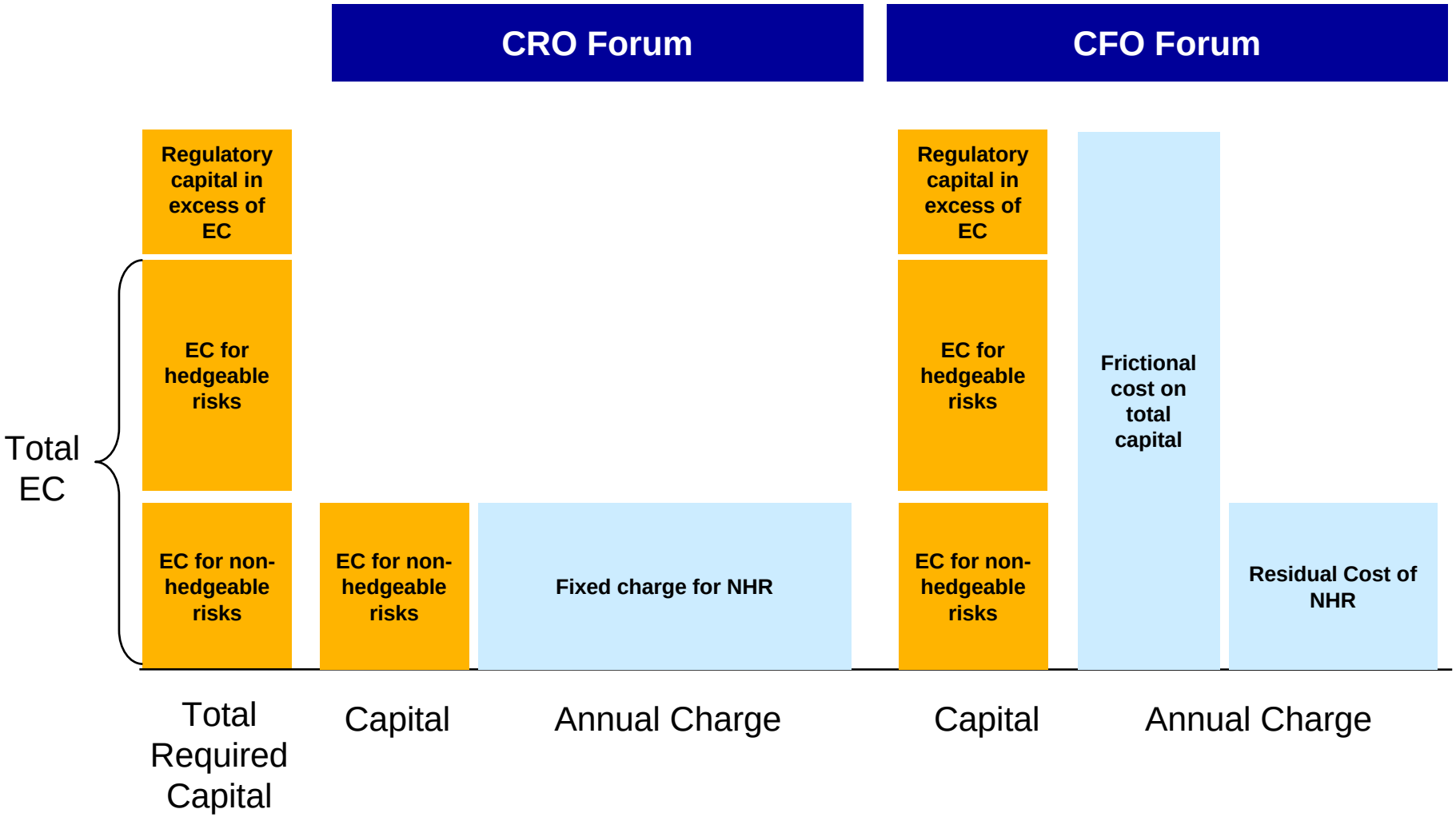
Reconciliation between the CRO and CFO Forum approaches



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Presentation of MCEV analysis of earnings

	Earnings on MCEV analysis			
	Free Surplus	Required Capital	VIF	MCEV
Opening *MCEV* Opening adjustments Adjusted opening *MCEV*				
New business contribution Existing business contribution (*reference rate*) Existing business contribution (in excess of *reference rate*) Transfers from VIF and *required capital* to free surplus Experience variances Assumptions changes Other operating variance				
Operating *MCEV* earnings				
Economic variances Other non operating variance				
Total *MCEV* earnings Closing Adjustments Closing *MCEV*				

Source: Appendix A, CFO Forum MCEV Principles

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Treatment of future flexible policyholder crediting rates is a very important issue

- On a market-consistent basis, the “average” asset default cost is substantially larger than real world expectations
- The table below illustrates two potential MCEV situations:
  1) Company strategy is to set credited rate based on real world assumptions
  2) Company has strategy and ability to deduct all actual default costs

	Traditional Real World EV	MCEV – No Asset Risk to Policyholder	MCEV – All Asset Risk to Policyholder
Gross Earned Rate	6.00%	5.30%	5.30%
Assumed Default	(0.20)	0.00	0.00
Net Earned Rate	5.80%	5.30%	5.30%
Spread	(2.00)	(1.50)	(2.00)
Credited Rate	3.80%	3.80%	3.30%

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Companies have taken different approaches to flexible policyholder crediting rates

- Practice is not entirely consistent in North America
  - In some cases, this reflects differences in the way the business is managed
- Among the few companies who have reported MCEV values, we have seen the following methodologies:
  - Assume future crediting based on real world assumptions (no asset risk in excess of expected transferred to policyholder)
  - Asset risk transferred to policyholder via lower credited rate
  - A portion of asset credit risk is transferred to policyholders
  - In all cases, minimum interest rate guarantees may result in spread compression

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Companies have taken different approaches to flexible policyholder crediting rates – cont.

- In some cases, the approach taken varies based on whether a new money (prospective) vs. a portfolio (retrospective) approach is used to set credited rates
  - Portfolio (retrospective) approach akin to participating insurance
- Competitor credited rates and the resulting effect on dynamic lapse assumptions are also important
  - Would all competitors pass asset risks to policyholders?
- US companies that have implemented or are in the process of implementing MCEV are currently struggling with these issues
  - One company has essentially withdrawn from the fixed annuity market
  - Some companies do not believe/understand the results and have not made changes to their pricing

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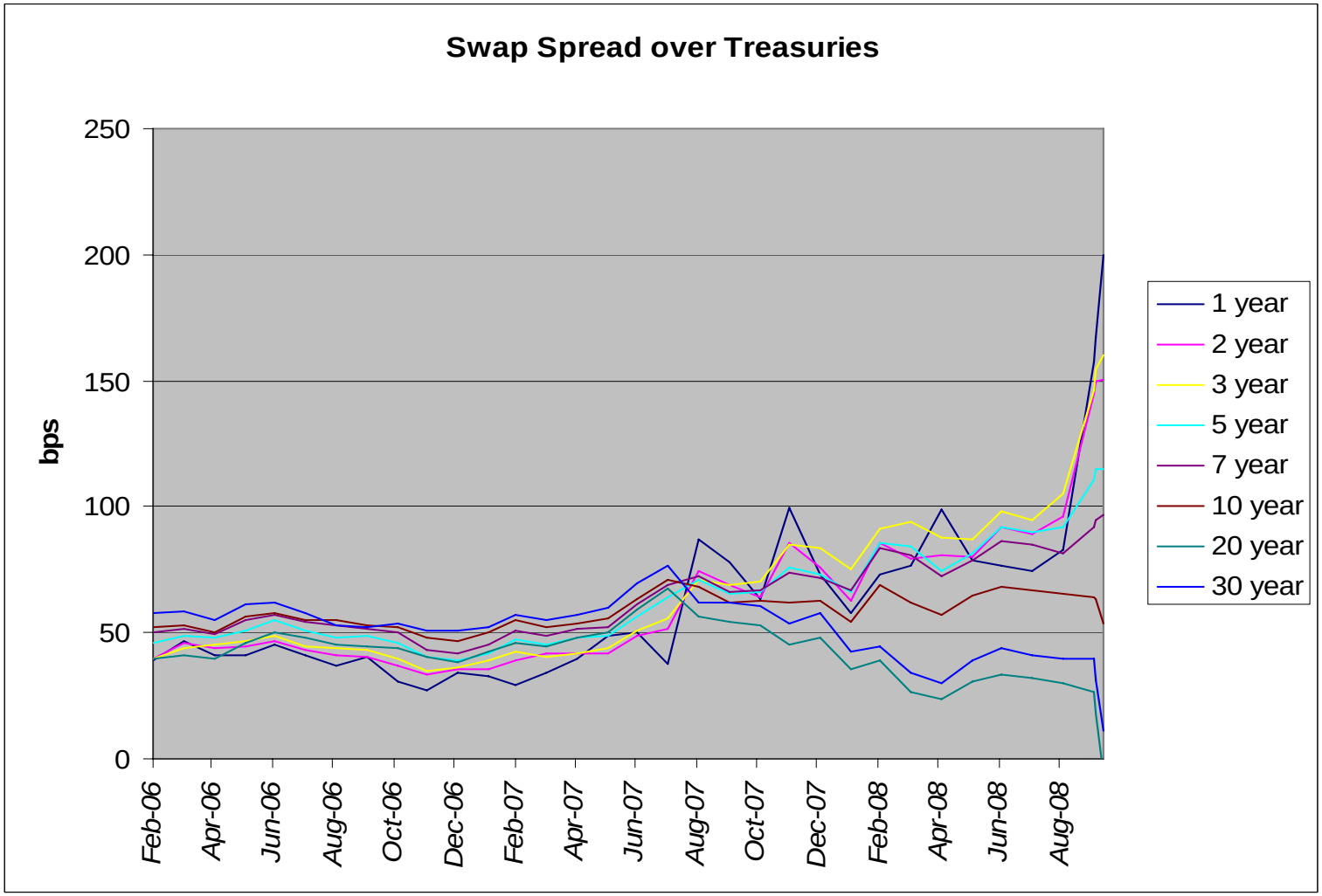
Swap spreads have increased recently so the issue has not been as significant



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MCEV implications for North American products and companies are numerous

- Recap
  - Assets earn swap rate (bad, unless assets are negative then good)
  - Profits discounted at swap rate (good, unless unprofitable then bad)
  - “Cost of capital” reduces to frictional investment expense and tax costs (good)
  - Allowance for non-hedgeable risk (bad)
- MCEV can have significantly different impacts on EV and VNB by company depending on several factors including:
  - Product mix
  - Split of fixed vs. variable/segregated fund business
  - Level of guarantees
  - Amount of asset risk (e.g., credit quality of assets)

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MCEV profit margin effects we have observed on typical North American products

- **Term Insurance**
  - Margins increase, as lower discount rate (and lower cost of capital) dominates lower earned rate on assets
  - Products with longer term periods (but not long enough to require significant reserves) benefit most
- **SPIA**
  - Margins decrease a lot, when asset risk premiums removed
- **Fixed Annuities**
  - Varies depending on whether asset risk is transferred to policyholders
- **Variable Annuities/Segregated Funds**
  - Little change for basic product, but large increase in cost of guarantees
- **Universal Life/Variable Universal Life**
  - Depends on whether UL product's orientation is accumulation or protection, level COI or YRT, how fund values are invested (fixed vs. variable) and level of guarantees
  - In-between term and fixed annuities regarding asset risk and, therefore, results

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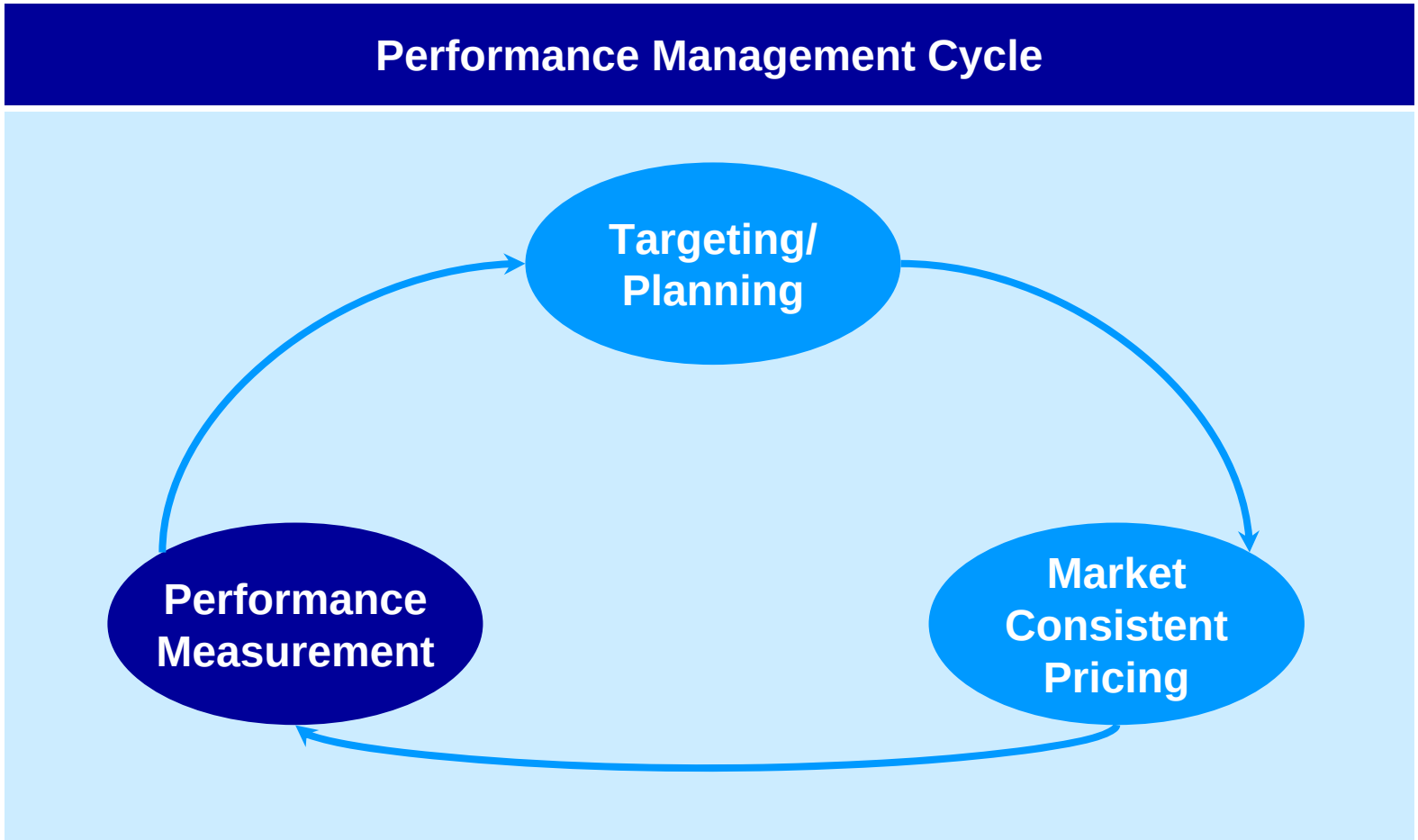
Performance Measurement is one component of the Performance Management Cycle, within a Risk Based Financial Management Framework



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Thank You

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