



TALENT • HEALTH • RETIREMENT • INVESTMENTS

SURREY COUNTY COUNCIL PENSION FUND TRAINING ON: LIABILITY RISK MANAGEMENT & INFRASTRUCTURE

20 September 2013

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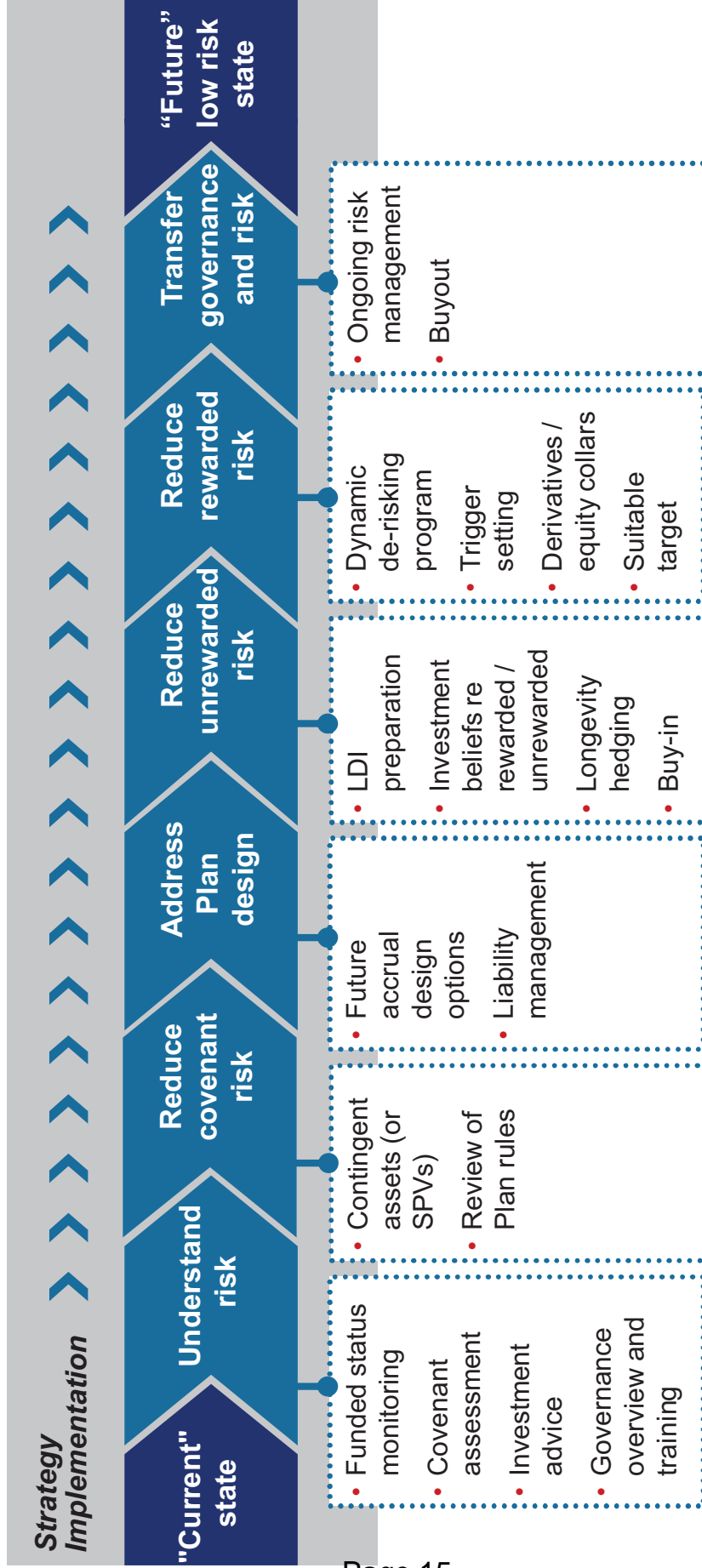
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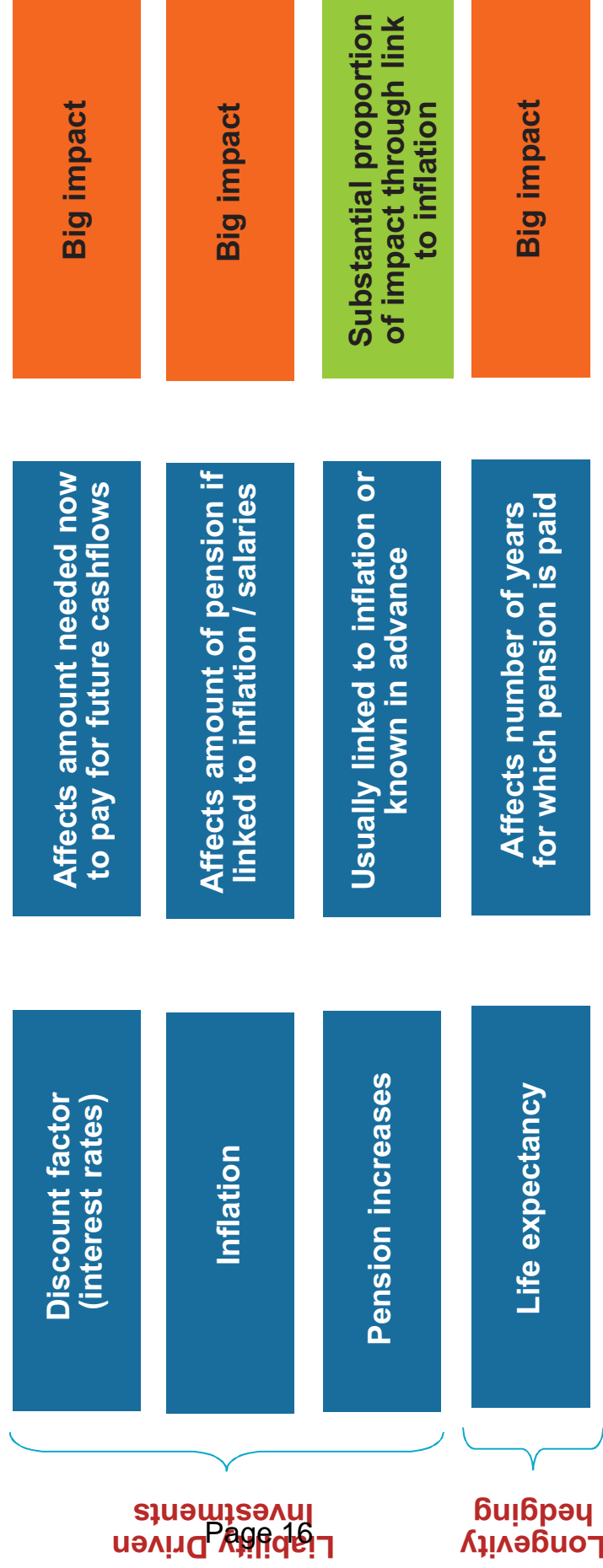
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Stages of defined benefit pension risk management



Understanding the liabilities

Main factors influencing the Fund's liabilities



Liability Driven Investments

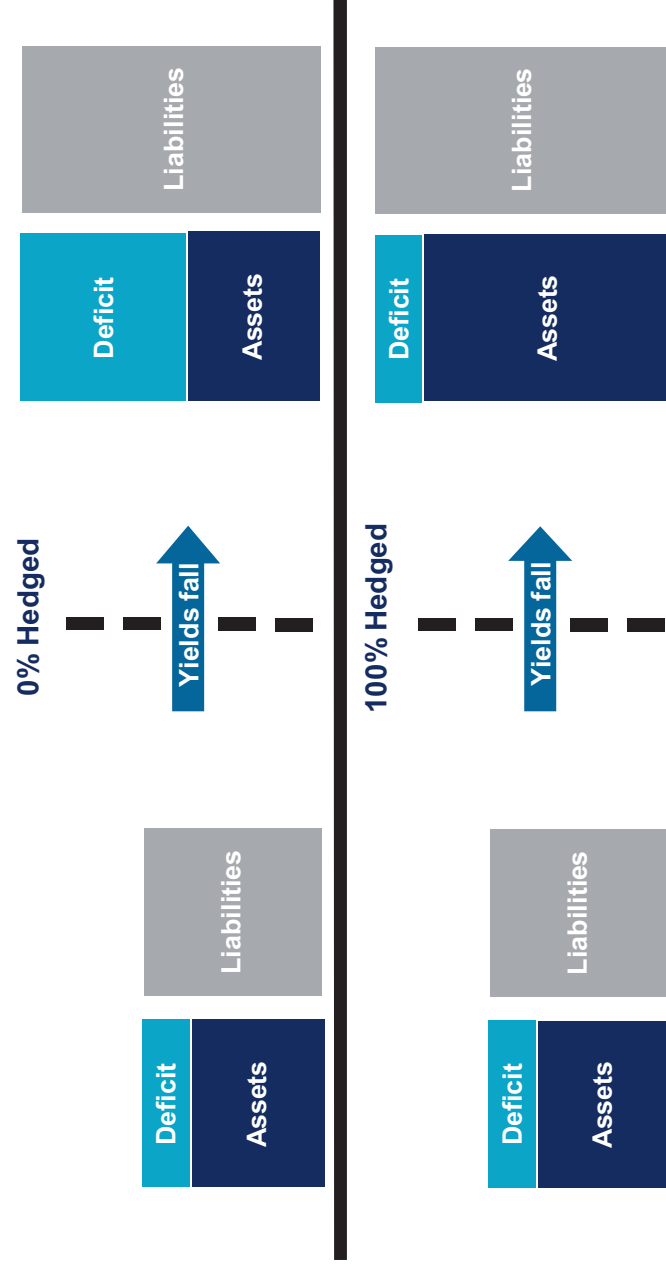
Longevity hedging

Liability Driven Investment (LDI)

What is it?

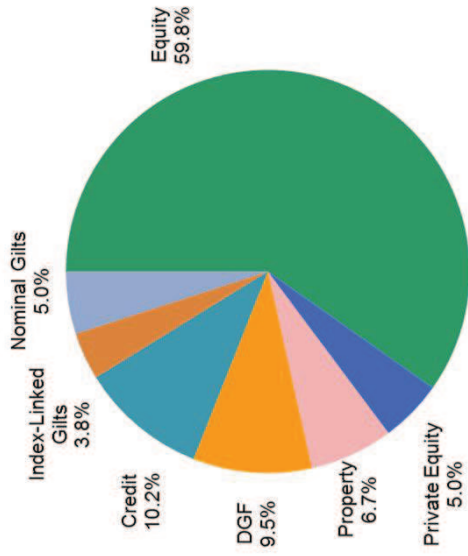
- ‘Liability hedging’ simply means that you offset the impact of movements in interest rates and inflation on the value of the liabilities by holding an asset that responds in the same way as the liabilities to movements in interest rates and inflation. A ‘hedge ratio’ of 50% means that the change in value of the asset is expected to be around 50% of the change in the value of the liabilities.
- Assuming the Fund has no interest rate hedging, then a fall in interest rates results in a rise in liabilities, whilst the assets remain unchanged, thus increasing the deficit. Had the Fund been 100% hedged on interest rates, then the assets would rise by the same amount as the liabilities, and the deficit would remain the same size.

Similar analysis applies with changes in inflation and the amount of inflation exposure that is hedged.



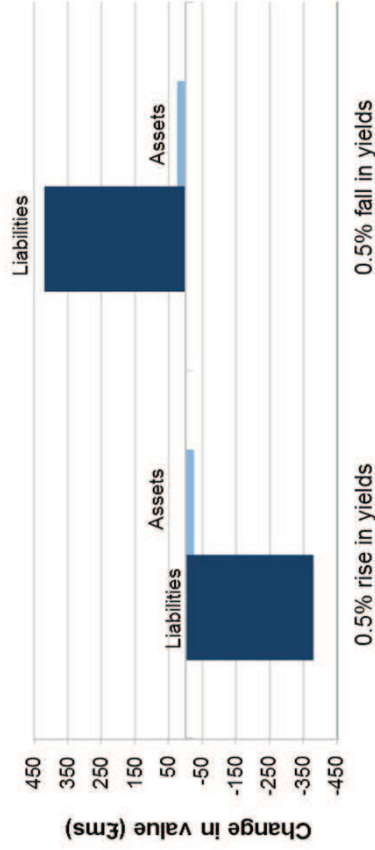
Surrey - current investment policy

Benchmark asset allocation

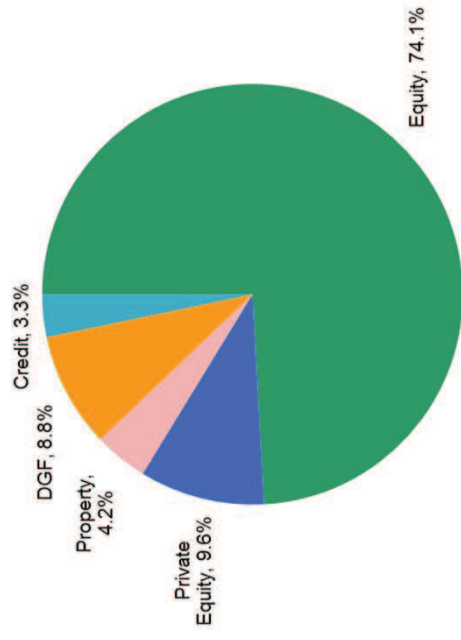


Understand liability mismatch risk

Impact of changes in interest rates



Sources of expected return (gilts + 3.2% p.a.)



Equity dominates the sources of expected returns

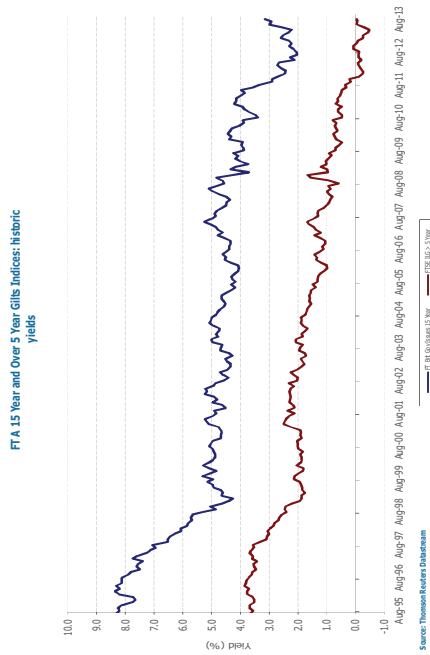
Liability risks are significant

Funding level will be highly volatile

Diversifying the assets and more focus on liability risks is required to effectively manage overall funding level risk

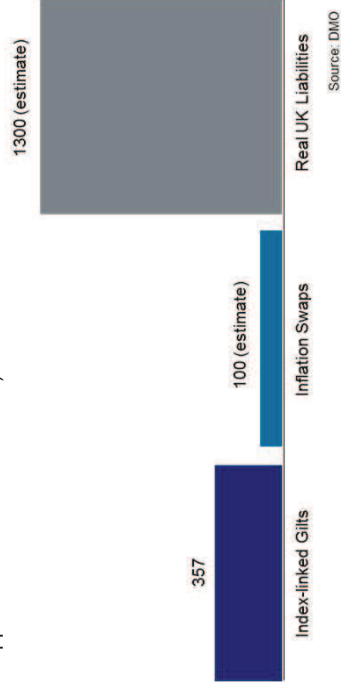
Index-Linked Gilts (ILG) are your best liability matching asset... But there is a massive long-term structural demand & supply imbalance

1. Long-term decline in ILG yields

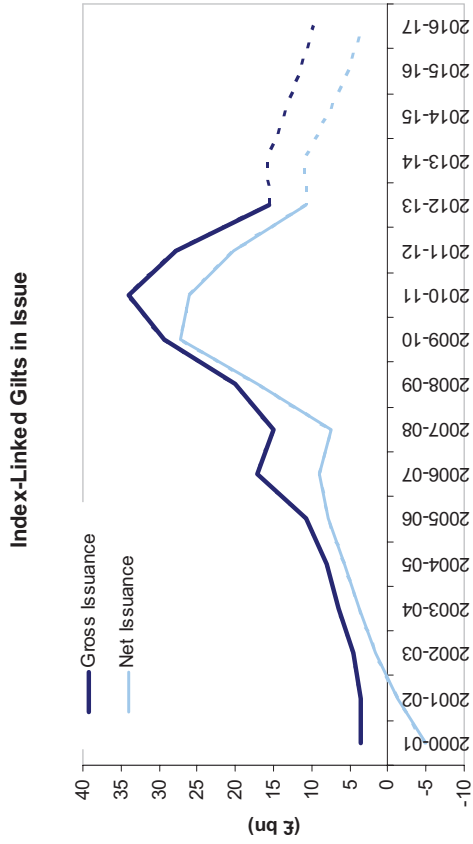


2. Demand for ILG exposure outstrips supply

Comparison of index-linked gilts in issue, plus inflation swaps transacted with UK pension scheme real liabilities (figures are very approximate estimates in £bn)



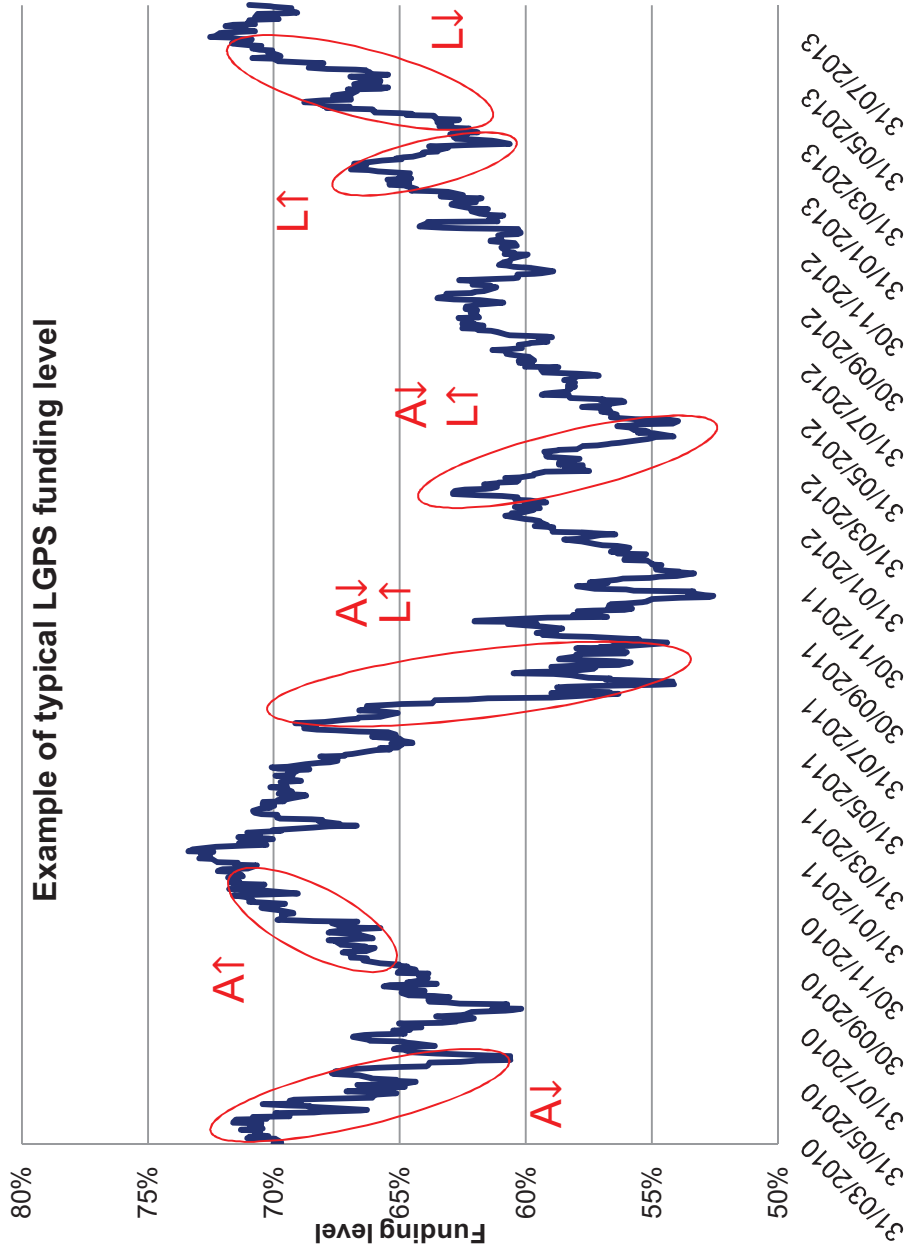
3. Net issuance of ILGs is expected to fall



Strong argument to put in place a plan to introduce liability hedging, e.g. based on funding level improvements

Real yields are likely to remain at depressed levels for an extended period of time due to supply and demand imbalance

Estimated funding level volatility Typical LGPS Fund



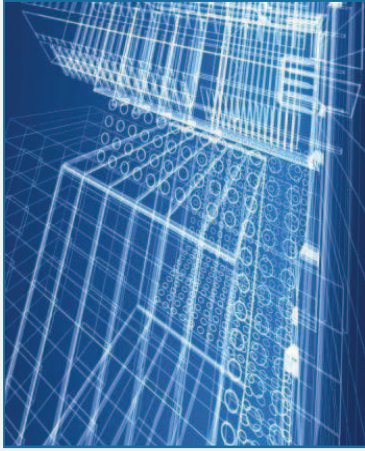
Key: A and L refer to the material movement of either the Fund's assets and/or liabilities, which have contributed materially to the change in funding level over the highlighted periods. The arrow shows the direction of the change in value.

- Based on an 80 / 20 Growth / Bond asset split and typical LGPS liabilities
- Funding levels remain broadly unchanged over the period shown, but £ deficits are expected to have increased materially due to higher liabilities.
- For the Fund, between the last two valuation dates the deficit has increased by c£1.3bn. The monetary value of the liabilities will continue to grow with interest and future accrual of benefits
- Volatility in funding level clearly evident – may be unacceptable to some Employers

Surrey CC & LGPS

There's a lot on your plate.....

**New LGPS 2014
scheme design**



**Austerity and
affordability**



**Potential Scheme
Mergers**



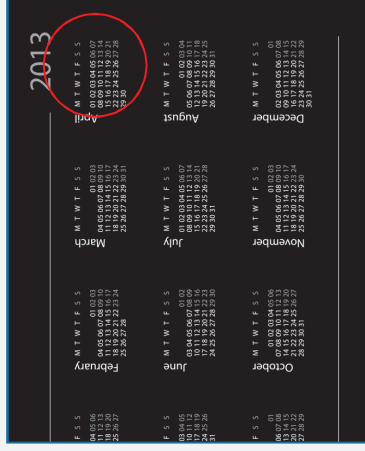
**Call for
Evidence**



**New governance
structures**

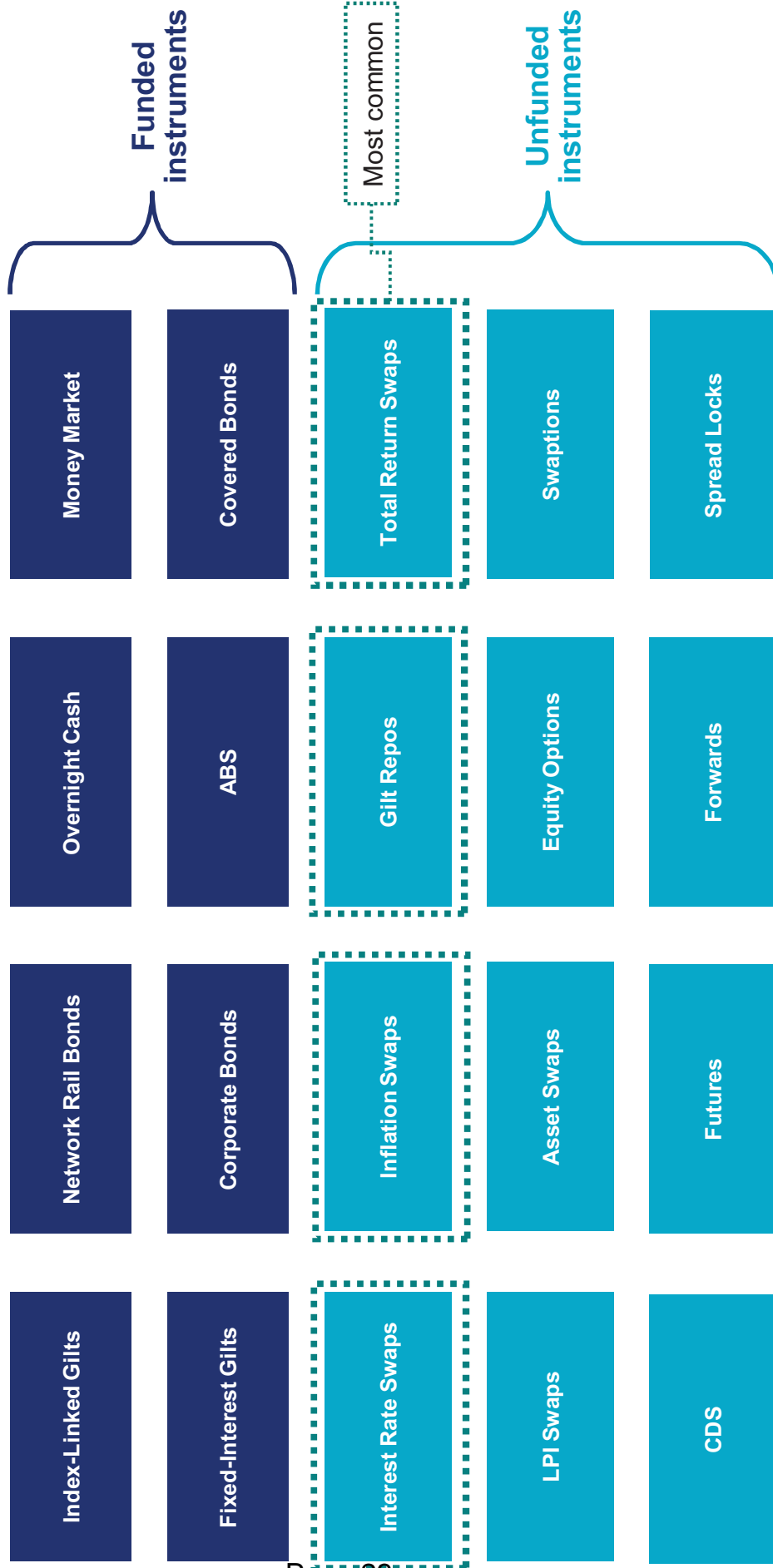


**Actuarial Valuation
year**



HEDGING INSTRUMENTS

Hedging instruments 'Toolkit'



Hedging instruments

Common features among unfunded instruments

Receive fixed or inflation-linked cashflows

- The Fund would receive fixed or inflation-linked cashflows from the counterparty.
- These would be used to match the Fund's fixed or inflation-linked liability cashflows.

Pay floating cashflows

- The Fund would pay a floating rate of interest in exchange for the fixed or inflation-linked cashflows.
- For example, in the case of swaps this interest rate would most likely be LIBOR.

Change in value of the instrument hedges change in liability value

- As interest rates change over time, the value of the instruments change.
- These changes in value hedge the changes in the liability value.

Limited initial capital required

- In theory, apart from transaction costs and initial collateral, no initial capital is required to enter into these transactions. It is for this reason that gearing is possible.

Subject to counterparty credit risk

- Instruments are traded directly with investment banks. However, some derivatives will be moved to central clearing houses.
- If the counterparty defaults, the Fund may make a loss.
- This is partially mitigated by collateralisation, but some risks still remain, for example:
 - The Fund may be out of the market for some time after default.
 - The collateral received may fall in value or the Fund may have posted collateral worth more than its loss on derivative positions.

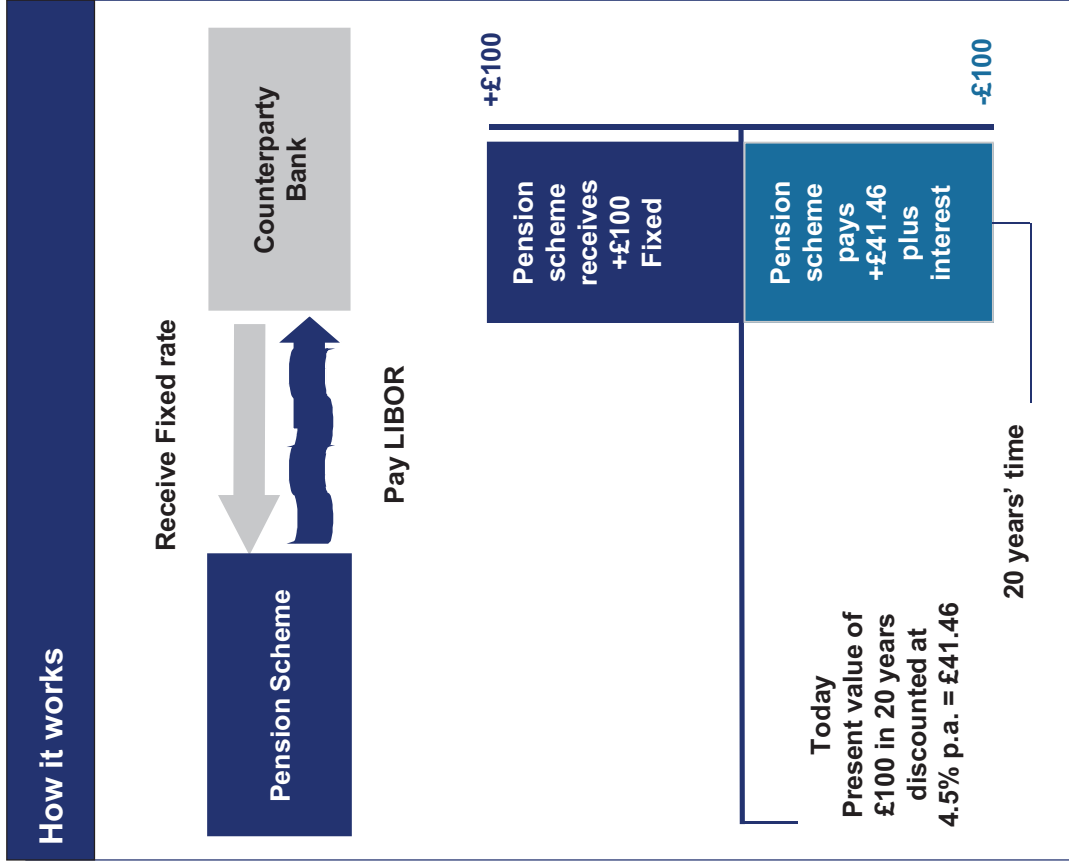
Ongoing collateral requirements

- The Fund must have collateral to post to cover any losses on the derivative positions.
 - Similarly, the Fund will receive collateral on any gains on its derivative positions.
-

Most unfunded instruments involve the payment of a floating interest rate in exchange for fixed or inflation-linked cashflows.

Hedging instruments

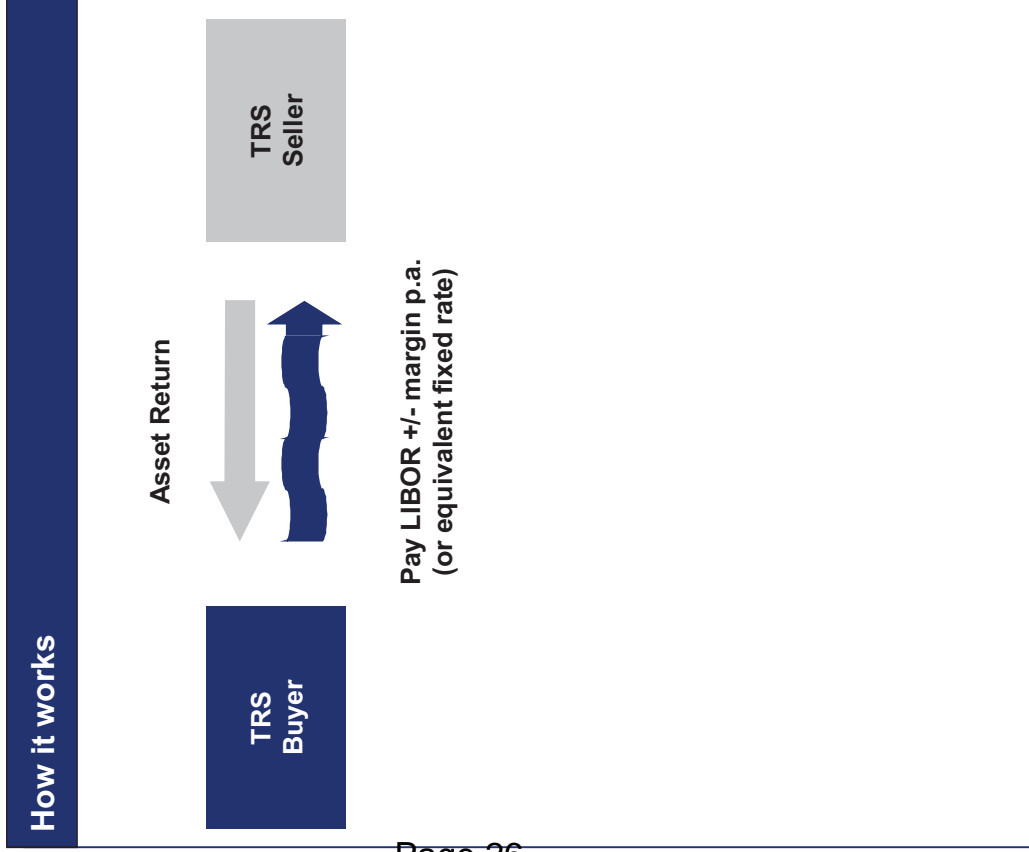
Interest rate swaps and Inflation swaps



| Interest Rate and Inflation Swaps | |
|-----------------------------------|--|
| Purpose | <ul style="list-style-type: none"> Pension schemes use interest rate swaps to hedge interest rate risk <ul style="list-style-type: none"> – Pay a floating “cash” rate (usually LIBOR) – Receive fixed “swap” rate. |
| Mechanics | <ul style="list-style-type: none"> A zero coupon swap is quoted in terms of the fixed rate and the notional exposure, which equates to the present value of the cashflows. For example: <ul style="list-style-type: none"> – 20-year zero coupon swap rate of 4.5% p.a. – Cashflow of £100 in 20 years – Notional of £41.46. Interest rate swaps provide fixed payments. Inflation swaps can be used in addition to provide inflation-linked payments: <ul style="list-style-type: none"> – Pay a fixed rate (breakeven “swap” inflation) – Receive actual RPI. Cashflows have equal value at outset – in theory no payment is required (apart from transaction costs). Both interest rate and inflation swaps could be traded with terms of up to 50 years. |

Hedging instruments

Total Return Swaps

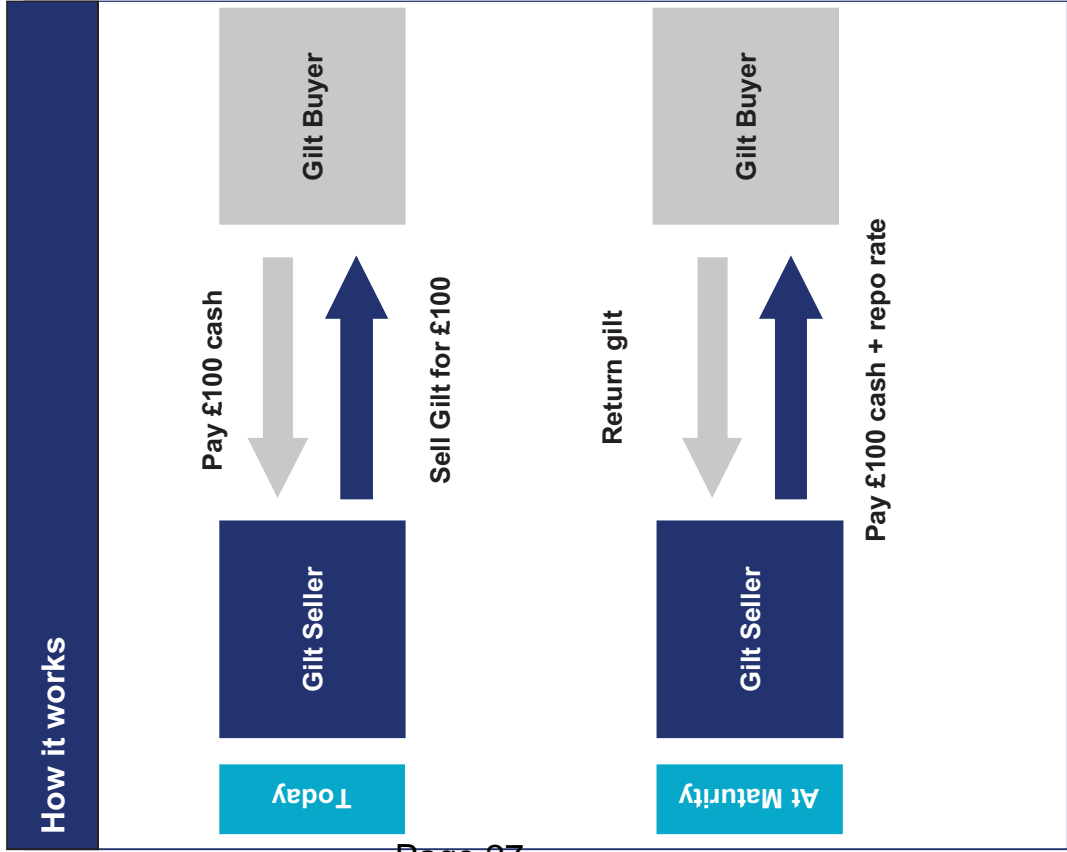


Total Return Swaps

- Under a gilt TRS, a pension plan agrees to:
 - pay a floating rate (LIBOR +/- a margin) on a specified notional amount
 - receive the total return on a specified gilt applied to the same notional amount
 - for a specified term
- No assets are exchanged up-front, so the Fund would therefore obtain unfunded economic exposure to the specified gilt.
- Unlike swaps, the term of gilt TRS is limited to 2-3 years. This means that the position must be rolled from time to time. This creates **roll risk**:
 - The margin relative to LIBOR may be unattractive
 - It may in extreme cases be impossible to roll the position. If this happens other instruments could be considered (e.g. swaps or gilt repo).
- Each time a gilt TRS position is rolled, it must be cash settled, creating **liquidity risk** if insufficient cash set aside (and the Fund has made a loss)
 - In practice, pooled funds and manager processes (and ongoing collateral management) are designed to ensure that this situation does not happen.

Hedging instruments

Gilt Repo



| Gilt repo | |
|--------------------|--|
| Today | <ul style="list-style-type: none"> ▪ Transact a gilt repo with a counterparty bank, i.e. sell a gilt and agree to buy it back at a future date at a pre-determined price. ▪ Pension fund retains economic exposure to gilt. Cash may be subject to a "haircut" retained by bank counterparty. |
| At Maturity | <ul style="list-style-type: none"> ▪ Pension fund re-purchases gilt at the pre-determined price. ▪ At the end of each repo contract, the Fund would roll the repo (i.e. enter into another repo to continue borrowing). |
| Comments | <ul style="list-style-type: none"> ▪ The Fund could use its existing gilt holdings to held establish an LDI portfolio. Cash raised from repos could be used to purchase further gilts. At the end of each repo contract, the Fund would roll the repo (i.e. enter into another repo to continue borrowing). ▪ Economically, the transaction is broadly equivalent to the use of gilt TRS, the key difference being the funding cost (i.e. the difference between the gilt repo rate and the gilt TRS rate). ▪ Gilt repo typically have terms of up to 1 year and must be rolled from time to time, so like gilt TRS they are subject to roll risk. |

Hedging instruments

Key risks in the use of Over The Counter (OTC) derivatives and repos

Counterparty risk

- The Fund should understand the approach taken by any investment manager to selection and monitoring of counterparties and measures of controlling this risk

Regulatory / legal risk

- Documentation will need to be reviewed from both legal and investment perspectives. The scope of the reviews depend on delivery mechanism, structure, instruments and techniques used. Any structure would need to be “future-proof” to accommodate regulatory changes, such as central clearing of derivatives.

Operational Risks

- Liquidity and costs of ongoing management of synthetic/repo positions needs to be understood. For gilt repo, ‘the roll risk’ in particular.

Gearing

- If positions are geared the level of gearing will vary with the changes in yields. The process will need to be understood and agreed on how to manage the gearing within the portfolio.

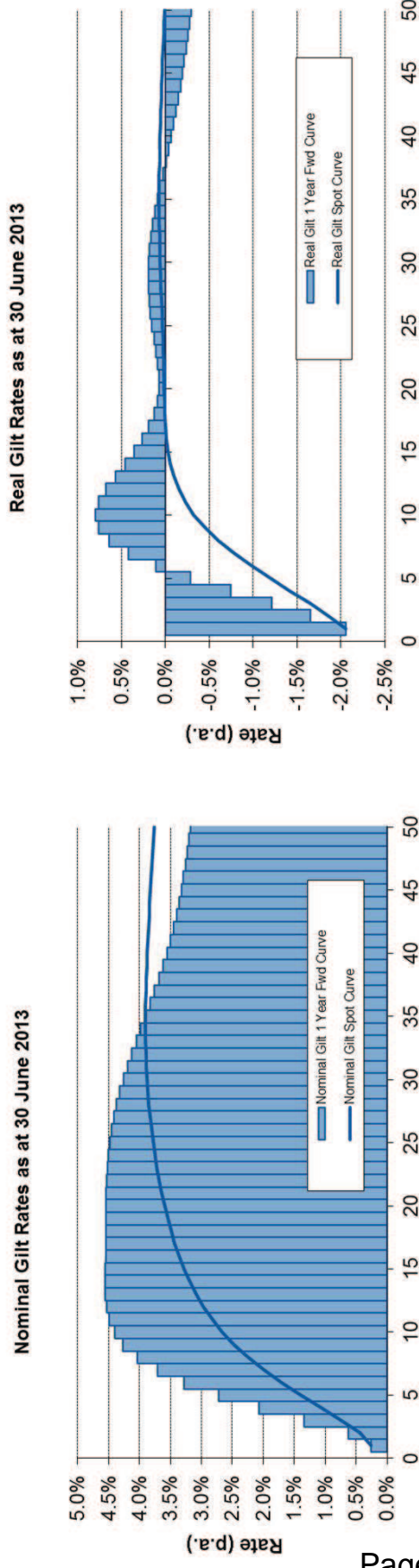
LIBOR/Repo rate generation

- Risks associated with LIBOR and/or Repo rate needs to be understood.

GILT MARKET UPDATE

Gilts market update

Spot and forward yields (as at 30 June 2013)



Page 30

- The charts show gilt yields (**dark blue curve**) as at 30 June 2013 and the year-by-year forward rates implied by these yields (**light blue bars**). Forward rates show the path of cash returns that would result in the same return as the gilt yield over the relevant period.
- A forward rate is the expected rate at a point in the future. For example,
 - Based on 30 June 2013 pricing, the markets expect that the nominal (left-hand chart) cash return in 2033 (i.e. in 20 years time) will be just over 4.5%. This is significantly higher than the current nominal cash return of c.0.5%.
 - A spot rate is the expected average rate between today and a point in the future, e.g.
 - A 20 year spot nominal rate is the average expected rate from years 1 to 20 (i.e. it is the average of forward rates over the next 20 years). Using the same example, the gilt yield (spot rate) is c.3.6% p.a.

Gilt yields are being dragged down by current low short-term interest rates. This is consistent with Bank of England's current base rate of 0.5% p.a.

What is fair value?

Long-term interest rates (or yields) are said to be fair value if there is a broadly even chance of cash returns being higher or lower over the same period...

*... or in other words if the fixed (interest) rate is broadly in line with the expected floating (cash) rate over the term of a swap.
(Note: the economics of an interest rate swap are akin to borrowing to invest in a bond.)*



Fair value is...

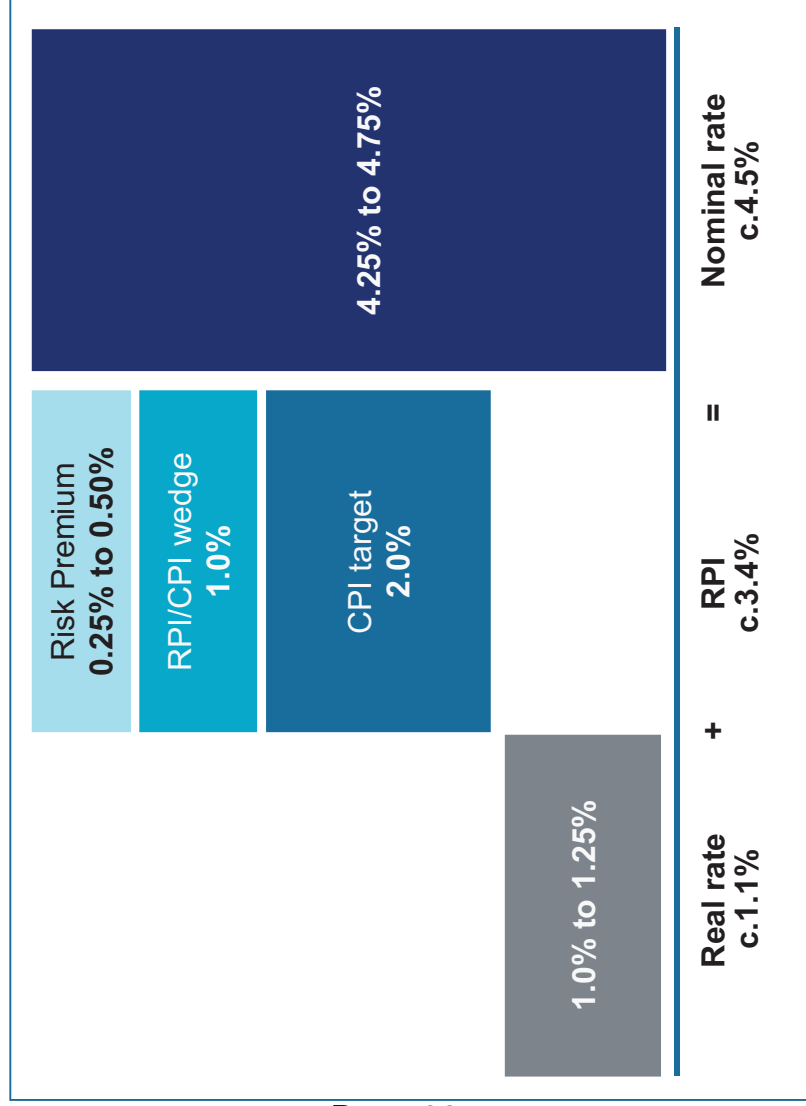
- A consideration for when hedging should be undertaken.
- A highly subjective judgement.

Fair value is not...

- A target for all hedging.
- More important than broader strategic considerations (e.g. risk tolerance).
- A short-medium term prediction for reversion of long-term interest rates. Long-term interest rates may be below fair value for a long time.

Gilts market update

Mercer 'fair value' for long term nominal and real gilt interest rates – defined as 5yr+ forward rates



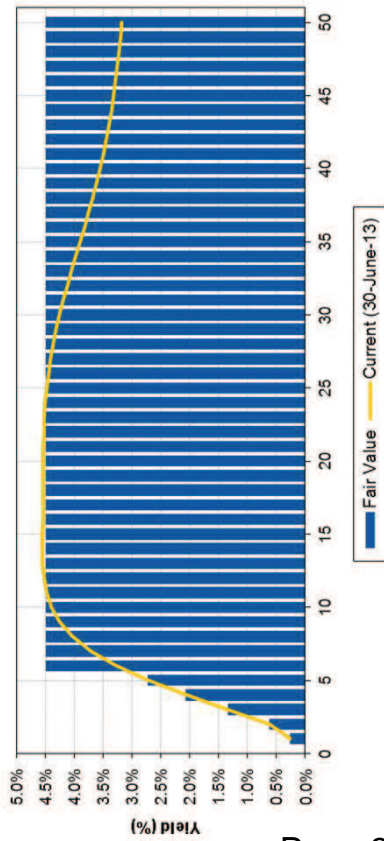
- The Mercer Rates Committee (MRC) sets 'fair value' views for gilt yields and inflation (RPI).
- Specifically, taking a view on forward rates beyond five year maturities. The first five years are assumed to be fair value.
- Mercer fair value views are informed by historic averages for real rates, projections for inflation, and the expectation that the Bank of England will be successful in meeting its inflation target. The nominal rate is the by-product of the two.
- The real rate and inflation views are reviewed on a quarterly basis or more frequently should a significant event occur such as the CPAC review of the method of calculating RPI inflation.

Fair value views are subjective and should not be solely relied on when setting hedging policies.

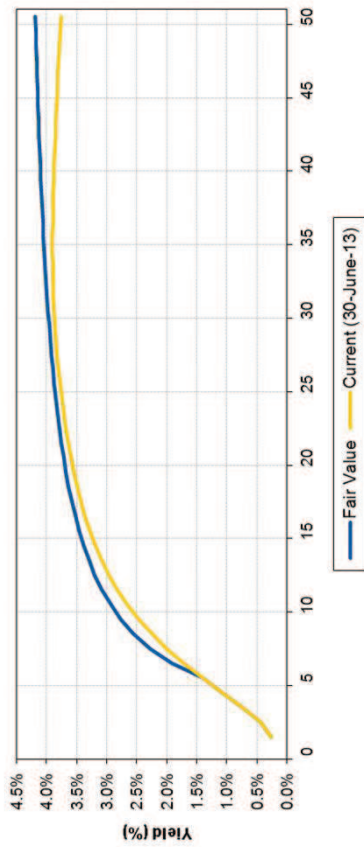
Gilts market update

Forward rates vs. Spot rates (current vs. Mercer 'Fair Value' views as at 30 June 2013) – assumed 1.25% real and 4.5% nominal

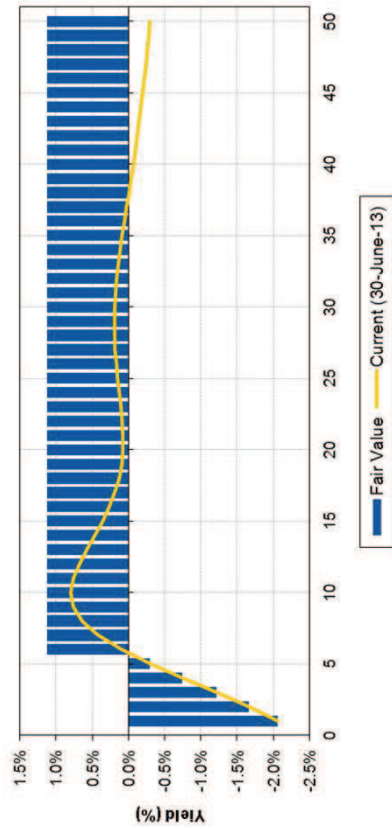
Nominal Forward Rates



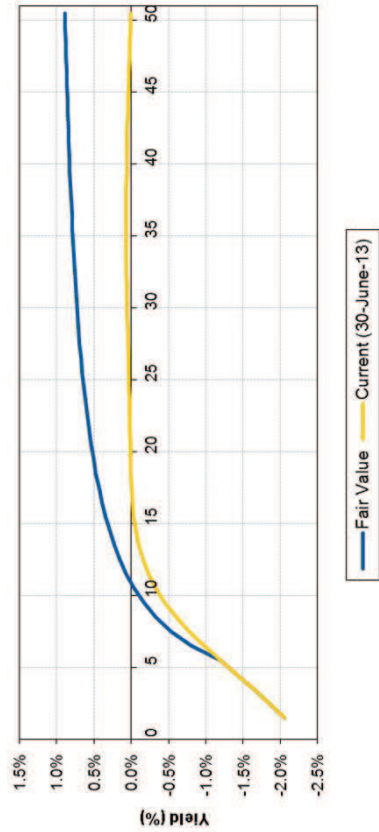
Nominal Spot Rates



Real Forward Rates

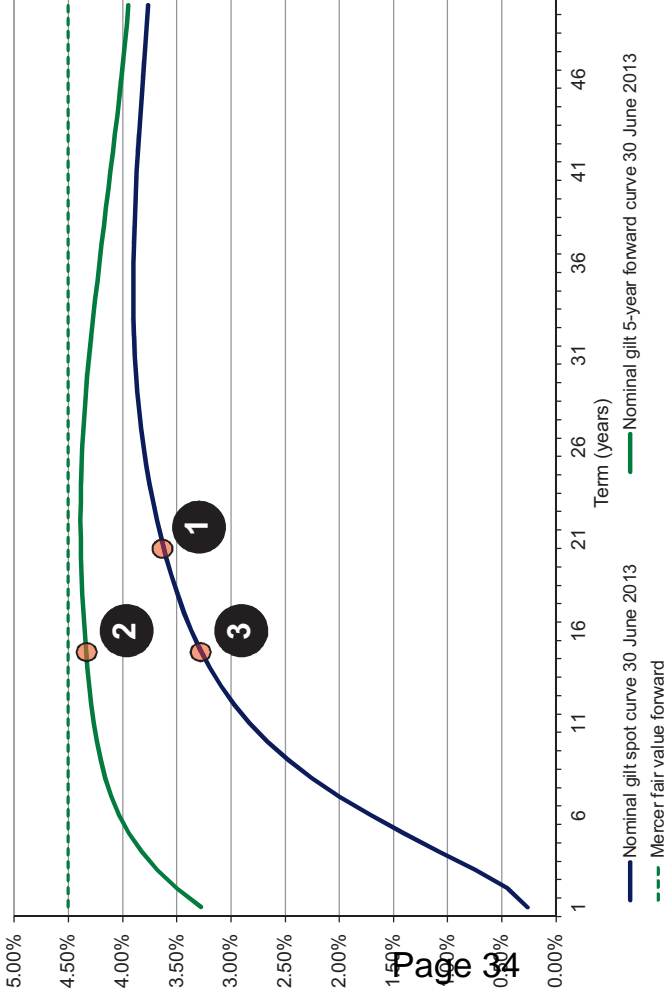


Real Spot Rates



Are yields too low to hedge? Yields are not as unattractive as they appear

Nominal spot and forward curves



- Significant increases in nominal yields are already priced in
- Under a traditional approach to valuing liabilities, the steepness in yield curve implies fixed liabilities would increase in value over 5 years by around 6%
- If yields remain unchanged, the value of a 20-year fixed liability would increase by around 25% over 5 years
- Any fall in yields would lead to even greater losses
- Similarly for real yields

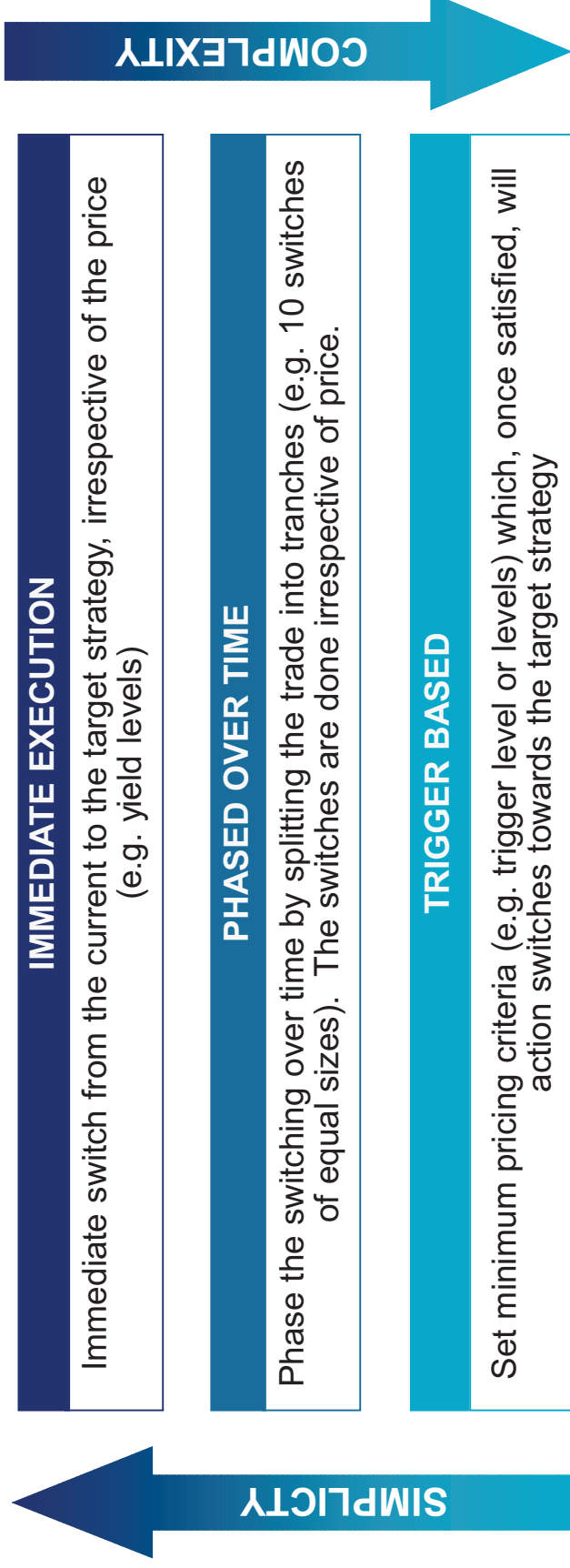


Scope for significant losses in a “muddle-through” scenario

IMPLEMENTATION

Implementation considerations

Overview of main approaches



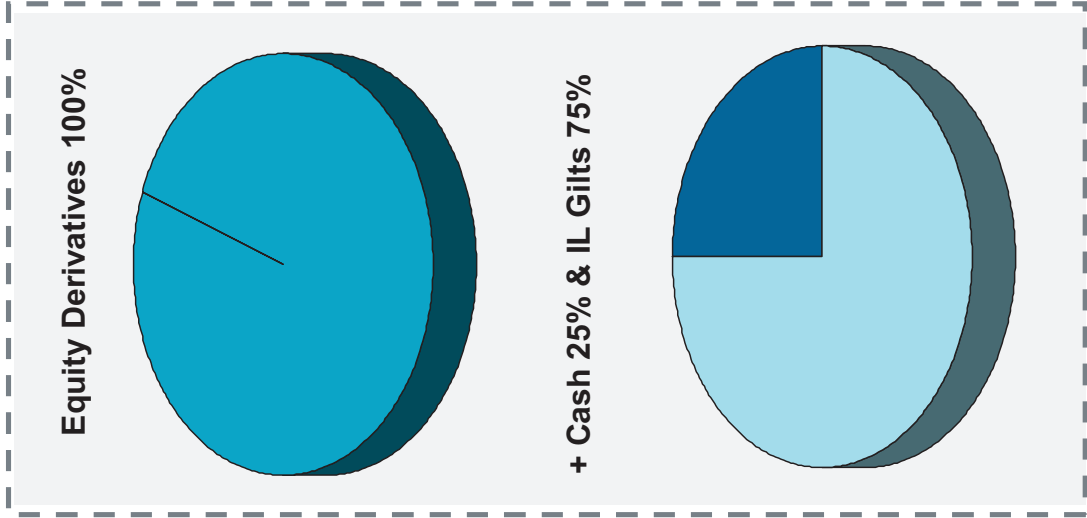
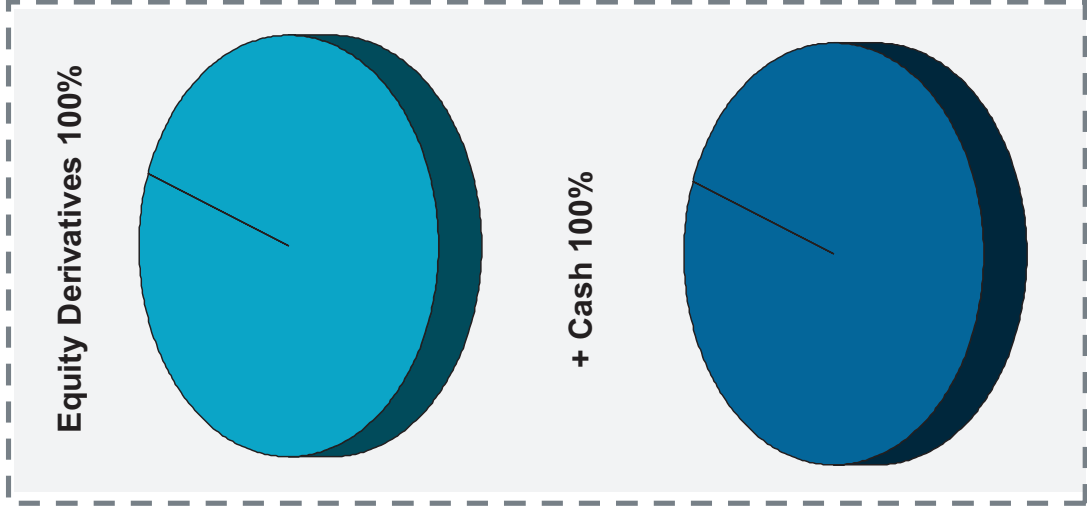
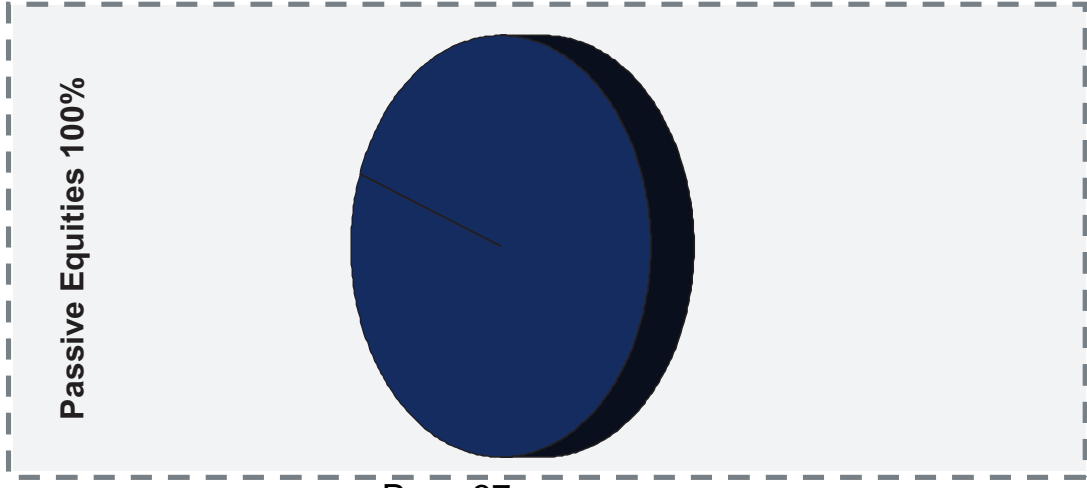
No single right answer – driven by beliefs and risk tolerance

In the following slides we show how the Fund could finance an LDI mandate without reducing the expected return on the assets

Make the Fund's passive equities work harder

Physical equity can be replicated by cash/bonds and equity derivatives

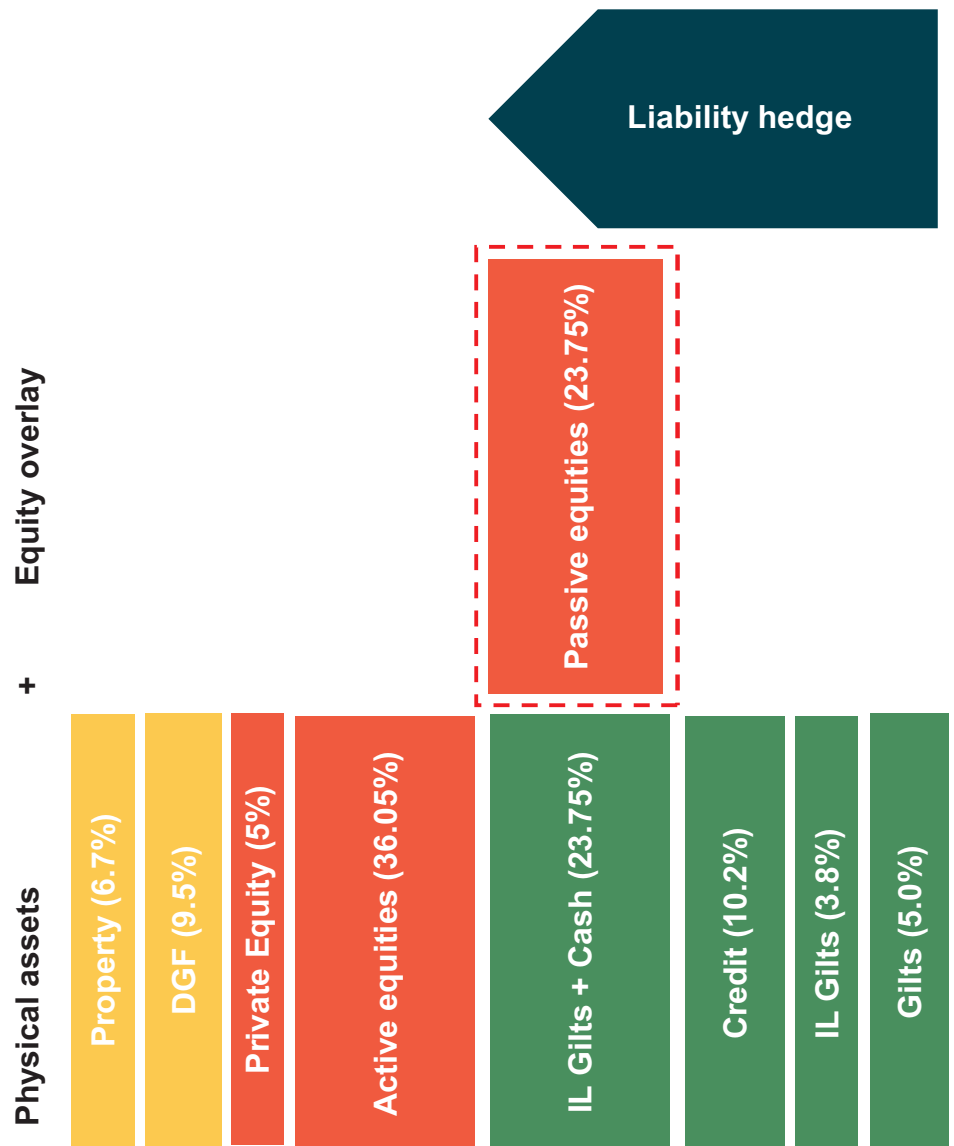
Using derivatives can retain equity returns but reduce interest rate and inflation risk



Using capital efficiently to increase liability hedge whilst maintaining expected return through exposure to return seeking assets

Current allocation

Add efficient equity



LONGEVITY HEDGING

Longevity swap and buy-in compared

Pensioner Longevity swap

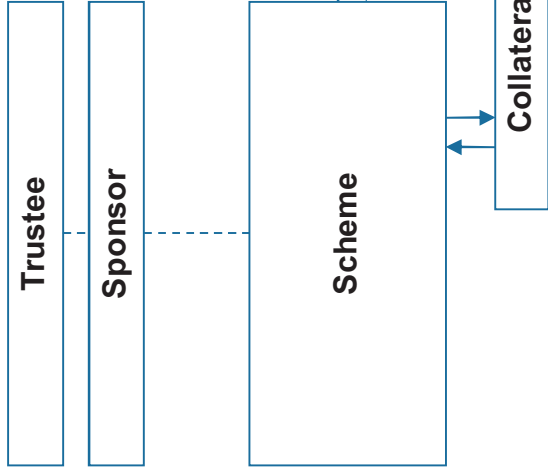
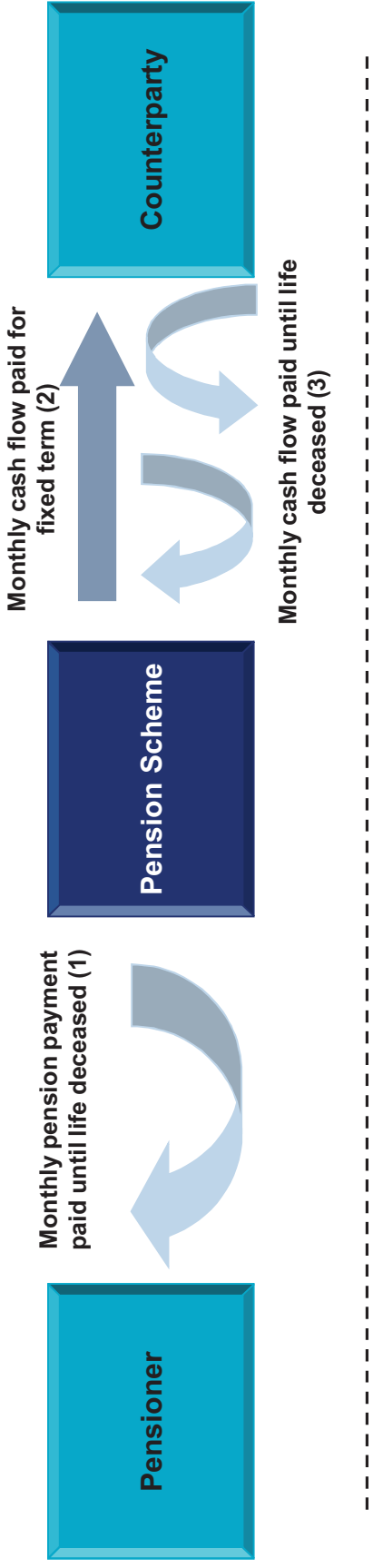
- Pros**
- Removes pensioner longevity risk at below recent trends
 - “Buy now while stocks last”
 - Avoid locking into current low yields
 - Retain asset flexibility
 - Possible stepping stone to later full risk transfer or self-sufficient run off
 - Possible adverse funding/accounting implications (although can potentially be funded by adjusting investment strategy)
 - Extra admin requirements

Pensioner buy-in

- Close matching on portion of liabilities
- Investment market dislocations can present pricing opportunities
- Consistent with a long term complete exit
- Illiquid so constraint on investment strategy
- If paid for by sale of gilts, potentially limited risk reduction or even increase in risk
- If paid for by sale of growth assets, lock in underfunding

A longevity swap is economically similar to an unfunded buy-in, retaining asset flexibility (so risk and reward) and spreading payment of longevity risk premium to the third party over the contract's life

At a high level, the mechanism of a longevity swap is relatively simple...although multiple parties are involved

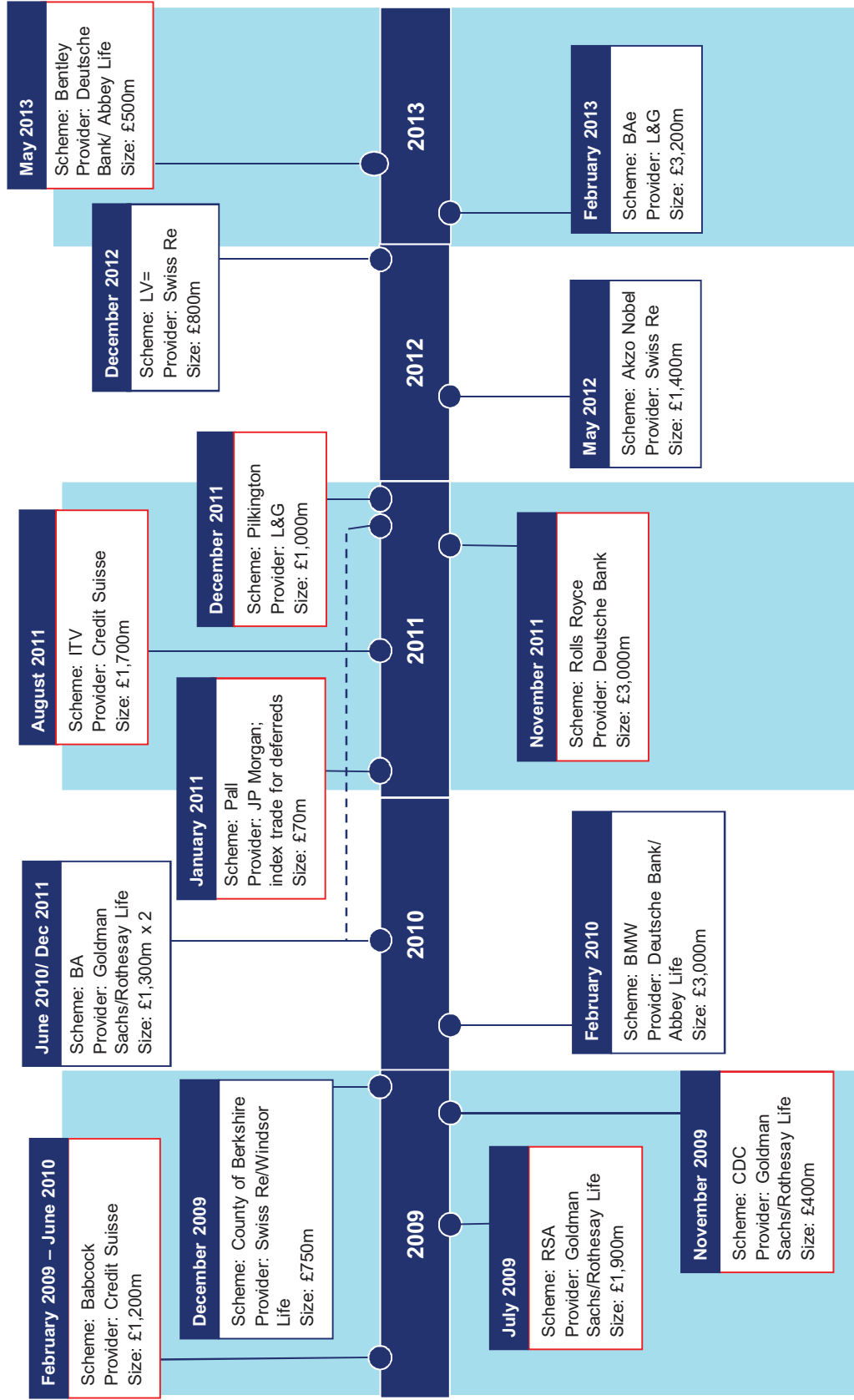


Need to consider:

- Members covered
- Named life vs. index
- Insurance vs. derivative
- Collateral structure etc

- Pension scheme administrator typically provides a monthly file of pensioner status movements (deaths, contingent spouse pensions becomes due, suspensions, reinstatements)

A number of longevity swaps have already transacted and the market continues to develop



• Red boxes denote involvement of Mercer consultant

INFRASTRUCTURE

Asset class overview

Defining economic characteristics

High barriers to entry



Economies of scale



Inelastic demand



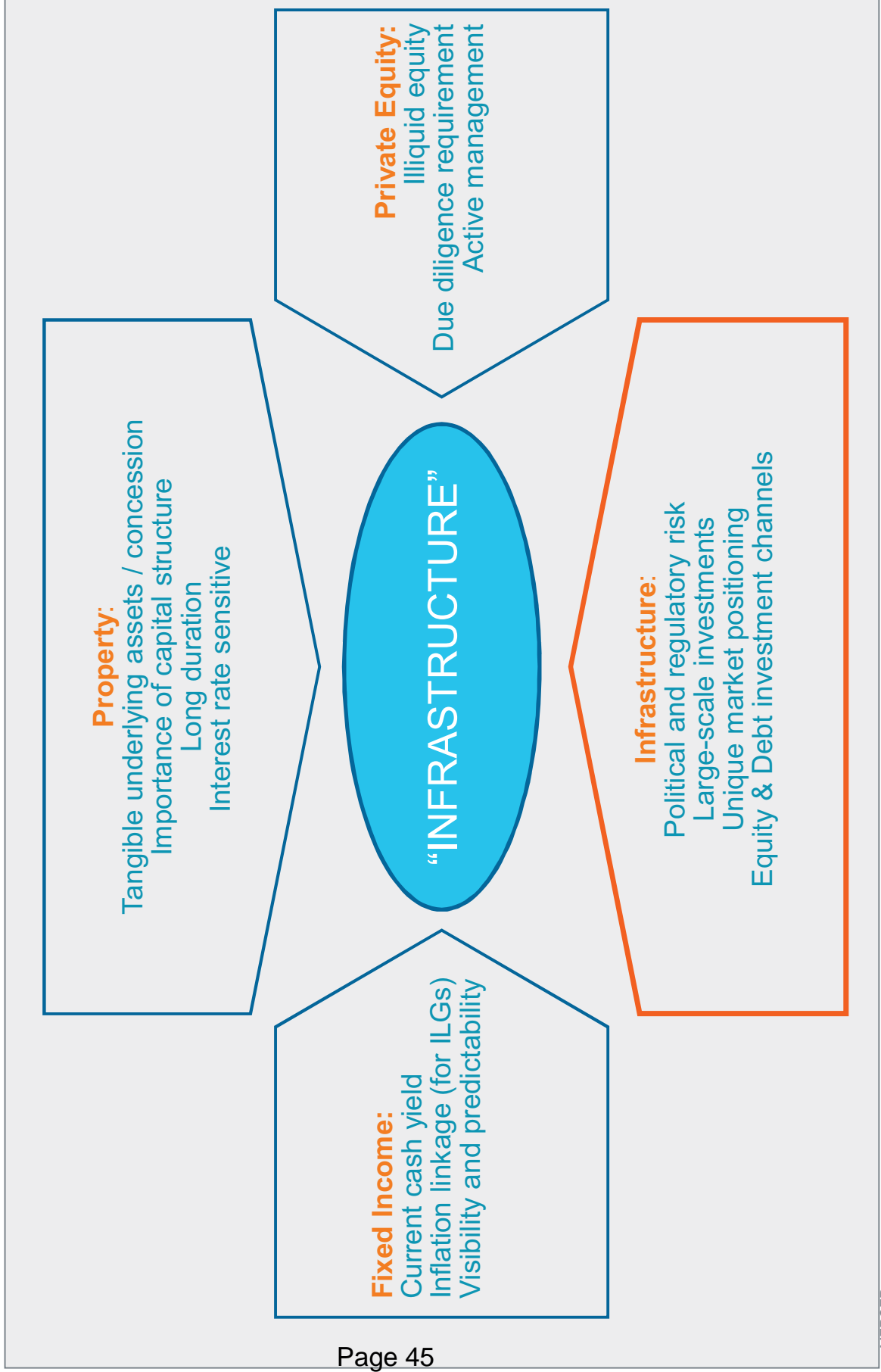
Long life duration



Inflation linkage

Asset class overview

Comparison to other asset classes



Current investment case Market backdrop

Demand side

Ongoing inflation uncertainty & concerns

Overbid traditional markets for inflation

High uncertainty around traditional asset pricing

**Need to
consider
alternative
investment
options**

Supply side

Systemic factors driving supply of new opportunities

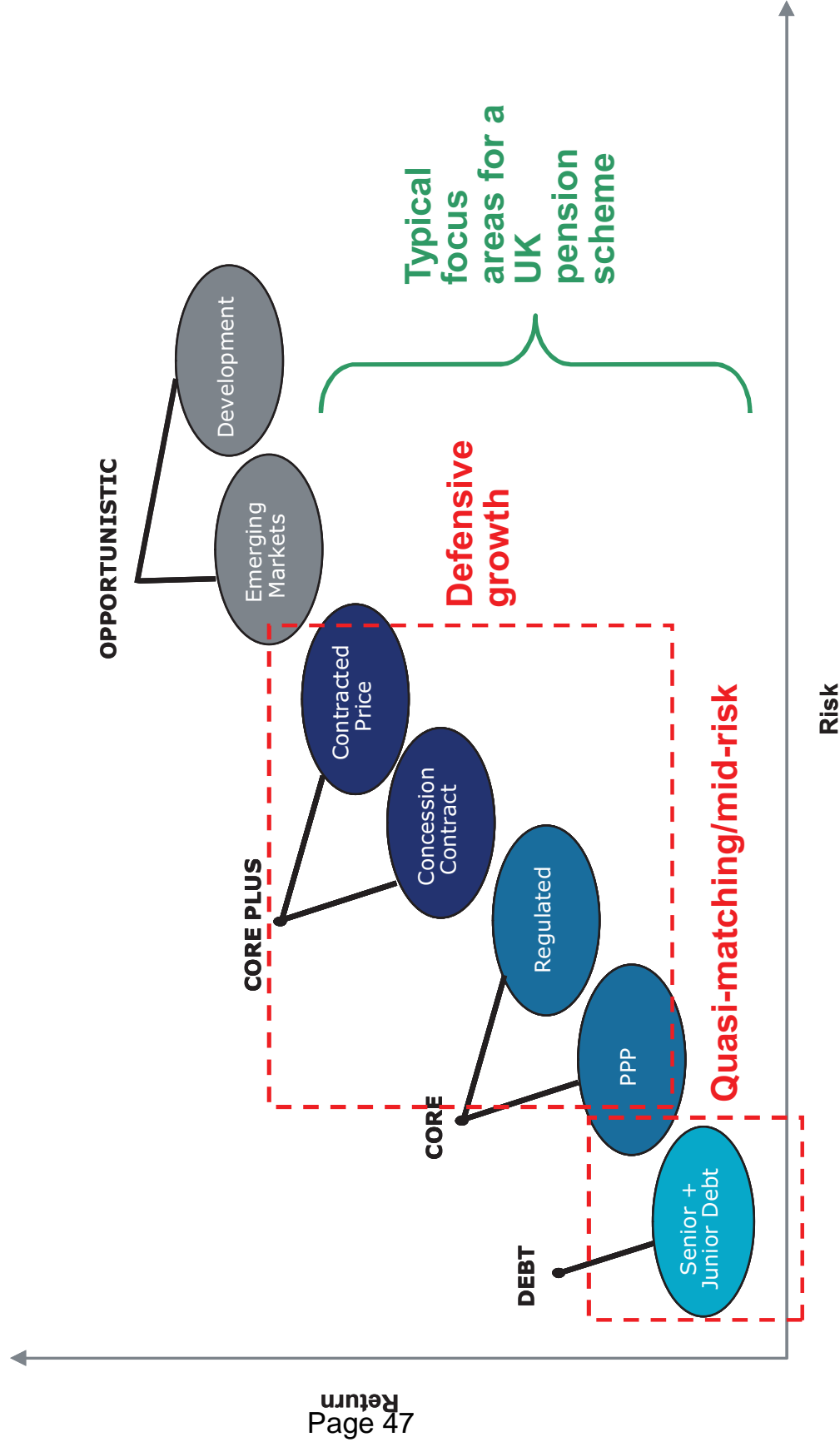
Asset gearing levels coming down

Strong focus on availability style low risk assets

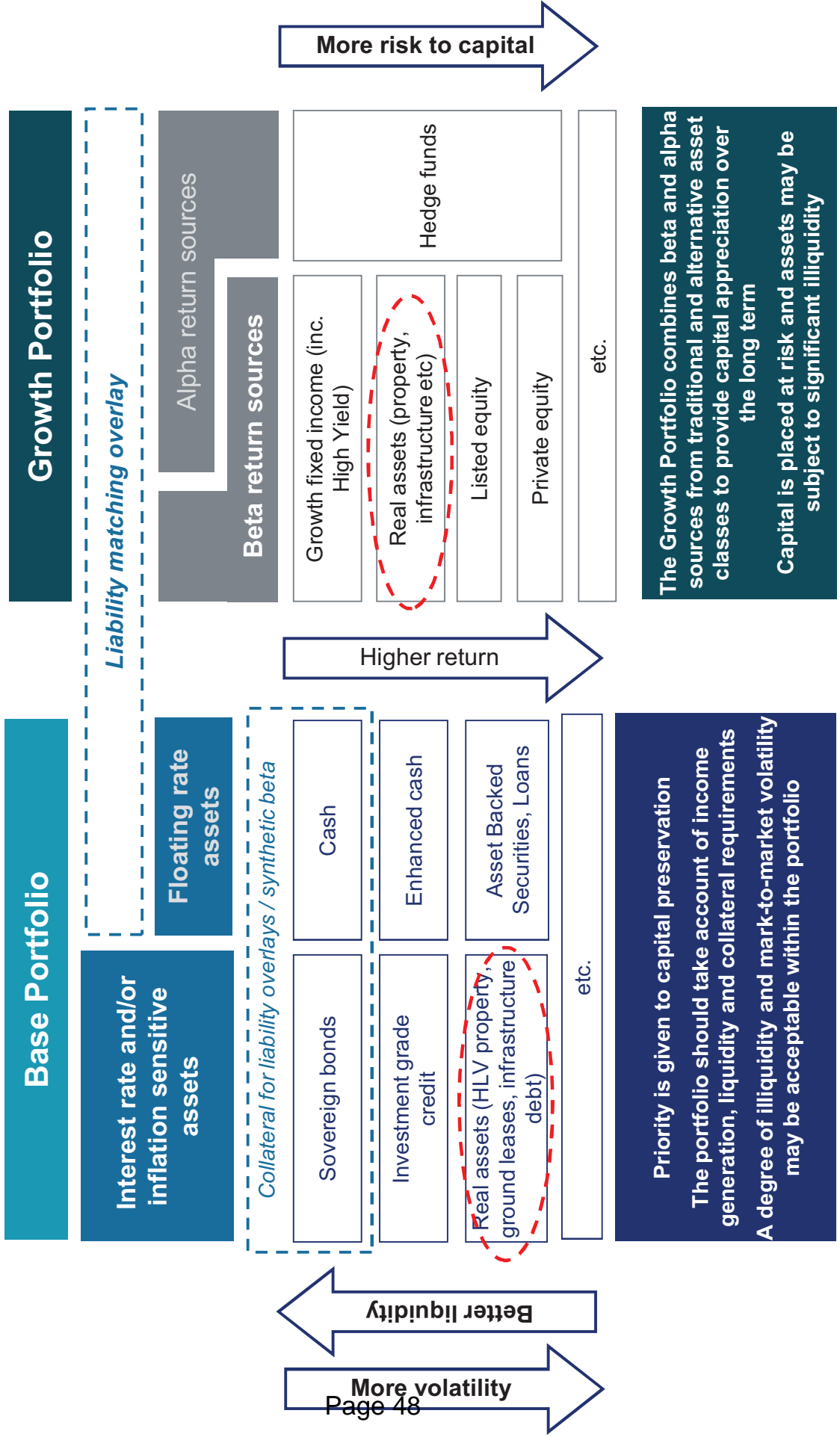
**Solid supply of
assets
Attractive
investment
environment on
a risk-adjusted
basis**

Positioning the asset class

A range of risk profiles



Positioning of the asset class ... and differing portfolio roles



Infrastructure debt

What is it?

- Can take two main forms, **public** (e.g. Network Rail bonds) but more commonly, **private**
- Privately placed loans (often unlisted and unrated) are issued by infrastructure businesses to finance capital expenditure, acquisitions, and ongoing asset ownership
- Pricing and wider terms are tailored to each transaction through a flexible deal structure
- Stable cash flows and high operating margins from infrastructure support relatively high debt levels
 - But also mean risk levels are lower than other sectors of private debt
 - With a commensurate reduction in expected returns (compared to other private debt)

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Infrastructure debt Characteristics

- Compared to debt from other sectors, infrastructure debt trades off **credit risk** for **liquidity risk**
- **Spreads at attractive levels** compared to historical norms

indicative return breakdown



Corporate Bond



Infrastructure Debt

Comparing infrastructure debt to equity Key features

- Characteristics of infrastructure lead to predictable business plans; senior lender protections further reduce the investment risk profile
 - terms typically allow for significant recovery upon default
- Subordinated debt sits between equity and senior debt on the risk spectrum
 - payments ahead of equity distributions
 - unsecured or 2nd ranking claim on asset

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| | Senior debt | Subordinated debt | Equity |
|------------------------|---|--|---|
| % of capital structure | <ul style="list-style-type: none"> ■ between 40% and 90% | <ul style="list-style-type: none"> ■ up to 25% | <ul style="list-style-type: none"> ■ between 10% and 60% |
| Ranking | <ul style="list-style-type: none"> ■ senior to all other stakeholders | <ul style="list-style-type: none"> ■ subordinated to senior debt ■ senior to equity | <ul style="list-style-type: none"> ■ subordinated to all creditors |
| Term | <ul style="list-style-type: none"> ■ amortisation profile generally matches expected life of asset (with some buffer) ■ may have intermediate maturity | <ul style="list-style-type: none"> ■ maturity after Senior Debt ■ average life longer than Senior Debt | <ul style="list-style-type: none"> ■ perpetual |
| Security | <ul style="list-style-type: none"> ■ 1st ranking charge over available assets ■ Typically does not include "hard" assets, but provides lenders control/step-in rights | <ul style="list-style-type: none"> ■ unsecured or 2nd ranking charge | <ul style="list-style-type: none"> ■ n/a |

Infrastructure debt Market pricing and expected returns

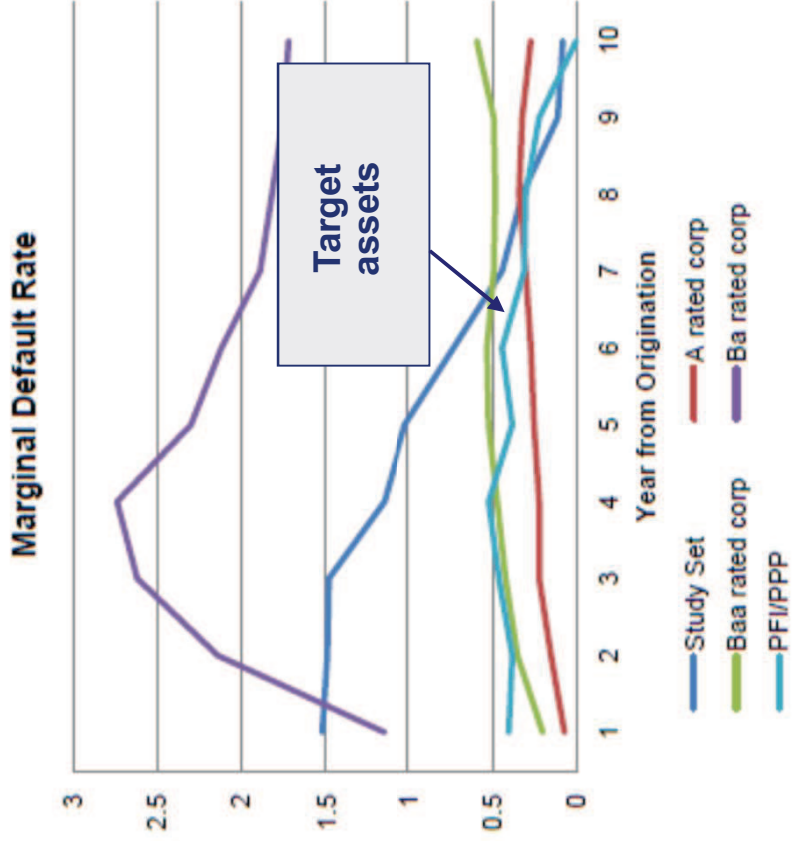
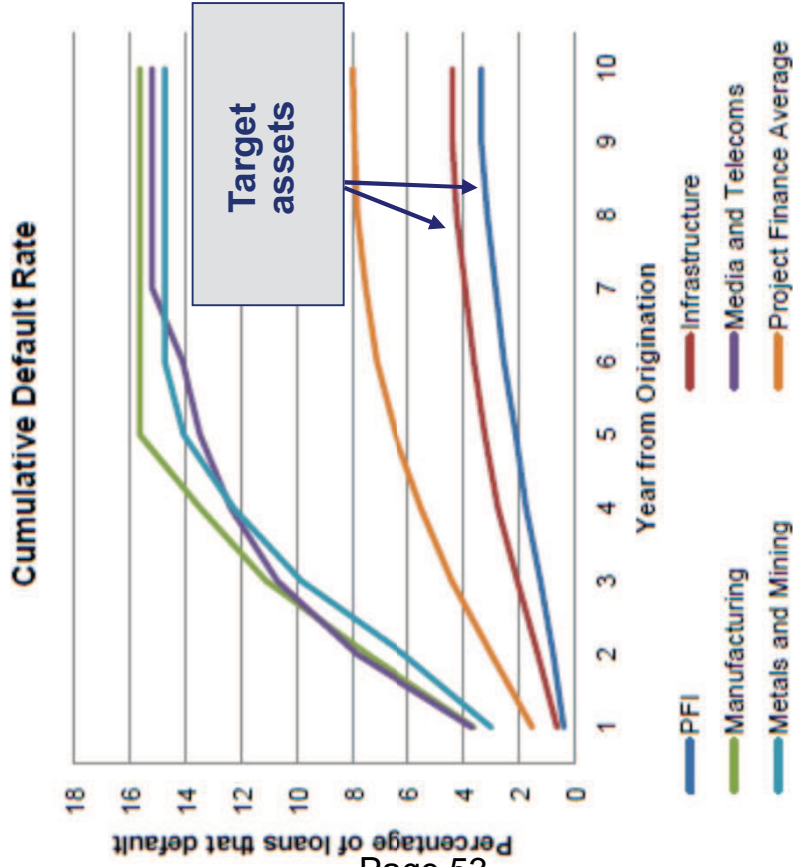
| | Senior Debt | Subordinated Debt | Equity |
|---------------------|--|---|--|
| Funding base | <ul style="list-style-type: none"> floating or fixed rate | <ul style="list-style-type: none"> floating or fixed rate | |
| Form of return | <ul style="list-style-type: none"> regular cash interest | <ul style="list-style-type: none"> primarily regular cash interest potential for accrued interest and capital gains | <ul style="list-style-type: none"> primarily capital gains equity dividends |
| Return expectations | <ul style="list-style-type: none"> LIBOR + 2.25% - 3.25% for Core | <ul style="list-style-type: none"> typical premium of >= 3% over Senior Debt in same transaction | <ul style="list-style-type: none"> 10-14% IRR for Core/Core Plus Up to 20% IRR for Opportunistic |

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* Indicative returns for individual investments

These vary according to position in capital structure, sector and risk profile

Infrastructure debt Default rates compared to other asset classes



Source: Sequoia, Moodys

...and high historical recovery rates

Implementation considerations

General comments

- For all but the largest investors, implementation will need to be via third party managed funds or separate accounts
- Existing universe of infrastructure senior debt managers, with an increasing array of senior managers entering the market in response to the emerging opportunity
- Preference for separate account for those investors that have the scale to access this format (typically \$100m allocations and upwards)
 - greater tailoring potential
 - greater control over mandate management and hold period
- Increasing array of pooled closed end funds emerging for smaller investors (further details below)
- Portfolio planning and objective setting as a necessary first step

Implementation considerations Implementation routes compared

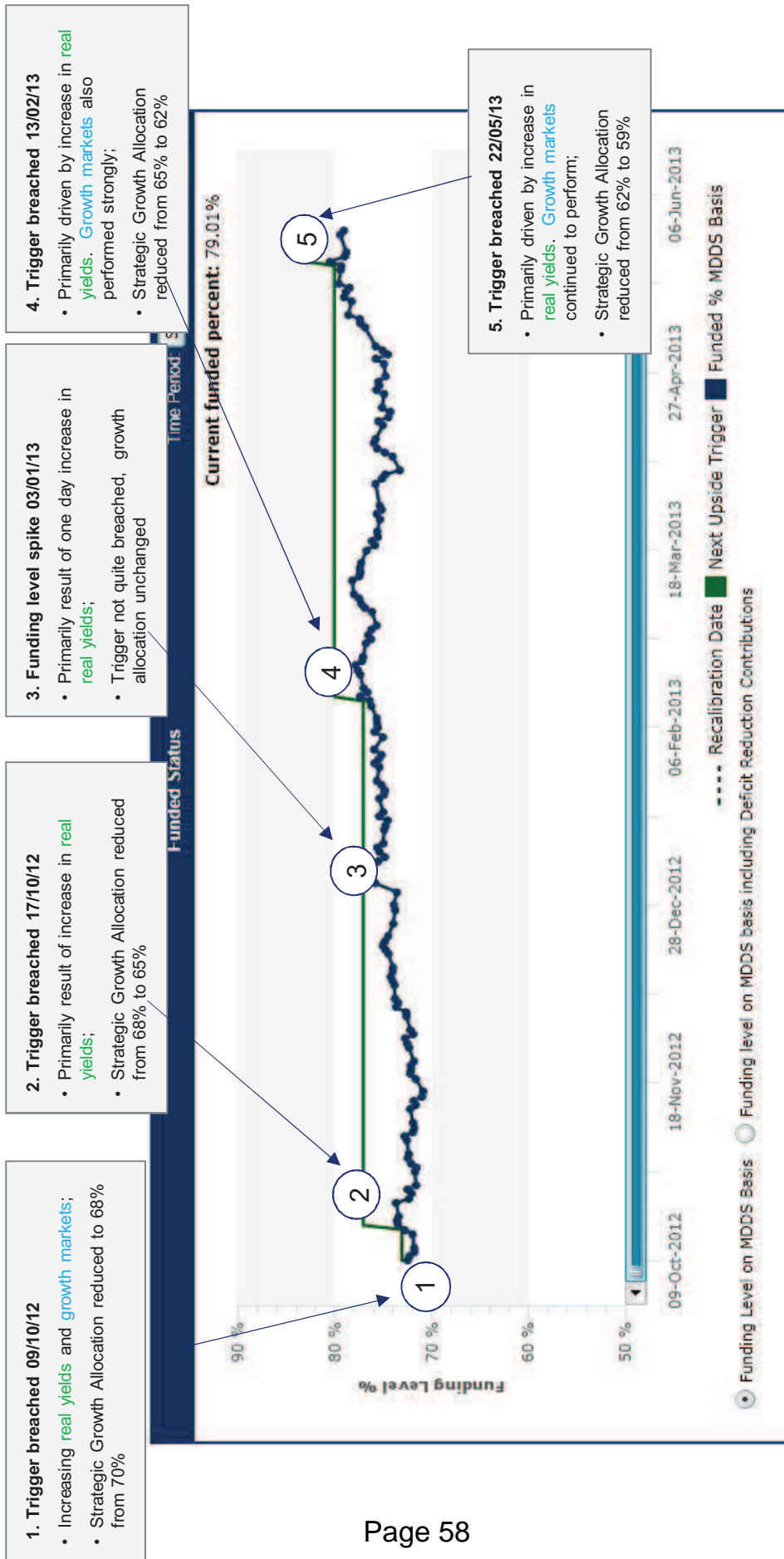
| | Potential Advantages | Potential Disadvantages | Indicative Size Threshold |
|--------------------|--|---|---------------------------|
| Direct investment | <ul style="list-style-type: none"> • Direct influence on investment selection and portfolio composition • Portfolio tailoring • Fee saving | <ul style="list-style-type: none"> • Need for in-house or outsourced credit expertise • Requires large sums of capital • Portfolio concentration especially in the early years | £150m+ |
| Mandate investment | <ul style="list-style-type: none"> • Delegated control of investments • Investment selection and management undertaken by a dedicated manager • Access to manager proprietary deal flow • Control of portfolio design and composition leading to portfolio tailoring potential | <ul style="list-style-type: none"> • Potential for agency risks in the absence of dedicated portfolio manager support/resourcing • Potential for agency risks • Higher fees than direct investing • Portfolio concentration especially in the early years | £75m+ |
| Unlisted funds | <ul style="list-style-type: none"> • Investment selection and management undertaken by a dedicated manager • Access to proprietary manager deal flow • Can accommodate smaller investments • Portfolio monitoring and reporting access | <ul style="list-style-type: none"> • Higher fees • Acquisition risk • Potential for strategy drift • Potential lack of long term track record • Manager reliance gives rise to agency risk | £75m |

Implementation considerations Indicative fund terms

| | Manager A | Manager B |
|------------------------|---|---|
| Type of strategy | Infrastructure Senior Debt, UK Only Pooled fund | Infrastructure Senior Debt, UK Only Pooled fund |
| Return targets | LIBOR + 2.85% (gross) | LIBOR + 2.50-2.75% (net) |
| Management fees | No fees on committed but undrawn capital 0.25% p.a. on drawn capital | 0.45% p.a. on committed capital during Investment Period 0.25% p.a. on Invested Capital thereafter |
| Drawdown period | 12 month maximum | 5 year maximum |
| Market capacity | \$15 billion+ | \$30 billion+ |
| Typical lock up period | 10 years | 10 years with rolling 5 year extension options thereafter |

APPENDICES

Affordable de-risking Banking improvements in the funding to help de-risk



1. Trigger breached 09/10/12

- Increasing **real yields** and **growth markets**;
- Strategic Growth Allocation reduced to 68% from 70%

2. Trigger breached 17/10/12

- Primarily result of increase in **real yields**;
- Strategic Growth Allocation reduced from 68% to 65%

3. Funding level spike 03/01/13

- Primarily result of one day increase in **real yields**;
- Trigger not quite breached, growth allocation unchanged

4. Trigger breached 13/02/13

- Primarily driven by increase in **real yields**. **Growth markets** also performed strongly;
- Strategic Growth Allocation reduced from 65% to 62%

5. Trigger breached 22/05/13

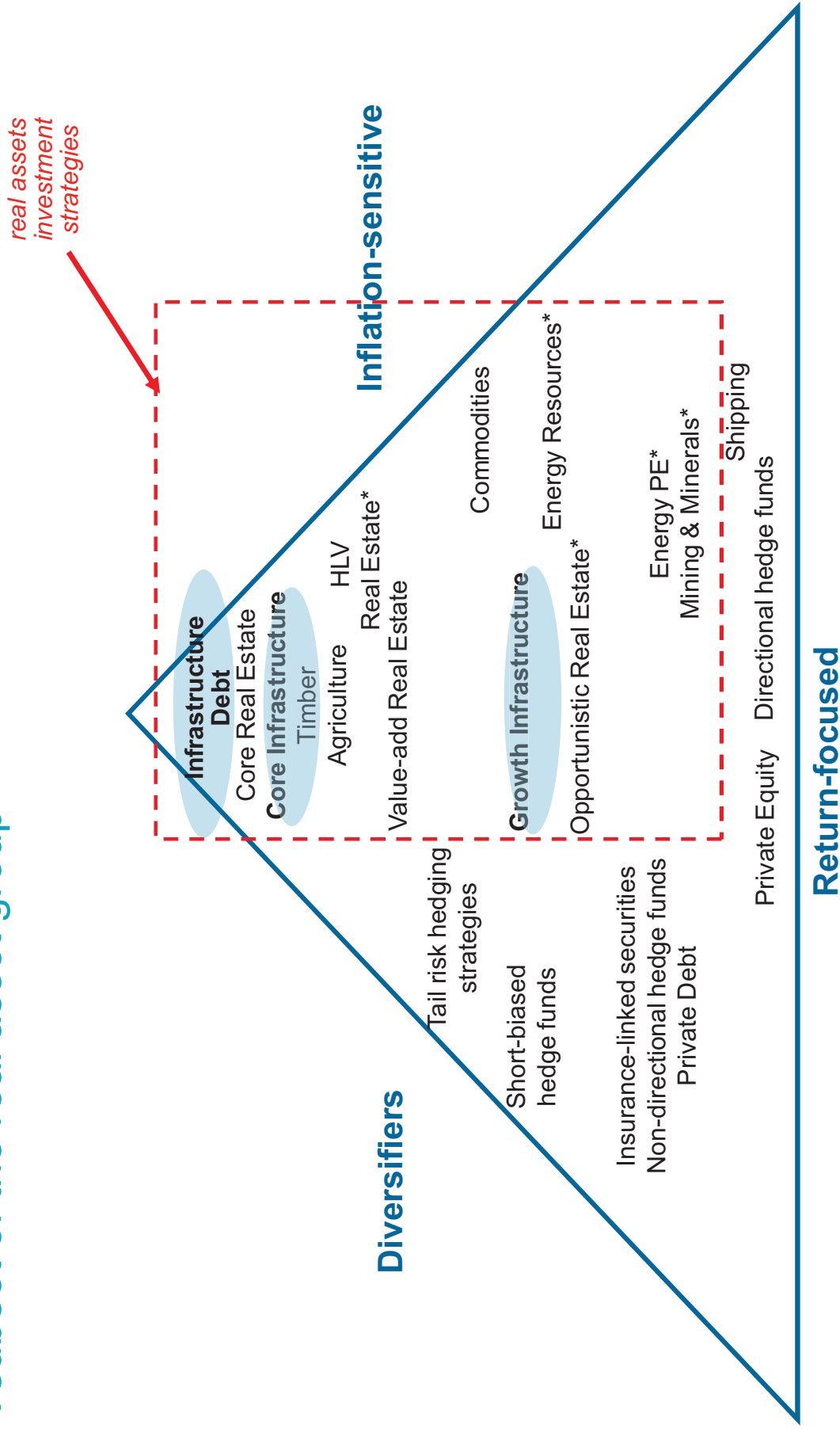
- Primarily driven by increase in **real yields**. **Growth markets** continued to perform;
- Strategic Growth Allocation reduced from 62% to 59%

- For this client, the funding level has increased from 72% at inception to 79% at end of period;
- De-risked through numerous triggers, Growth portfolio allocation reduced from 70% to 59%;

The Fund could look to dynamically de-risk to move to the lowest risk investment strategy that would still support the funding assumptions

Positioning the asset class

A subset of the real asset group



Current market opportunity

The infrastructure debt funding gap

- Demand for infrastructure is significant
 - \$500-\$600 billion estimated annual need among OECD members
 - \$40 trillion or 2.4% of world GDP to be invested in infrastructure to 2030
- Historically banks have been main provider of infrastructure debt (providing up to 90% of debt); post financial crisis, numerous factors are limiting bank participation
 - Basel III and balance sheet repair
 - lower risk appetite
 - “take-and-hold” model
 - refinancing wall
- Other sources of liquidity that were popular prior to the financial crisis (bonds wrapped by mono-lines, CLOs, hedge funds) are no longer in the market
- ...leaving a key role for other institutional investors

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Asset class overview

A range of risk profiles

