HEALTH WEALTH CAREER

RISK MANAGEMENT FRAMEWORK

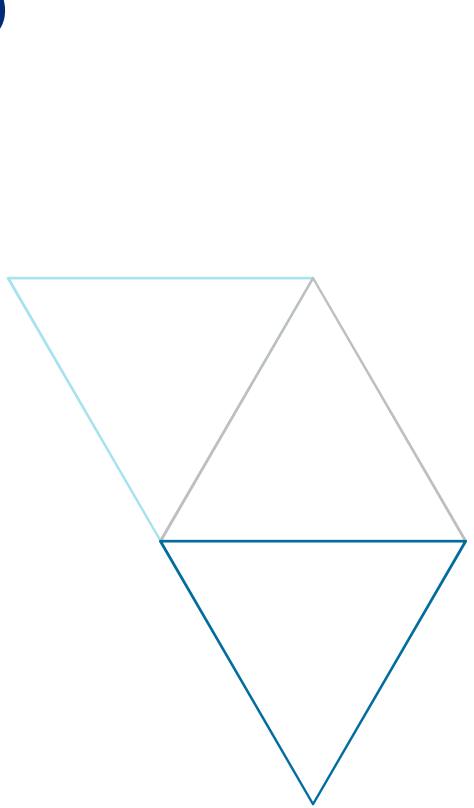
AVON PENSION FUND

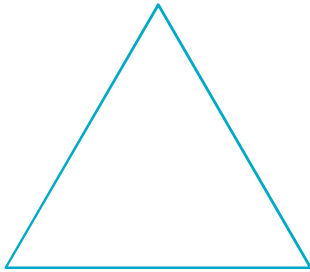
11 SEPTEMBER 2015

Steve Turner
Partner

AGENDA

INTRODUCTION AND OBJECTIVES





RISK CONSIDERATIONS

Risk	Manage, reduce or monitor?	How?
Equity and growth asset risk	Monitor (and potentially reduce) We expect to be rewarded for this risk but could reduce if we get ahead of plan	Performance monitoring + de-risking if affordable
Credit risk	Monitor (and potentially reduce) We expect to be rewarded for this risk but could reduce if we get ahead of plan	Performance monitoring
Active manager risk	Monitor We expect to be rewarded for this risk	Performance monitoring
Interest rate risk	Reduce – two of the larger risks facing the Fund, and arguably unrewarded	Use physical index-linked gilts and in time leveraged index-linked gilts
Inflation		
Longevity risk	Monitor	As part of the actuarial valuation
Covenant risk	Manage and monitor	Develop employer specific investment strategies

PRINCIPLES OF RISK MANAGEMENT

Stable and affordable contribution rate

versus

Achieve investment returns required under current funding arrangements

Objectives are two-fold but conflicting

- Risk needs to be taken in order to achieve returns but risk does not guarantee returns

Need to ensure a reasonable balance between the two objectives

- No need to take the same level of risk when 70% funded (say) than when 100% funded

RISK MANAGEMENT FRAMEWORK

Strategic Rationale

- Will help reduce deficit volatility which is high, through better protection against adverse changes in long-term interest rates and inflation expectations
- Expected return on the investment policy is expected to remain broadly the same given proposed initial structure (i.e. no reduction, which is clearly expected to help reduce the deficit over the long-term)

Forward Looking

- Initial emphasis on putting in place “the plumbing” to facilitate future de-risking in a timely fashion, following improvements in the funding level and / or increases in market yields

HOW DO INTEREST RATES AND INFLATION AFFECT LIABILITIES?

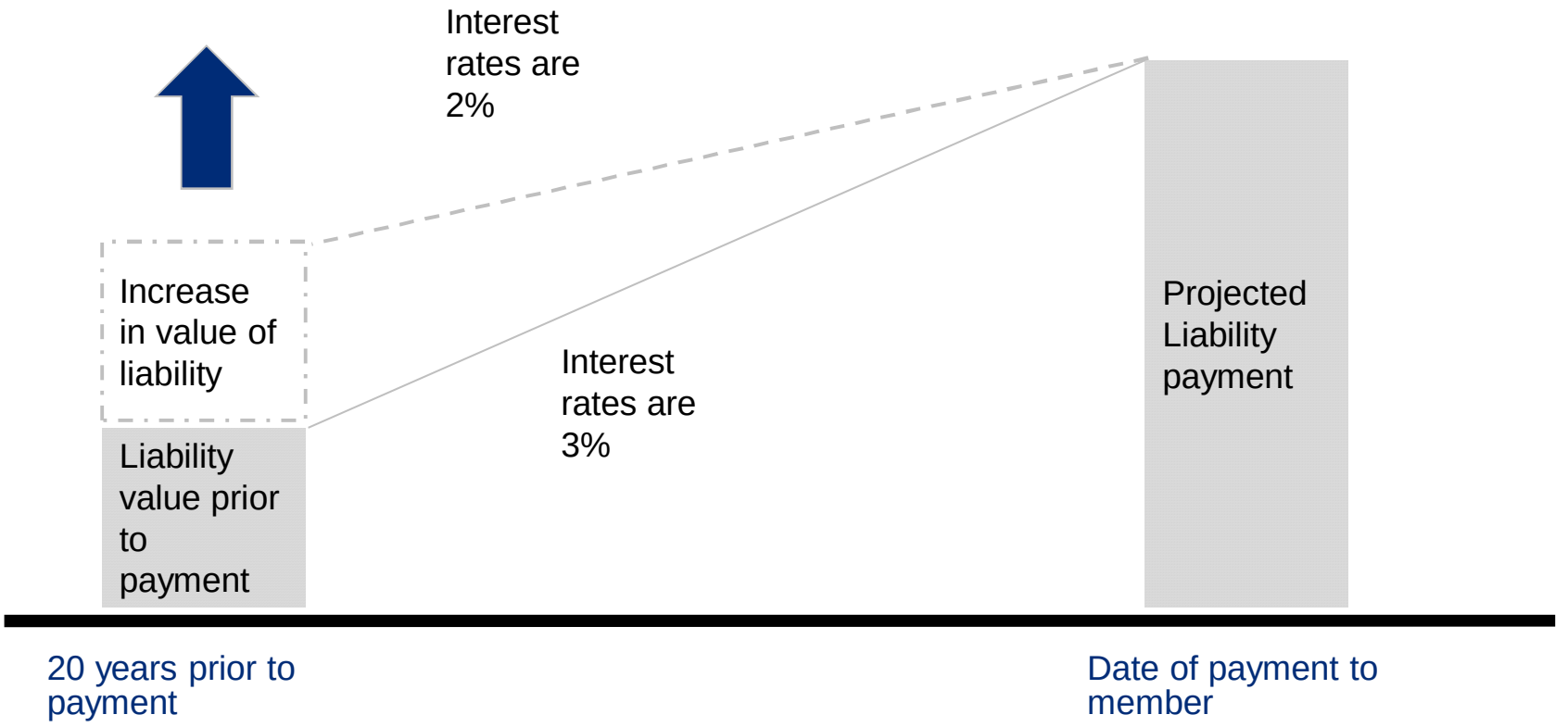
- There is an **inverse** relationship between interest rates and liability values

If long-term interest rates fall, the Fund's discount rate falls → Hence the Fund's liabilities rise → So, all else being equal, the funding level deteriorates

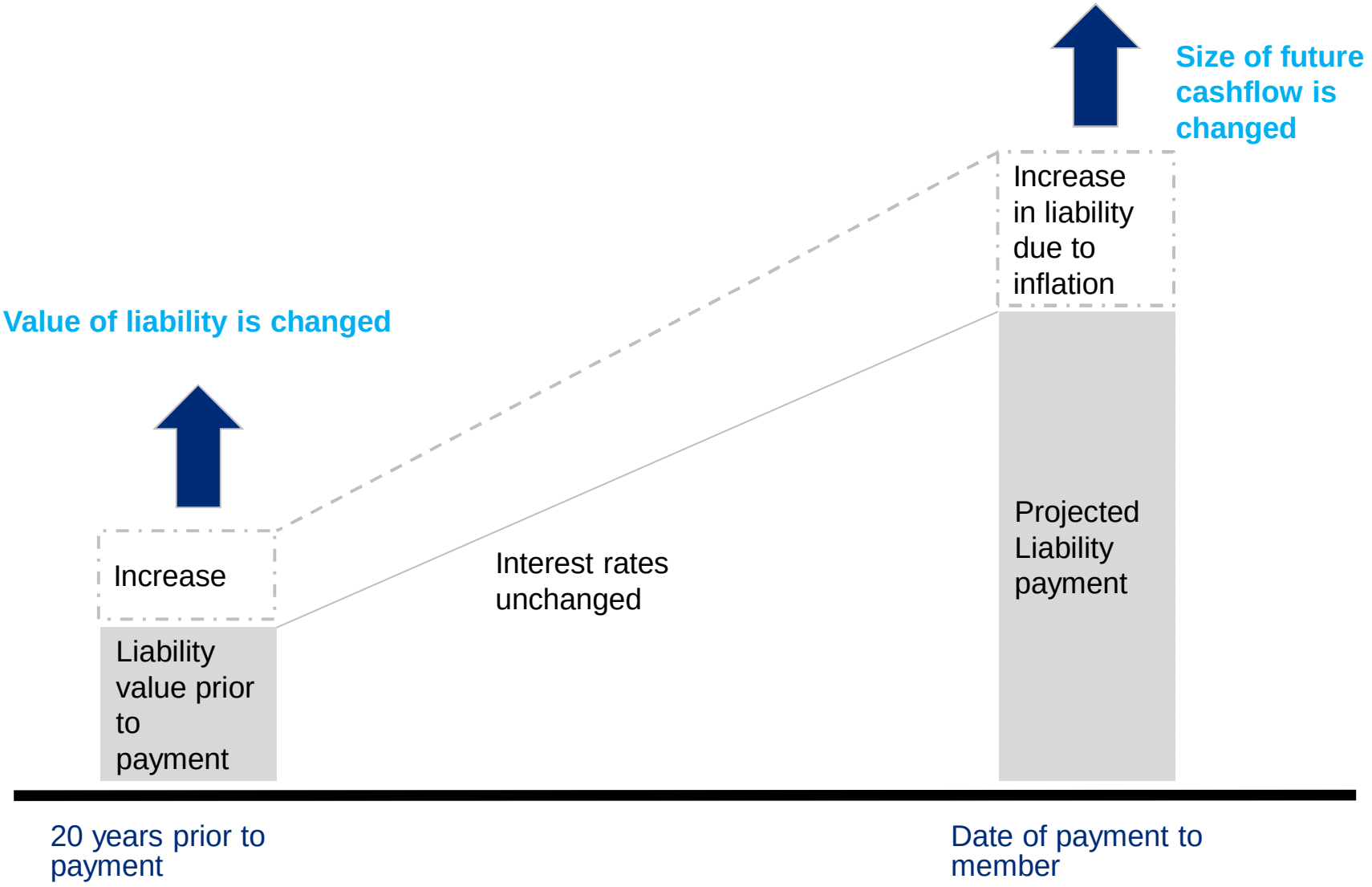
- There is a **direct** relationship between changes in inflation expectations and liability values

HOW DO INTEREST RATES AFFECT LIABILITIES?

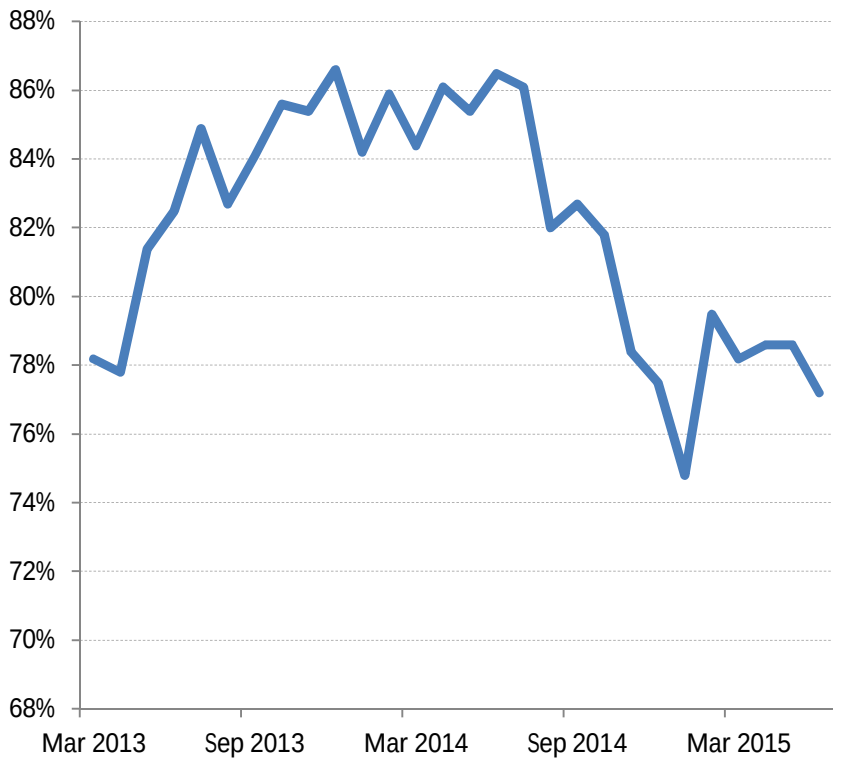
Value of liability is changed (but projected cashflow is not)



HOW DOES INFLATION AFFECT LIABILITIES?



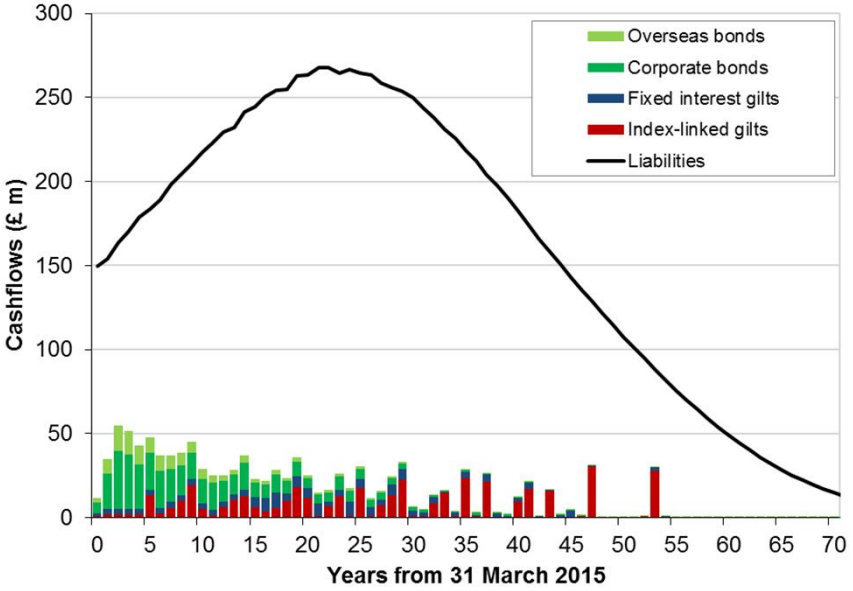
SINCE THE LAST VALUATION
AVON FUNDING LEVEL VOLATILITY



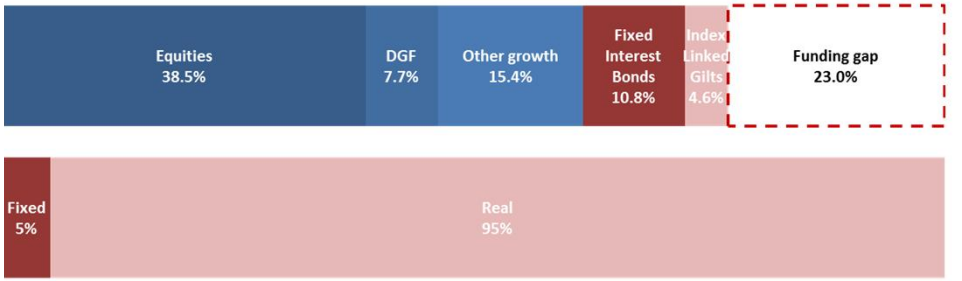
Source: FSM

- Funding level at 30 June 2015 marginally lower than from March 2013 actuarial valuation
- **BUT:** deficit has increased from **£877m** to c. **£1,100m** at 30 June 2015
- Strong returns from Fund's assets and deficit contributions more than offset by impact of falling discount rates.
- Avon's funding level experience in line with the rest of the LGPS
- **Key learning points:**
  - "Investment returns" (i.e. being below expectations) have not been the issue
  - Increase in deficit due a significant asset and liability mis-match
  - Stronger focus needed on liability risk management, combined with achieving strong investment returns

WHY IS THE MISMATCH SO GREAT?



ASSETS: DURATION C. 2 YEARS



LIABILITIES: DURATION C. 18 YEARS

- Value of liabilities linked to changes in expected asset returns / interest rates and inflation.
- Fund does not hold enough index-linked bonds to match the change in value of the liabilities (the “best” matching asset given nature of liabilities).
- Duration is a measure of sensitivity to changes in the value of bonds. The Fund’s liabilities are approximately 8 - 9x more sensitive to changes in interest rates than the Fund’s assets
- This means that on the current funding basis, changes in interest rates and inflation have a significant impact on the funding position and could lead to increased contribution requirements to meet a deficit

INTERACTION WITH 2016 VALUATION

	£m	
	31 March 2013	31 March 2010
Total assets	3,146	2,459
Liabilities:		
Active members	1,528	1,300
Deferred pensioners	749	451
Pensioners	1,745	1,260
Total liabilities	4,023	3,011
Past service surplus / (shortfall)	(876)	(552)
Funding level	78%	82%

Covenant (Affordability)

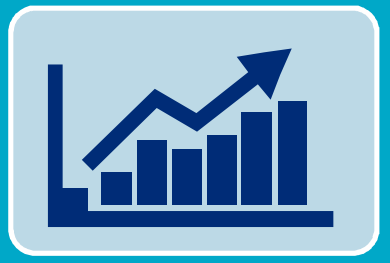
Funding Strategy

Investment Policy

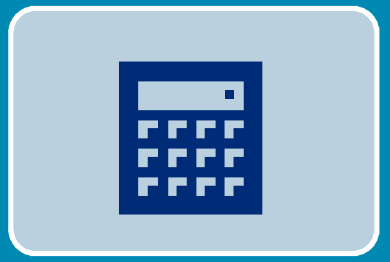
All three aspects are interlinked

More certainty of outcomes (e.g. around deficit volatility and contributions) can be achieved by investing in a more liability aware manner

DISCOUNT RATES
DECIDE ON LEVEL OF PRUDENCE



Liabilities are calculated using a “prudent” expected return on assets.

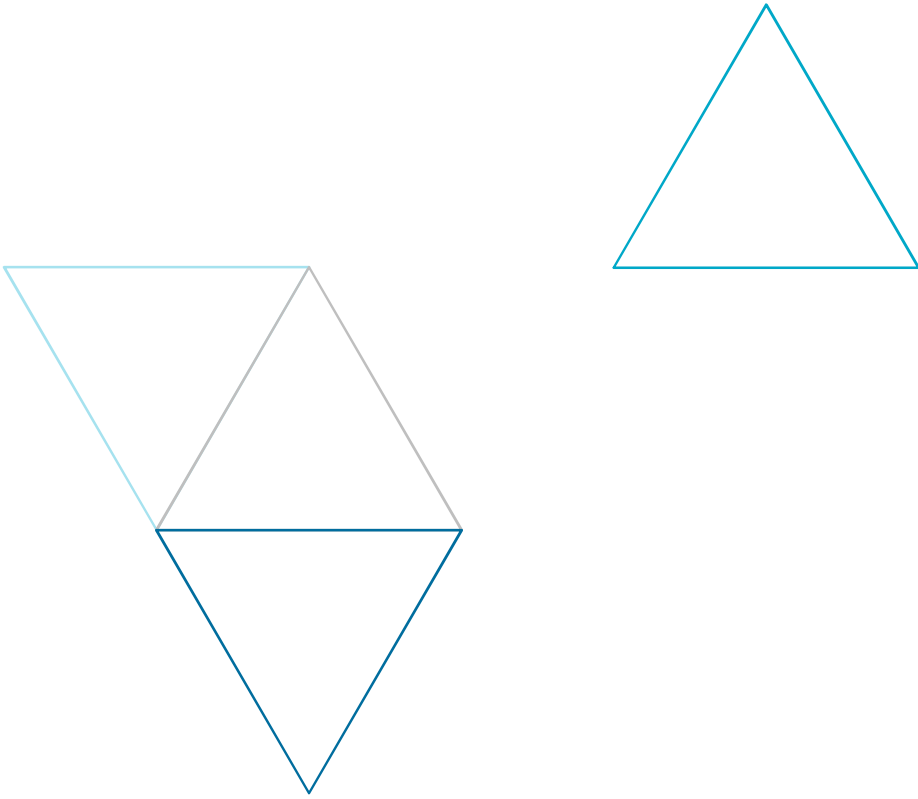


Increasing the certainty over returns means a smaller prudent margin is required

In combination this means:

- Lower value placed on liabilities
- Lower deficit
- More certain outcome

RISK MANAGEMENT OPTIONS



THE KEY RISK MANAGEMENT OPTIONS

Make the physical bond holdings more efficient	• Better match assets and liabilities to reduce volatility of the funding position • Use current government bond allocation to do this and retain growth assets (needed to provide returns to meet cost of benefits and remove deficit).
Use of leverage	• Put pragmatic plan in place to move from current level of liability protection to improved position by using leverage (building up over three years, but accelerating if market conditions are attractive) • And then on to longer-term target (suggested at 50%).
Employer specific strategies	• Potentially a longer term development – will be considered at a future meeting • Introduce flexibility for employers to align strategy with covenant and tolerance for volatility • Specific cashflow driven strategy for “orphan” / corporate-bond basis liabilities to minimise volatility

PLAN TO IMPROVE MATCHING ASSETS

Make the bond portfolio more efficient

STABILISING ASSET	BENCHMARK ALLOCATION	ROLE
Index-Linked Gilts	6%	Match for inflation characteristics
Fixed Interest Gilts	3%	Small allocation and limited link to majority of liabilities. No contribution to excess return. Propose moving to index-linked gilts
Overseas Government Bonds	3%	Small allocation and very limited link to majority of liabilities. No contribution to excess return. Propose moving to index-linked gilts
Corporate Bonds	8%	Contributes to asset returns - retain

Proposal:

1. Move Fixed-Interest Gilts and Overseas Government Bonds to Index-Linked gilts to provide more liability protection (exact transfer process to be agreed). No reduction in expected return.
2. Put plan in place to improve protection from these gilts by moving to leveraged version over next three years (with a trigger in place to complete switch if real yield above CPI is at least 1%).

WHAT IS LEVERAGE?

Make the bond portfolio more efficient

Funded Exposure

- It is said that the position is funded (or unleveraged) if the amount of assets invested in the hedging portfolio is backing an equivalent amount of risk exposure.
- e.g. £100 of collateral is hedging £100 of risk.

Unfunded Exposure

- If the amount of collateral invested in the hedging portfolio is less than the equivalent amount of risk being hedged then the hedging portfolio is said to be geared.
- e.g. £100 of collateral hedging £300 of risk.

Leverage can be used to "free up" assets to use elsewhere in the portfolio while still hedging a greater proportion of the liabilities; it is implemented using derivatives.

NEW RISKS INTRODUCED AS A RESULT OF USING LEVERAGE

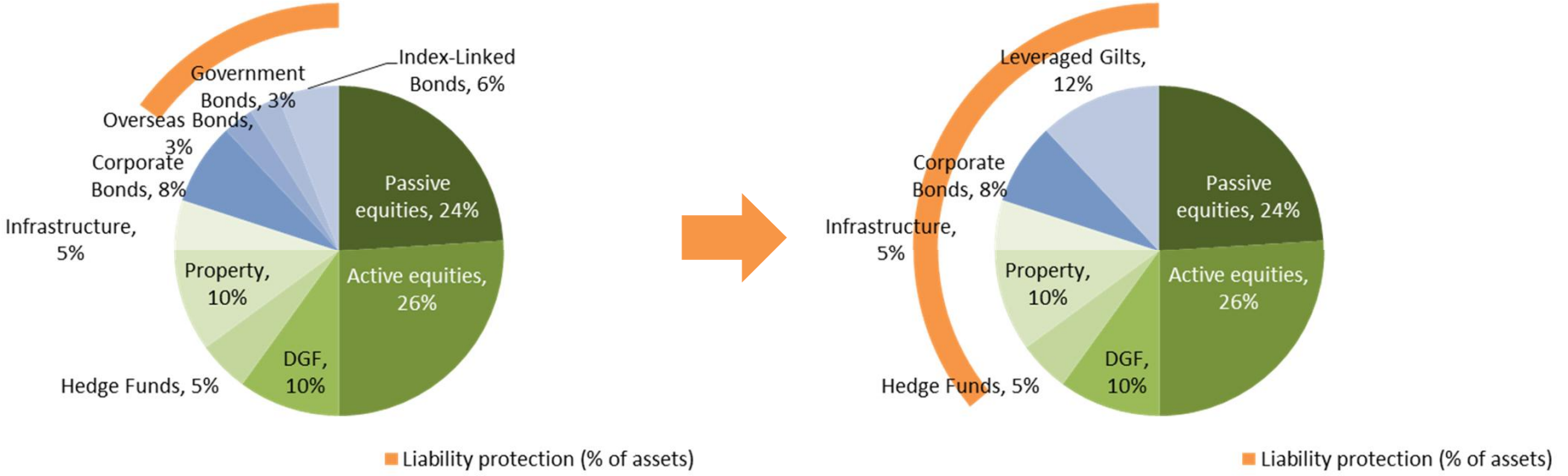
Make the bond portfolio more efficient

Counterparty and manager risk	• Default of counterparty bank may lead to losses • Significantly mitigated through collateralisation, but not eliminated • Process managed by the fund manager
Funding	• Pension schemes obligation to pay a cash (LIBOR) rate with interest rate swaps and repo rate with repurchase agreement • LIBOR cannot be generated without taking risk
Valuation	• Potential for basis risk between assets held by pension scheme (e.g. swaps) and yields used to value the liabilities (i.e. gilts or corporate bonds) • Some level of mismatch vs. the liabilities is inevitable as it may not be possible to find assets that are a perfect match for the liabilities
Liquidity	• Liquidity can be low at times (particularly for inflation swaps) and transaction costs have increased in both physical and synthetic markets
Regret	• Unrealistic to expect sustained and significant increases in long-term gilt yields • Consider trigger mechanisms to hedge at acceptable levels
Leverage	• Profits or losses will vary with changes in interest rates and inflation • May require the transferring of assets from another portfolio to the hedging mandate so that collateral can be posted by the pension scheme to the counterparty banks

Majority of risks can be mitigated through a combination of holding collateral, diversification of counterparty exposure and providing limits on leverage allowed

IMPROVING MATCHING
INITIAL TARGET (NEXT THREE YEARS)

Make the bond portfolio more efficient



Strategy	Current	Initial target
Liability protection (% of assets)	15% of assets* (18.5% when switched to ILG)	36%
Best estimate return (% p.a.)	6.0%	6.0%
Illustrative discount rate (% p.a.)	4.3%	4.5% ↑
One year deficit risk	£1.0bn	£0.9bn ↓

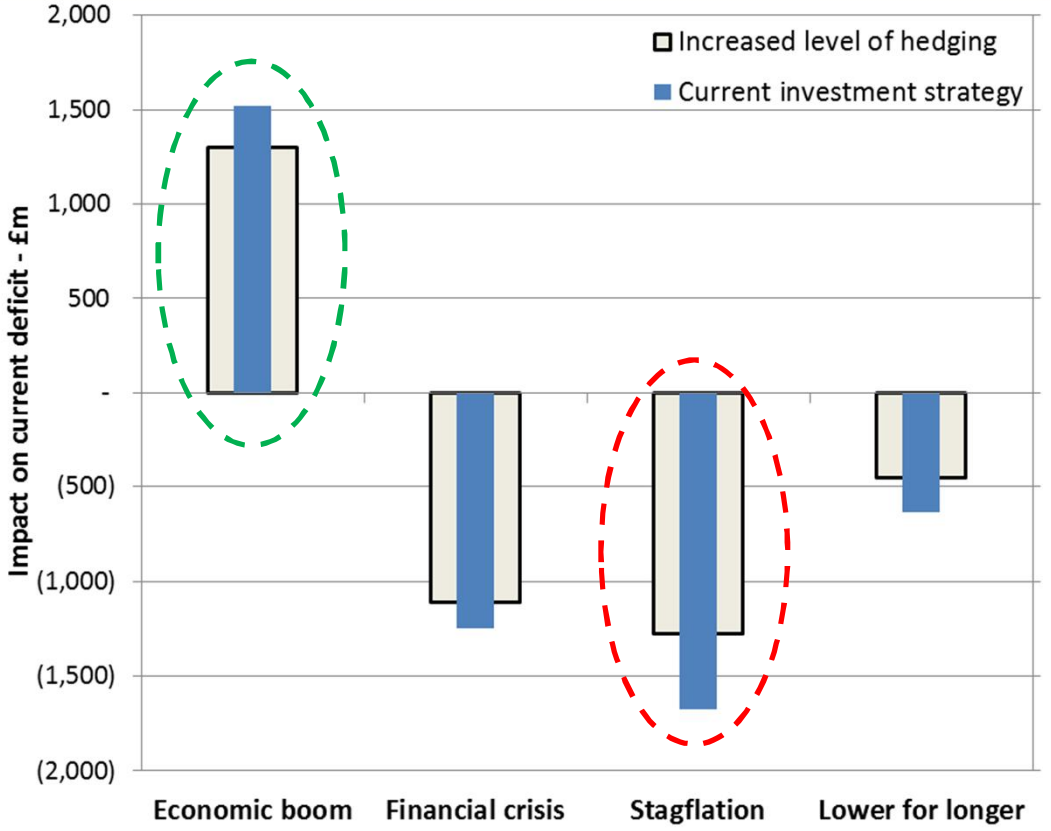
*Higher level of liability protection than bond holding, as bonds held are of slightly longer duration that liabilities

INCREASE IN DISCOUNT RATE POSSIBLE BECAUSE GREATER CERTAINTY ALLOWS PRUDENCE TO BE RELEASED

IMPACT OF IMPROVED PROTECTION

Make the bond portfolio more efficient

Impact on deficit of increase in hedging



Protection in downside scenarios

Some upside given up in "boom" times

More stable position

More certainty of outcomes

In an **economic boom**, the liabilities and (bond) assets are both expected to fall; as the liability protection is not 100%, liabilities fall by more than the assets do and the deficit falls. Improving liability protection limits this upside to c. £1.3bn (the white bar), whilst under the current allocation the upside is c. £1.5bn (the blue bar)

However, in a **stagflation scenario**, liabilities rise more than assets and the deficit rises; this increase in deficit is smaller when better liability protection is in place (and so the impact on contribution requirements is limited).

IMPLEMENT A FLIGHTPATH

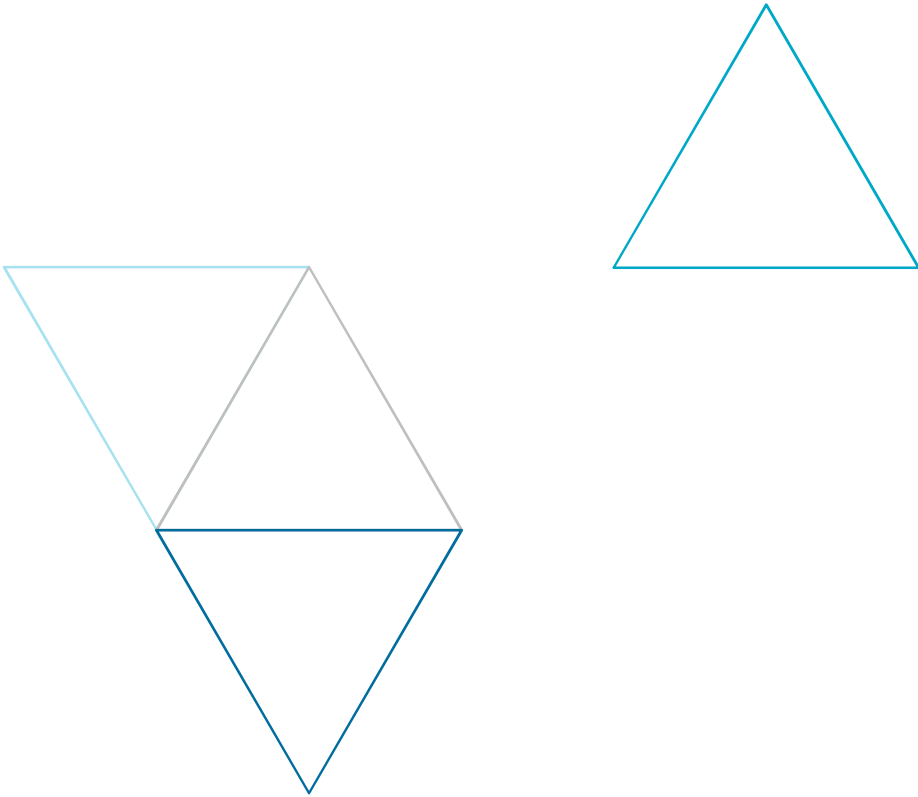
Implement a flightpath

1.
   - Propose moving Fixed Interest and Overseas Government bonds to Index-Linked gilt holdings (increasing protection from current 15% of assets to c. 18.5%, as index-linked gilts are a better match for liabilities.

2.
   - And over a three-year period increase the level of liability protection from 18.5% to 36% by quarterly switches of 1% of total Fund assets from index-linked gilts to leveraged index-linked gilts
   - Phased approach helps diversify timing risk of the move and provides certainty that risk reduction will be achieved

3.
   - With a trigger that if the Fund can buy liability protection with an expected return of at least 1% p.a. above CPI then implement the switch to 36% liability protection immediately.
   - Use of trigger helps takes advantage of potential market opportunity

PROPOSED RISK MANAGEMENT FRAMEWORK



SUMMARY

OBJECTIVE	• Achieve a fully funded position by 2033 (in line with the current deficit recovery plan) or earlier • Increase certainty of outcomes and contributions but maintain sufficient real returns to achieve the objective
HOW TO ACHIEVE THIS	• Make the bond portfolio more efficient • Have a plan to remove risk over time when affordable • Develop alternative strategies for different employers
IMMEDIATE CHANGE	• Use existing government bonds to avoid reducing expected returns • Switch fixed interest and overseas government bonds to index-linked gilts for better liability protection
NEXT THREE YEARS	• Increase liability protection by switching 1% of Fund assets from index-linked gilts into leveraged gilts each quarter (to spread timing) • Accelerate switch if a real yield of CPI + 1% is available.
LONG TERM PLAN	• Funding level based triggers to increase liability protection to 50% when affordable • Cashflow driven strategy for selective employers / liabilities

RISK CONSIDERATIONS

Risk	Manage, reduce or monitor?	How?
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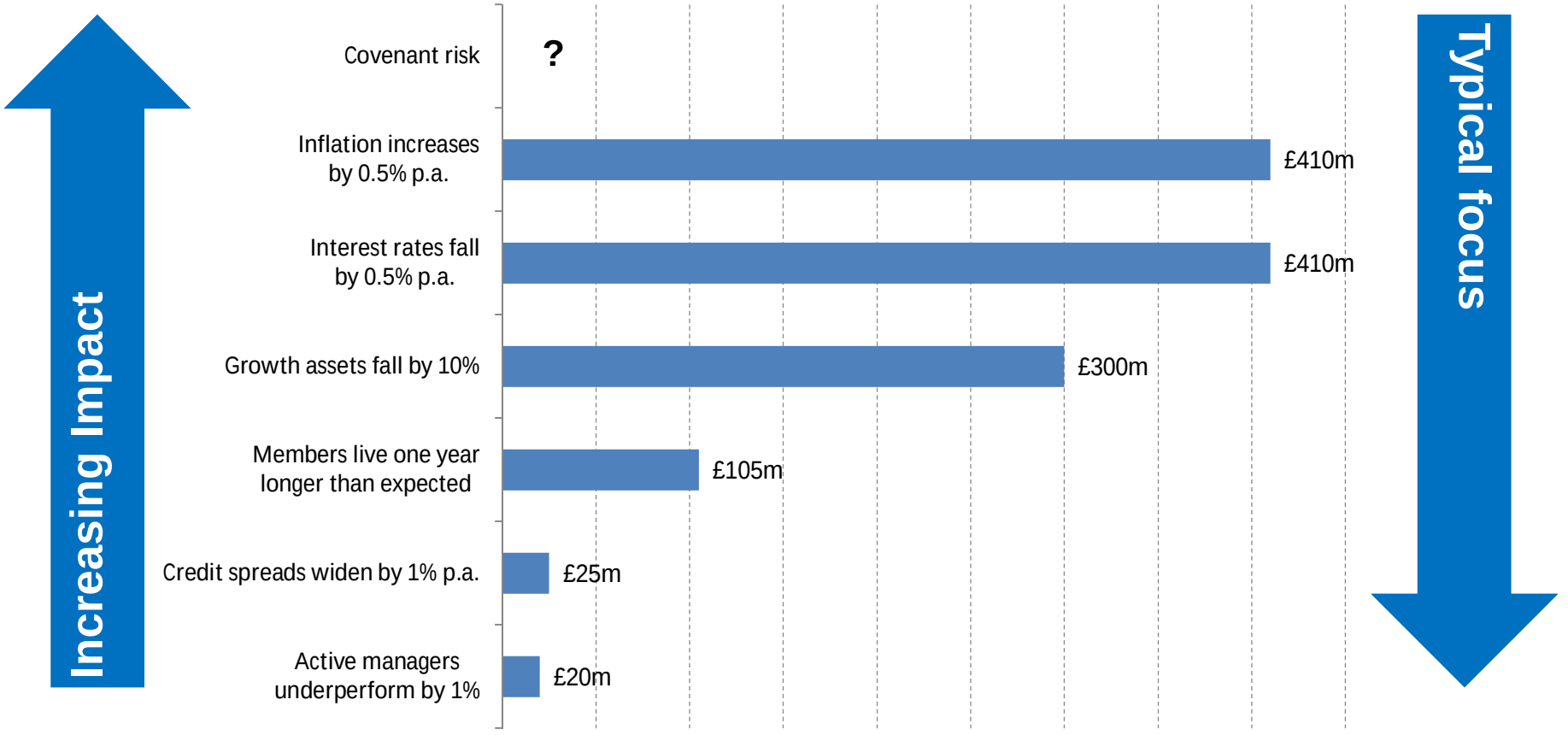
WHAT REALLY MATTERS?
IMPACT ON DEFICIT – CURRENT BASIS



Approximate figures based on 2013 valuation sensitivities and 30 June 2015 estimated funding position.

WHEN TO HEDGE

- Options for implementing increase in hedging from 12% in conventional index-linked gilts to use leveraged gilts

IMMEDIATE EXECUTION

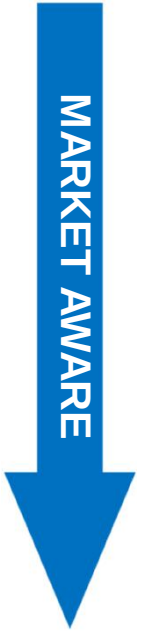
Immediate switch from the current to the target strategy, irrespective of the price (e.g. yield levels)

PHASED OVER TIME

Phase the switching over time by splitting the trade into tranches (e.g. 10 switches of equal sizes). The switches are done irrespective of price.

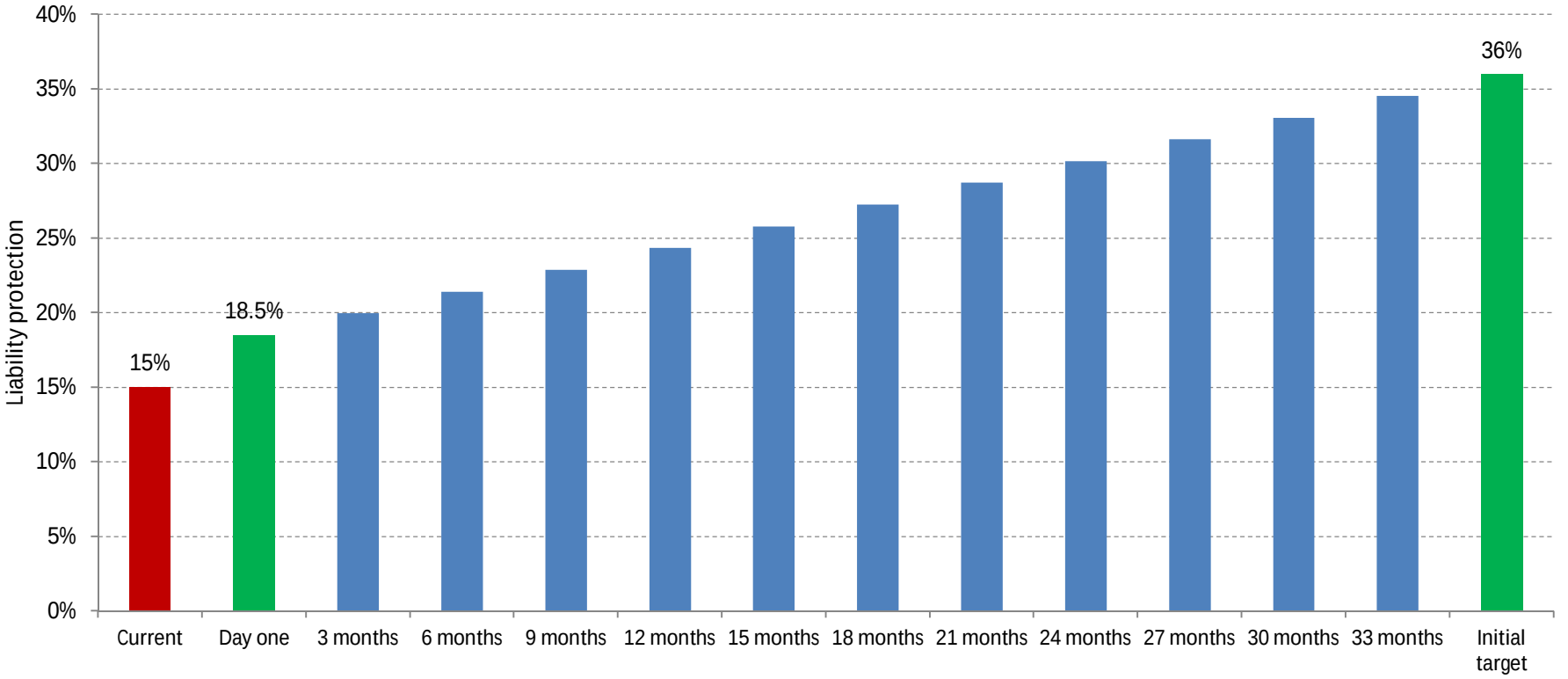
TRIGGER BASED

Set minimum pricing criteria (e.g. trigger level or levels) which, once satisfied, will action switches towards the target strategy. If implemented on their own, run the risk of inaction due to not hitting triggers.



No single right answer – driven by beliefs and risk tolerance. A combination of approaches often adopted in practice. Suggest phasing in increase in liability protection with 12 quarterly switches of 1% of assets (to spread switch over time) plus a pragmatic yield trigger to capture upside.

WHEN TO HEDGE



SWITCH FIXED INTEREST GOVERNMENT BONDS TO INDEX-LINKED GILTS

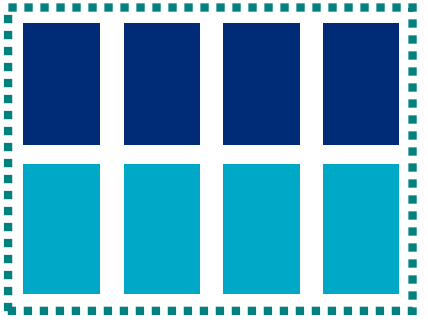
INCREASE LIABILITY PROTECTION THROUGH LEVERAGE (QUARTERLY SWITCHES) – ACCELERATE IF REAL YIELD TRIGGER MET

HOW IMPLEMENT?

Increasingly bespoke

Client-specific Pooled Fund

- A Fund specific, tailored 'pooled fund for a single investor'.
- Only an IMA is required. Other documentation is done by the manager.
- Typically set up as Dublin registered Qualified Investor Fund ("QIF").



Multi-client Pooled Funds

- LDI providers offer a variety of ranges of pooled funds. These include
  - Gilt-based LDI funds (real and nominal, various durations)
  - Swap-based LDI funds (real and nominal, various durations)
  - Dynamic LDI funds (instrument selection / curve positioning)

Simplicity

Can be comfortably implemented using pooled funds. While liability protection remains at 50% or lower; most straightforward approach.

Not concerned over manager concentration risk at these levels and initially using 12% of assets (currently all held with one manager anyway); re-evaluate this if and when increasing further (and consider if a bespoke pooled fund is more efficient).

Currently use income on segregated bond holdings to pay benefits; this will not be available from pooled leveraged funds, and so disinvestments from elsewhere will be needed.

GOVERNANCE STRUCTURE

Decision making

- Strategic decisions to be confirmed / made by Committee, e.g. level of liability protection to target
- Implementation detail to be agreed by Panel, e.g. broad vehicles to use, use of pooled funds
- Detail on triggers, execution and choice of manager to be delegated to Officers

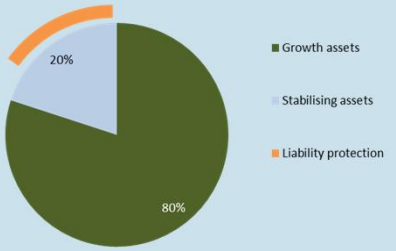
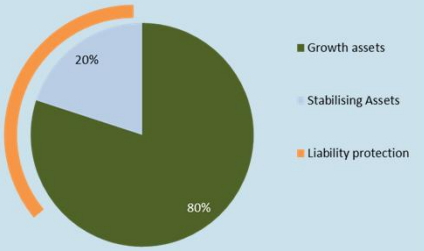
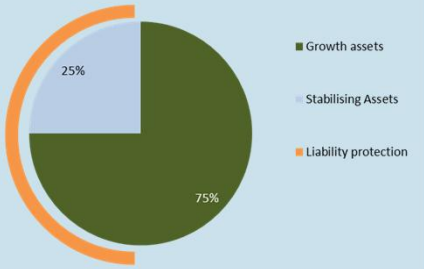
Delegation

- Delegate implementation of agreed triggers and liability protection increases to LDI manager (ensures opportunities captured, and time based triggers implemented to plan)

Monitoring

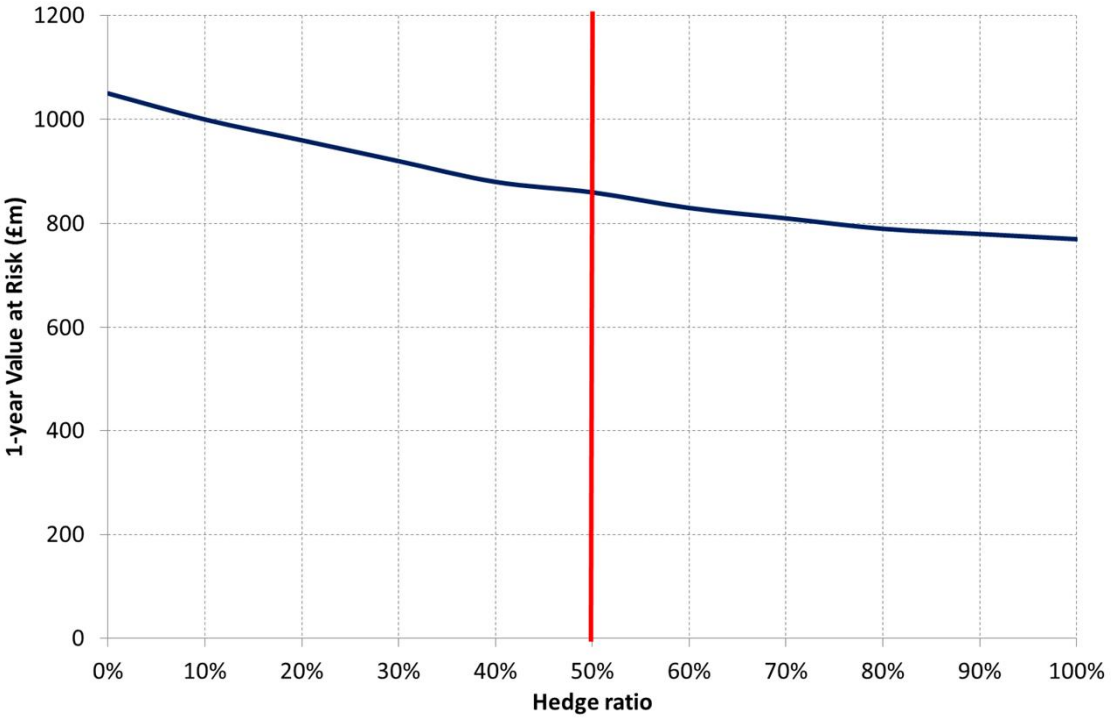
- Limited additional governance requirements once implemented, although reporting likely to be required on the level of hedging in place, and market levels relative to any triggers.

IMPACT ON THE VALUATION

Strategy	Current	Initial target	Long-term (see overleaf)
Asset allocation			
Hedging ratio (of assets)	15% (18.5% when switched to ILG)	36%	50%
Best-estimate return (p.a.)	6.0%	6.0%	5.8%
Illustrative discount rate (p.a.)	4.3%	4.5%	4.5%
One year deficit risk	£1.0bn	£0.9bn	£0.8bn

INCREASE IN HEDGING RATIO THROUGH USE OF LEVERAGE; DISCOUNT RATE INCREASED / RETAINED THROUGH RELEASE OF PRUDENCE

LONG-TERM LIABILITY PROTECTION TARGET



Increasing the hedge ratio to 50% has the greatest impact on risk and hence certainty of outcomes. Increasing the hedge ratio above this level has marginal benefits due to the level of growth asset risk.

Further risk reductions may be achieved by selling growth assets and extending the hedge ratio further (but this would be a longer term consideration).

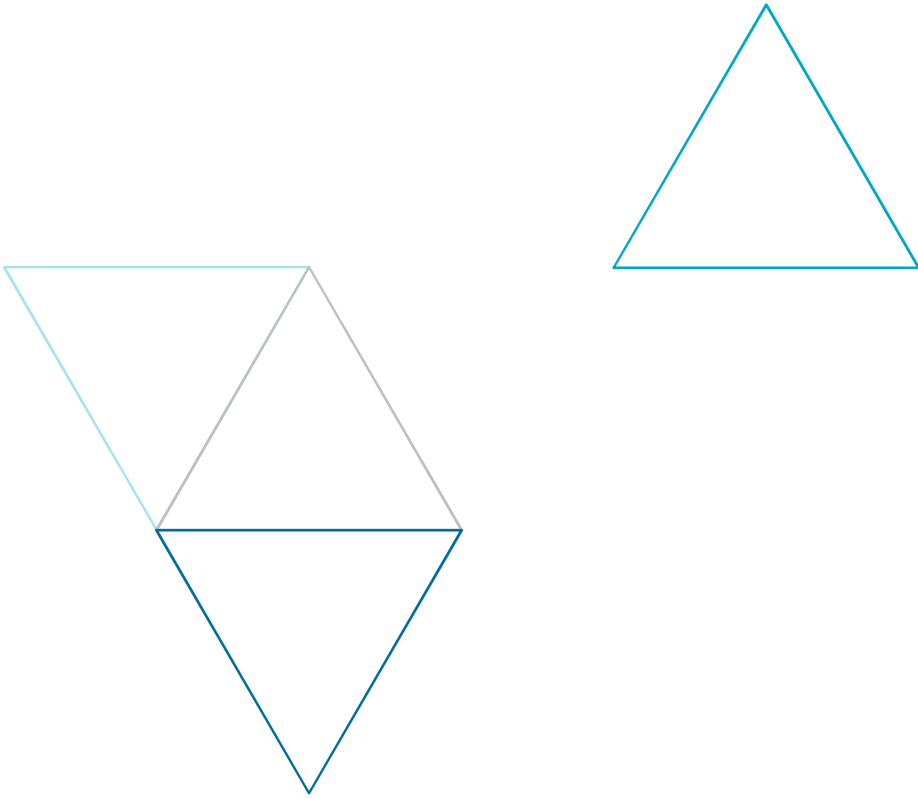
MOVING TO LONG-TERM TARGET

Increasing liability protection from 36% of assets to 50% would require an extra 4.7% of Fund assets to be held in leveraged index-linked gilts (c. £170m)

We would propose assessing the funding position once the interim position has been achieved (i.e. after three years at the latest) and then agreeing a real yield trigger to implement this switch

This would require disinvestment from other assets – potentially those with lower expected returns, e.g. the RLAM corporate bond mandate, or the Fund's Diversified Growth Fund holdings

NEXT STEPS



SUMMARY AND NEXT STEPS

- Significant benefit from “putting a plan in place” to be able to increase the level of liability protection when acceptable to the Fund.
  - Propose switching the current fixed-interest and overseas government bonds (totalling 6% of assets) to index-linked gilts which better match the Fund’s liabilities, and using a combination of time and yield based triggers to switch this combined 12% of assets to provide greater liability protection over the next three years…
  - … with a longer-term plan to increase this to 50%
- Next steps
  - Agree proposal to take to Committee
  - Use Fund specific liability cash-flows to identify broad characteristics of hedging portfolio
  - Agree implementation route (pooled funds are most straight-forward)
  - LDI manager selection decision – combine with passive equities / other form of growth assets in order to facility future de-risking opportunities in a timely fashion
  - Identify specific hedging solution with the appointed manager
  - Ongoing training throughout the process

QUESTIONS?

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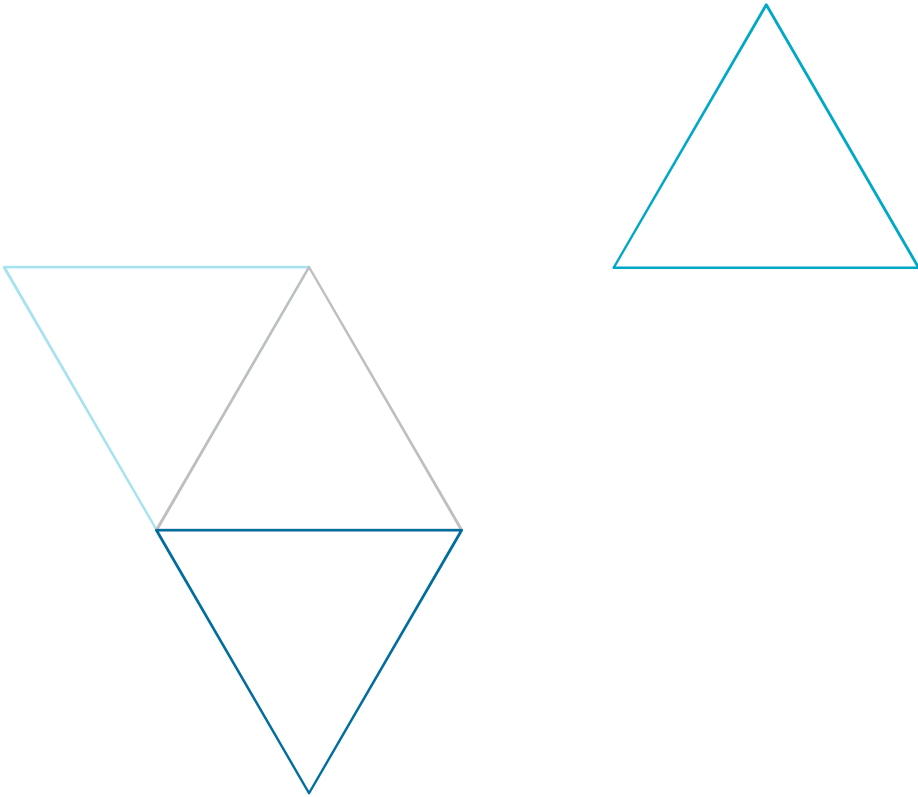
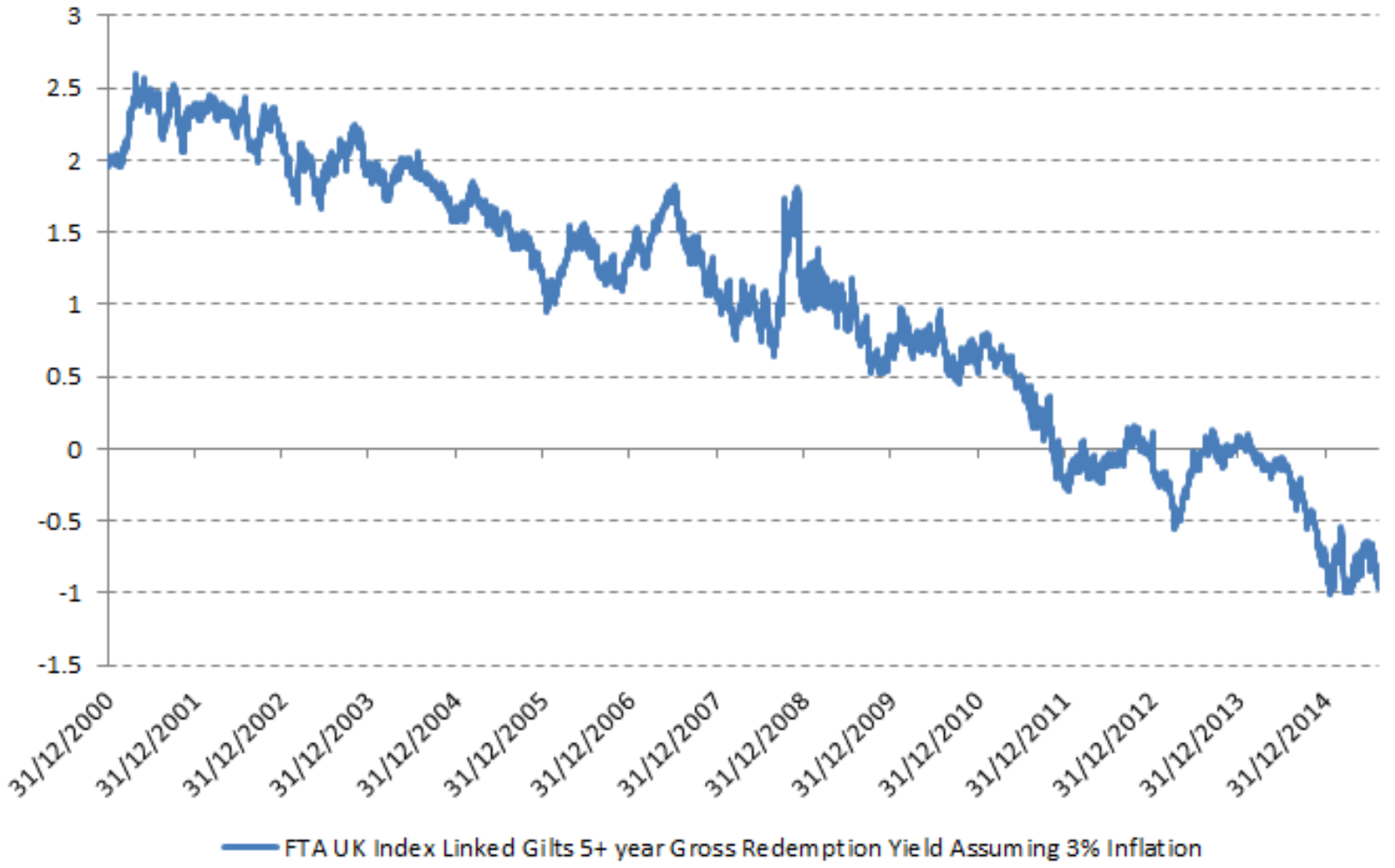
APPENDICES

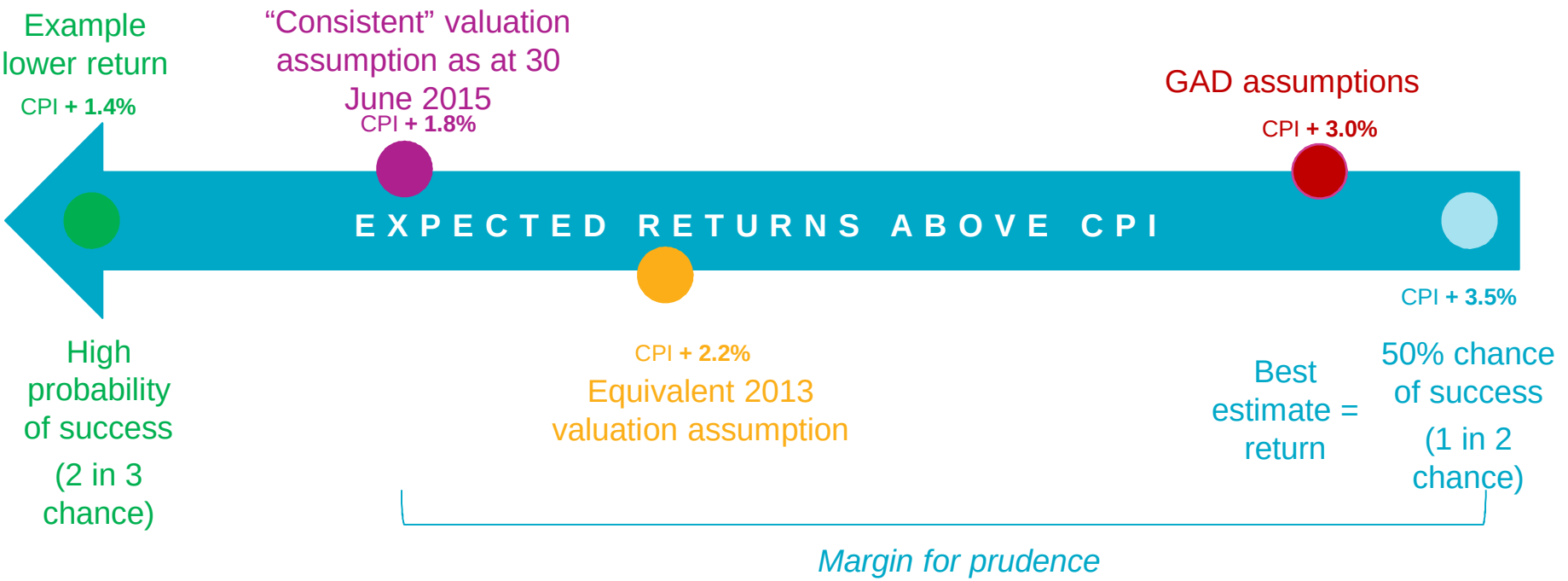


REAL YIELDS OVER THE LAST 15 YEARS



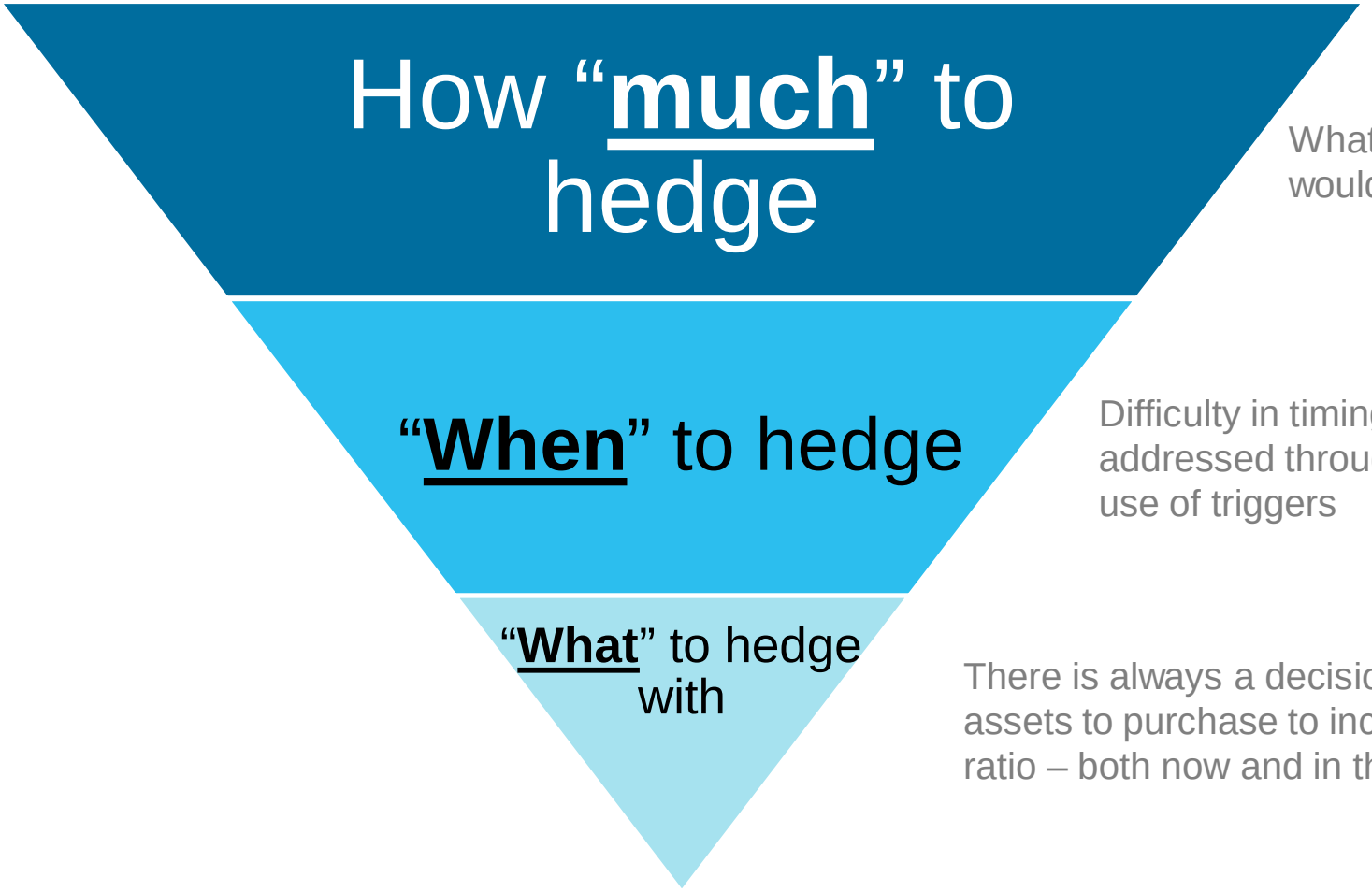
SOURCE: THOMSON REUTERS DATABANK

DISCOUNT RATES
DECIDE ON LEVEL OF PRUDENCE



- Liabilities are calculated using a "prudent" expected return on assets; given the fall in real yields since 2013, a "consistent" approach to defining the discount rate would give a lower expected return relative to CPI inflation.
- Increased certainty over returns means a smaller prudent margin is required
- In combination this means
  - Lower value placed on liabilities
  - Lower deficit
  - More certain outcome

KEY CONSIDERATIONS



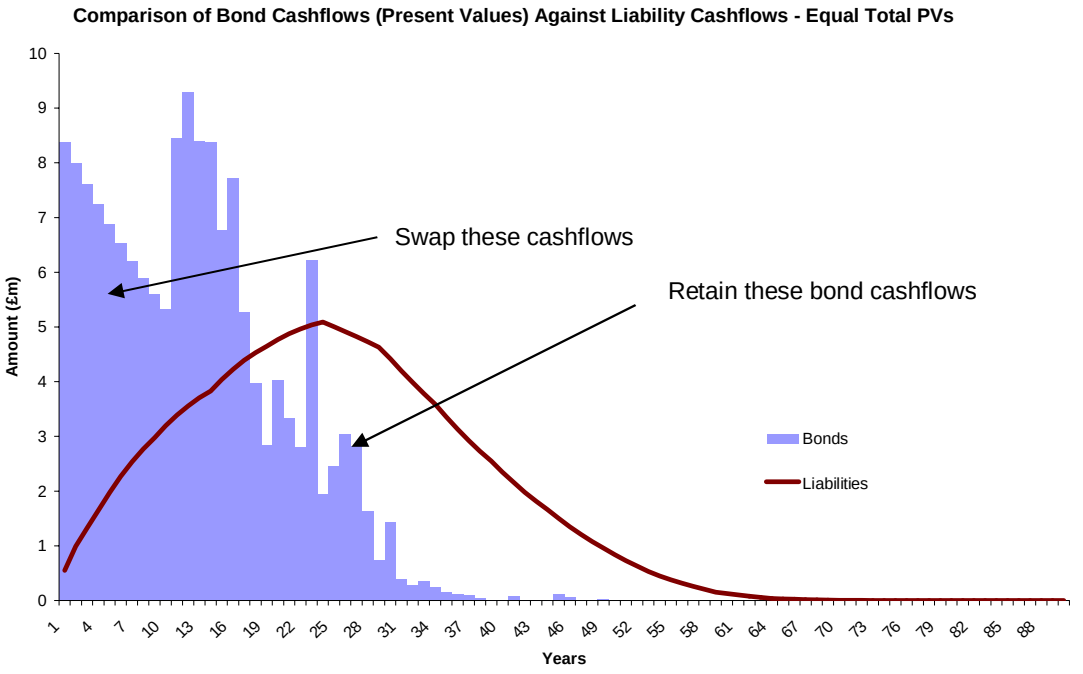
What level of protection would be optimal?

Difficulty in timing decisions can be addressed through phasing and use of triggers

There is always a decision about which assets to purchase to increase the hedge ratio – both now and in the future

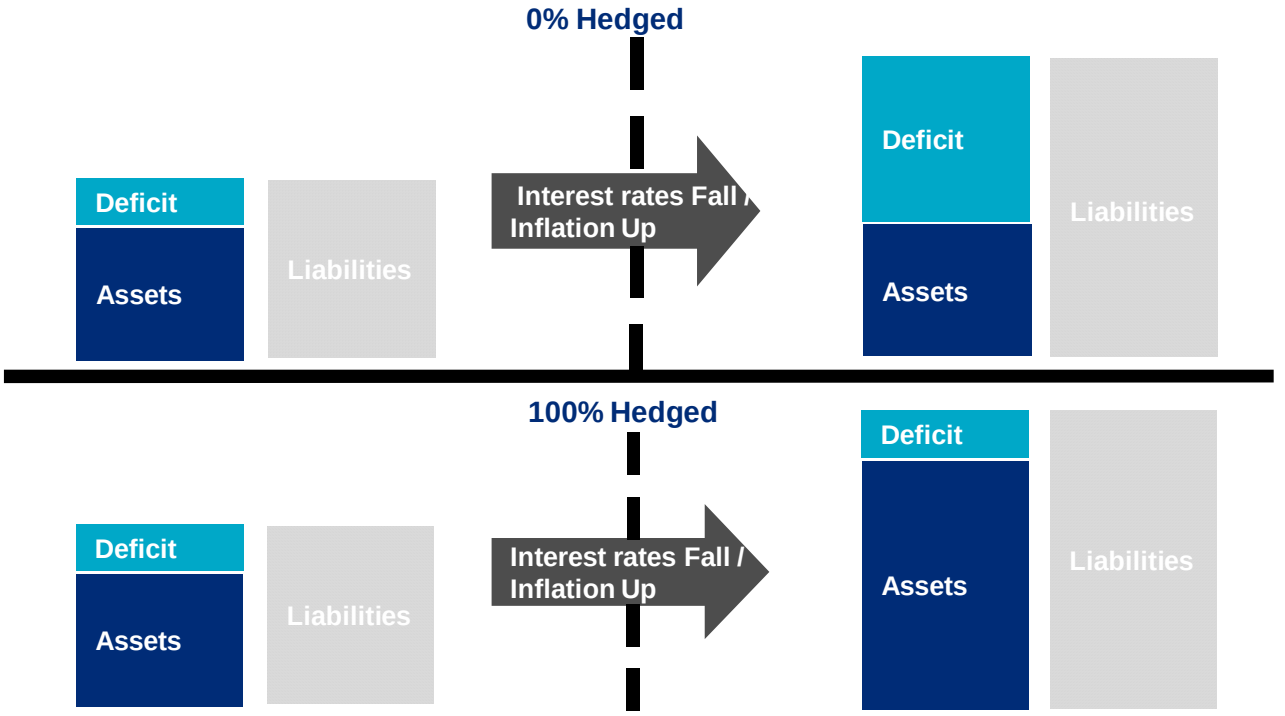
WHY NOT JUST USE BONDS?

- Using only physical bonds does not provide a close match to the Fund's liability cash flows:
  - duration of broad market bonds are not as long as the liabilities, particularly where corporate bonds are used
  - there are 'gaps' in the durations of available bonds
  - the Fund also holds growth assets
- By using derivatives (e.g. swaps or gilt repos – see later) it is possible to efficiently overcome this problem
  - for example, by swapping earlier cash flows for later cash flows



WHAT IS "LIABILITY DRIVEN INVESTMENT"? ONE OPTION TO MANAGE RISKS

Offsetting the impact of movements in interest rates and inflation on the value of the liabilities by holding assets that respond in a similar way



Assets mimic liability movements due to changes in inflation/interest rates by protecting against increases in inflation/falls in interest rates

In practice, the Fund will be limited to buying fixed or RPI-linked assets to hedge the liabilities; whilst it may be possible to buy CPI swaps, liquidity is very poor in these markets.

HOW TO HEDGE

Physical Instruments

- Physical instruments require a capital investment at outset (i.e. funded)
- Liquidity varies by instrument
- Pricing is typically transparent and standard instruments are traded
- Commonly held by pension schemes and generally well understood

Fixed-Interest Gilts | **Corporate Bonds** | **Index-Linked Gilts**

Synthetic / Derivative Instruments

- Can be funded (i.e. capital commitment is made) or unfunded (i.e. geared or leveraged)
- Typically these are Over the Counter ("OTC", i.e. bespoke) although some exchange traded versions also exist
- Liquidity varies by instrument and within each type, some are highly illiquid and could be more illiquid than physicals
- Less transparency on pricing for OTC contracts, although some standard contracts address this
- Can offer more efficient hedging – i.e. more liability hedging per pound invested

Interest Rate Swaps | **Inflation Swaps** | **Gilt repos**

WHAT IS "DURATION"?

"A measure of interest rate sensitivity, with the price of longer duration bonds or liabilities being more sensitive to changes in interest rates"

This therefore explains how a Fund's liabilities will change in response to changes in interest rates

Duration is calculated as:

"The average term (in years) of the payments from a bond/liability taking into account the present value of each payment"

For example, **a 20 year duration means**:

The liabilities will *decrease* in value by 20% if interest rates rise 1%

The liabilities will *increase* in value by 20% if interest rates fall 1%.

IMPORTANT TERMS

- **Interest Rate Swap** – Two parties exchanging two sets of cashflows, usually based on one party paying a “fixed” rate (e.g. 3% p.a.) and the other paying a “floating” rate (e.g. Bank of England Base Rate + 2%)
- **Repurchase Agreement (Repo)** – An agreement to sell a security (usually a bond) to another party with the promise to buy it back at a specified date and price
- **Repo Rate** – The interest rate charged to the seller of the security in a repo
- **Basis Risk** – Risk that arises when an investor aims to hedge a position using an instrument that has an underlying security whose risk is being hedged. For example, a pension fund using bonds to hedge liabilities they do not perfectly match

MAKE TOMORROW, TODAY