



# Pensions Committee

2.00pm, Wednesday, 23 June 2021

## Investment Strategy Review

### 1. Recommendations

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The Pensions Committee (Committee) is requested to:

- 1.1 Approve (amendments to) the investment strategy as outlined in paragraphs 4.32 to 4.34

**Doug Heron**

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# Investment Strategy Review

## 2. Executive Summary

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- 2.1 The purpose of this report is to provide the conclusions of the review of investment strategy of the Lothian Pension Fund (the Fund) and to ask Committee to approve the long-term investment strategy.
- 2.2 The proposed strategy makes minor amendments to the current strategy, including a name change for one Policy Group (paragraph 4.7) and changes to the Policy Group weightings and permitted ranges (paragraph 4.32), including a 5% reduction in Equities.
- 2.3 The review of strategy has been undertaken in cooperation with the Falkirk and Fife Pension Funds, taking advice from the Joint Investment Strategy Panel (JISP) and Hymans Robertson.
- 2.4 The proposed strategy aims to balance this Committee's assumed aim for contribution stability (which is affected by the actuarial assessment of funding level every three years), against the need to generate positive real returns from invested assets to pay pensions over a long time horizon. Stability in the actuarial assessment of the funding level is achieved by owning assets that match the discount rate that the actuaries use to calculate the current value of liabilities – essentially UK gilts. The strategy, therefore, balances the fact that gilts are currently priced to produce negative real returns, which will act as a drag on future returns, with the assumption that other financial assets will generate positive long-term returns.
- 2.5 The JISP advisers note that the central scenario of the asset liability model (ALM) provided by our investment consultant, Hymans Robertson, assumes a significant rise in gilt yields (involving a corresponding fall in capital value). They believe that it would be most appropriate to consider buying into gilts as this is realised rather than to anticipate the rise.

## 3. Background

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- 3.1 The Fund undertakes an in-depth review of its investment strategy following the completion of its triennial actuarial valuations. This enables consideration of the actuary's updated assumptions. The Committee reviewed the recently completed actuarial valuation dated 31 March 2020 at its meeting in March 2021. The investment strategy review described in this report was able to consider developments in the funding level and financial market developments to end March 2021.

- 3.2 The investment strategy of a pension fund has a significant impact on its investment performance, funding level and employer contribution rates. Setting strategy is therefore a major decision for the Pensions Committee.
- 3.3 The review has been undertaken in collaboration with Falkirk and Fife Pension Funds, working with the JISP and Hymans Robertson. A joint event was held for the Committees and Boards of the three funds on 11 June to provide background information, and to discuss, this review.
- 3.4 The Pensions Committee of each fund is responsible for determining its own investment strategy and monitoring implementation of that strategy and its success. Given that the funding position and cash flow outlook of each fund is different, the investment strategy of each fund may be different.
- 3.5 LPF's Committee delegates implementation of investment strategy to the Executive Director of Resources and in turn the Head of Finance taking advice from the JISP. The Head of Finance works with the officers to implement and monitor strategy, which includes the regular quarterly meeting of the JISP advisers.
- 3.6 The Fund constituted the JISP to provide strategic advice. Its three external independent advisers, Scott Jamieson, Kirstie MacGillivray and Stan Pearson, have been supported by Lothian's internal investment team and Hymans Robertson in this investment strategy review. Hymans Robertson undertook asset liability modelling (ALM), which tests potential investment strategies, and quantifies the probabilities of achieving objectives. JISP advisers will attend this meeting and will be available to comment further on the proposed strategy.
- 3.7 In order to provide suitable investment programmes for the differing requirements of employers, the Fund currently operates four investment strategies.

**Table 1**

<b>Investment Strategy</b>	<b>Assets (£m)</b>	<b>Weight</b>
Main Strategy	7,887	91%
Mature Employer Strategy	80	1%
50/50 Strategy	75	1%
Buses Strategy	578	7%
<b>Total</b>	<b>8,619</b>	<b>100%</b>

At end March 2021

- 3.8 Most employer liabilities are funded under the Main Strategy, which maintains a significant exposure to real investments, such as equities, which have a history of protecting and enhancing real purchasing power. This reflects the fact that the fund is open to new entrants, so these employers have long duration liabilities that continue to grow. Indeed, without real growth in the investments, contributions

would need to be significantly higher to meet these new liabilities. Volatility of returns associated with these real investments is less important when liabilities are long in duration and so funding level variability is less important though not unimportant.

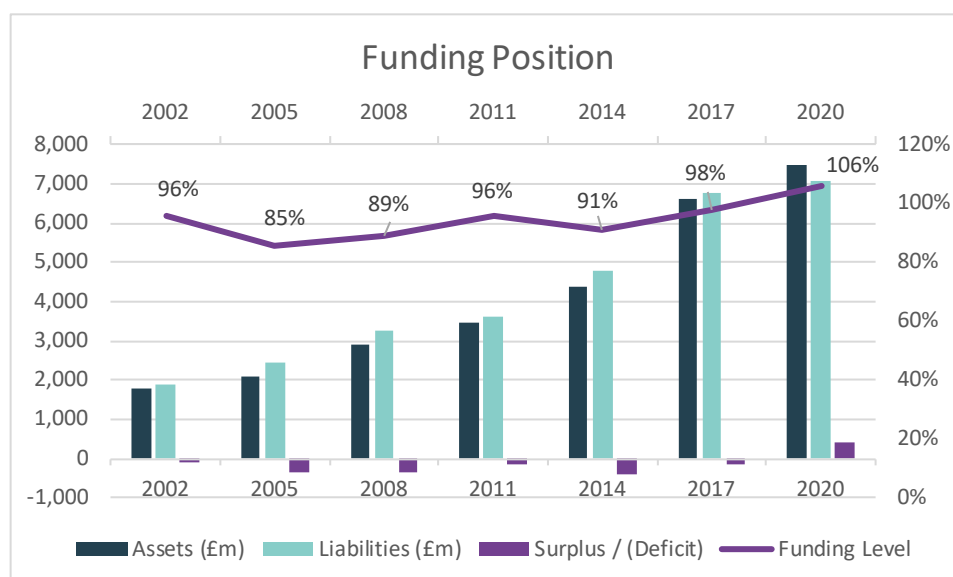
- 3.9 The other three employer strategies are maintained because the duration of liabilities of some employers are relatively short. The Buses company has closed to new entrants and so the fund is maturing and a more appropriate asset strategy to fund liabilities is in place. The Mature Employers Group (MEG) is invested entirely in index-linked gilts and cash to match assets and liabilities and eliminate funding level variability as much as possible. The 50:50 strategy combines the Main and MEG Strategies in 50:50 proportion, reflecting the relative maturity of those employers and the duration of their liabilities.

## 4. Main Report

### Funding Position

- 4.1 The investment strategy of a pension fund has a significant impact on its investment performance, funding level and employer contribution rates. Setting strategy is therefore the major decision for the overall pension fund.
- 4.2 The graph below shows the actuary’s assessment of the funding position over the last several actuarial valuations. This investment strategy review is based on the results of the 2020 actuarial valuation adjusted for estimated market movements over the year to 31 March 2021.

Graph 1



- 4.3 At 31 March 2020, the actuary estimated that the funding level was 106%. As noted in Appendix 1 (slide 17), that is the actuarial *reporting basis*. For the investment strategy review, the investment consultant has used the *long-term funding basis* to provide consistency with the approach used to set employer contributions. This basis more clearly illustrates that the Fund must invest in assets with returns above those of UK gilts to achieve its objectives. It was estimated to be 89% at 31 March 2021.
- 4.4 Committee will recall that, for the most financially secure employers, a Contribution Stability Mechanism has been applied over the last three actuarial valuations. Under this mechanism, employers are currently paying lower than the rate which would be based on the theoretical position based on markets. This is largely due to low yields.
- 4.5 The table below shows the cashflows into and out of the Fund. It illustrates that net cashflow from dealing with members is broadly neutral. Income from investments has averaged £217m over the last three years, which means that Fund is overall cash flow positive.

**Table 2**

<b>Cash Flow (net additions / withdrawals from dealing with members)</b>						
	<b>2011/12</b>	<b>2013/14</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>	<b>2020/21*</b>
Income	188	186	196	227	240	305
Expenditure	151	173	214	241	279	247
Net Cash Flow	37	13	(18)	(15)	(39)	58

\* A one-off transfer in of assets by Visit Scotland amounted to £58.3m in 2020/21

### **Policy Groups**

- 4.6 To support effective strategy determination, the JISP continues to recommend that the Committee defines the Fund's high-level investment strategy in terms of five Policy Groups. These classify assets into categories with similar risk and return characteristics, which are not completely correlated with one another. The weighting of these groups in a portfolio is the key determinant of risk and return. Appendix 1 contains asset return and volatility assumptions used in the modelling and the strategy. Table 3 below shows the Policy Groups in descending order of return and risk. (Note that the real returns on both gilts and cash are negative, and which is lower broadly depends on how much they each lag inflation).
- 4.7 The JISP has recommended minor amendments to the existing five Policy Groups which condense the vast array of investment choices into a manageable number of investment groups. The proposed Policy Groups are shown in the table below. The name of the Gilts Policy Group has been changed to LDI (liability driven investment) to reflect the fact that the main reasons for investing in gilts is to reduce the

variability of the funding level because they are a good match for liabilities. It should be noted that Gilts are currently expensive, with a guaranteed negative real return to maturity.

**Table 3**

<b>Policy Group</b>	<b>Objective</b>	<b>Permitted Assets</b>
<b>Equities</b>	The principal driver of the Fund's growth and. In the long term, expected to outperform liabilities, albeit with periods of volatility	Listed equity; private equity; forward currency contracts; equity futures
<b>Real Assets</b>	Positive real returns with an income stream, in some way, linked to inflation. Likely to deliver some diversification from equity returns.	Property; infrastructure; timberlands; agriculture; commodities
<b>Non-Gilt Debt</b>	Assets offering strategic funding level protection and / or delivering a superior yield to that available from gilts (and where returns may have a positive correlation with bonds).	Investment grade bonds; high yield bonds; loans; private credit; emerging market debt; overseas sovereign bonds
<b>LDI (formerly Gilts)</b>	Assets offering strategic funding level protection by virtue of being the asset that most closely matches the liabilities and so reduces funding level variability. This currently comes at a cost because gilts guarantee a negative real return if held to maturity.	Index-linked gilts; nominal gilts; gilt futures
<b>Cash</b>	Liquidity function avoiding (mostly) credit and duration risk premia.	UK Treasury assets; overseas Treasury assets; local authority loans; bank/building society deposits (all short term)

- 4.8 Under the governance structure of the Fund, the implementation of the investment strategy within these Policy Groups is delegated by the Pensions Committee to nominated officers with advice from the JISP.
- 4.9 The modelling results below and in Appendix 1 indicate that the level of equities is by far the key determinant of investment risk and return. Variation in the types of investment managers within each Policy Group is typically less significant to the overall risk and return than strategic Policy Group allocations over the long term.

### **Asset Liability Modelling**

- 4.10 An Asset Liability Model (ALM) is a tool which projects how the Fund's assets and liabilities might perform in the long-term. The primary aim is to indicate the degree of uncertainty associated with a particular strategy; the ALM is not a forecasting tool. It describes how likely different investment strategies are to deliver returns that

achieve the Fund’s objectives – paying pensions as they fall due. Investment strategies with higher expected returns are likely to require lower employer contributions. However, such strategies will be accompanied by more variability in funding level and the risk that employers will be required to make larger contributions if the investments do not perform as expected.

- 4.11 Asset Liability Models include many assumptions about how the economy and investment markets might change in the future, highlighting the uncertainty in projecting future outcomes. The assumptions in such models should be considered as well as the results. Hymans Robertson has tested the current investment strategy and potential investment strategies, which are expected to deliver sufficient returns with a high probability of success over a 20-year timeframe. There are, however, a wide range of possible outcomes, which reflects the need to generate returns in excess of the return generated by gilts, the matching asset for a pension fund. There is less certainty associated with the future returns from other financial assets.
- 4.12 The assumption for future gilt yields is one of the most critical inputs to the model. The level of gilt yields does not impact the actual pensions which will fall due. But it greatly affects the current value of these liabilities calculated by the actuary – as discounted by this rate. The higher the assumed discount rate (level of gilt yields), the lower the current value of liabilities, as calculated by the actuary’s model.
- 4.13 Hymans Robertson’s asset liability model assumes, on average, that nominal gilts return c. 1.5% p.a. over the next 20 years, with nominal yields increasing to +3.5% pa. This is a major assumption because nominal 20-year gilt yields are 1.3% pa (27/5/2021), and they are currently expected by the market to fall. Nominal 40-year gilt yields are currently 1.2% pa, which is consistent with 20-year gilt yields in 20 years’ time falling to 1.1% pa.

**Table 4**

UK Gilts		
Maturity	Years to Maturity	Yield
2071	50	1.122%
2061	40	1.216%
2055	30	1.316%
2035	15	1.163%
2030	10	0.808%
2028	7	0.582%
2026	5	0.344%
2024	3	0.153%
2023	2	0.043%

Source: Bloomberg

- 4.14 The ALM helps to demonstrate, on its assumptions, whether the investment strategy is likely to deliver the funding objectives, the associated risks and the impact of

changing investment strategy. However, model assumptions need to be considered when interpreting the results, particularly the gilt yield and equity assumptions.

## The Results

- 4.15 The results of the Asset Liability Modelling are attached as Appendix 1. The modelling shows that:
- 4.15.1 future funding levels are significantly reliant on the assumption of future gilt yields; and
  - 4.15.2 the risk associated with the investment strategy is largely determined by the amount invested in equities, typically the most volatile asset class over shorter term time periods.
- 4.16 The modelling has generated estimated probabilities of the Fund being at least 100% funded by 2040 (20 years after the 2020 actuarial valuation) based on several different investment strategies.
- 4.17 The Appendix shows 'Current' investment strategy is 65% invested in equities. The ALM calculates that:
- 4.17.1 The probability of reaching 100% funding by 2040 (20 years after the 2020 actuarial valuation) is 82% (slide 24); and
  - 4.17.2 There is a "very low" 4% probability that the funding level will be below 65% in 2023, which would be a deficit of approximately £3.3billion or more (slide 30). In comparison, the total payroll for members of the Fund as at March 2020 was £789million. Hence recovering such a deficit from employers over 20 years would equate to approximately 21% of payroll per annum.
- 4.18 As noted earlier, the anticipated increases in gilt yields are a critical assumption in the ALM model. Recall that the financial markets expect yields to fall slightly. Slide 28 illustrates the potential impact on the Fund if yields do not increase to the full extent assumed by the model. This has a meaningful impact (slide 29), reducing the probability of achieving the target funding level by 2040 by 13 percentage points. Based on the current strategy, the probability of exceeding 100% funding by 2040 is 82% assuming the nominal gilt yield reverts to 3.5%, but only 69% with a low yield model assumption of 1.5%. This yield assumption looks more prudent based on current financial market pricing.
- 4.19 The ALM indicates that there is scope for the Fund to reduce equities (the most volatile assets) to lower the probability of its funding level calculation falling below 65% to 2-3% against 4% currently. However, this implies buying (matching LDI gilt) assets with a guaranteed negative real return. This would reduce probabilities of



achieving funding targets. So, following the model would be acceptable if the assumptions are deemed acceptable. But the estimated 82% probability of success is significantly reliant on gilt yields increasing, when financial markets expect them to fall. On the “low yield reversion” assumption also tested by the ALM, the probability of success would be 69% on current strategy, dropping to 64% on “de-risking” (selling equities and buying gilts or debt assets).

- 4.20 The ALM does not incorporate climate scenario analysis, but Hymans Robertson and the JISP advisers believe that the existential threat of climate change should be taken seriously by pension funds with long duration liabilities. Hymans Robertson is actively developing a climate scenario model to integrate with its ALM. Currently, it provides standalone analysis, which was used for the purposes of this strategy review.
- 4.21 Three possible scenarios, which differ according to governments’ policy responses to climate issues, were considered. The scenarios capture the high-level impact of government policies over 20 years and an impact on longevity. As bad outcomes are already incorporated into Hymans’ ALM, the serious implications of climate change do not necessarily alter the ALM conclusions.

#### **Adviser Commentary**

- 4.22 Advisers have discussed the inputs and outputs of the ALM with Hymans Robertson to understand its strengths and its limitations. They note that it:
- 4.22.1 quantifies and frames the uncertainty inherent in forecasting 20-year risk and returns;
  - 4.22.2 quantifies the shorter term, downside risks that could impact employer contributions at the next actuarial valuation in 2023;
  - 4.22.3 highlights the critical role that gilt yields have in the funding level output and the probability of success.
- 4.23 The quantitative model cannot produce a right ‘answer’ for the Committee. It produces a range of possible outcomes and the central outcome is not more certain than any others. However, the central outcome of the model does rely on gilt yields rising. (Note that the model does incorporate potential, worse outcomes where yields do not rise.) The reality is that yields have continued to trend down over the last four decades along with a downshift in nominal economic growth. Obvious reasons for this include high and rising debt levels, demographic trends, globalisation and the substitution of capital for labour. It is not clear that these trends will reverse putting upward pressure on interest rates and inflation anytime soon. To sustain higher gilt yields, short term policy rates, such as the UK Base Rate, would need to rise to levels not seen for more than a decade. The Bank of England has cautioned against expecting such a move any year soon.

- 4.24 Perhaps the most insidious of these issues is the increasing global debt burden, which has been further exacerbated by the global pandemic. It was already very high by historical standards and yet fiscal policies have taken on a more expansionary flavour, financed by increased debt. Although the immediate future looks brighter as the world economy emerges from the COVID-19 trauma - interest rates and inflation expectations have already anticipated this to some degree - it is far from clear that the path of gilt yields is on the trajectory of the yield reversion in the model. Certainly, the model is at odds with the market's current expectations, which show yields falling to 1.1% per annum in 20 years, not 3.5% in the model.
- 4.25 The long-term implications of the current and expected economic policies - expansionary, debt-financed fiscal policy combined with easy, average inflation-targeting central bank monetary policy - will be a challenge for pension funds. There seems to be only one politically acceptable way to reduce debt levels and that is to inflate them away gradually. That would be to the detriment of savers and to the benefit of debtors; to the detriment of financial assets and the benefit of real assets. Levels of debt to GDP have continued to rise, not fall. It seems almost certain that major central banks around the world will be distorting price signals by buying government bonds to keep yields low and below inflation in order to deflate the real value of the debt. The existing policies have provided a tailwind to riskier assets, where valuations have expanded. Prospective policies may do the same, but real returns from financial assets are likely to be much lower in future than in the recent past given that starting valuations are higher.
- 4.26 The balance between minimising the probability that the ALM calculation of funding level will fall below 65% in 3 years, against maximising the probability that the fund will be able to pay (100% of) pensions as they fall due is the key strategic decision for the Committee.
- 4.27 Based on statistical modelling, our investment consultant judges that there is scope to reduce financial market risk within the pension fund without a material reduction in the probability of a successful outcome. This conclusion is informed by insight into thousands of possible economic and financial scenarios. An alternative to de-risking would be to plan for lower contribution rates.
- 4.28 Given that there is uncertainty about future outcomes, there are a range of views expressed by advisers, but the consensus view is that the most likely scenarios are those shaped by a continuation of expansive monetary and fiscal policies across the globe. Policymakers are explicitly targeting higher nominal economic growth and, by association, strong asset markets. To reduce risk would be to decide that these policy objectives will be missed. The advisers believe it is premature to come to that conclusion.

- 4.29 Accordingly, having reviewed the ALM results and considered the strengths and limitations of the model, the JISP advisers believe it is appropriate to wait for increased yields to arise, rather than to reduce the Fund's investment risk and return ahead of such time. As noted earlier, employer contributions being paid are lower than the theoretical rate based on current yields and this is, in effect, anticipating increases in yields.
- 4.30 Climate modelling is unavoidably fraught with uncertainty. Work done by the investment consultant highlights that, on balance, climate change would, in the longer term, weaken the financial position of the pension fund. This affects the probability of success and means that risk appetite should be maintained.
- 4.31 The JISP advisers conclude that the Fund should reduce its exposure to equities slightly to 60% invested in lower risk equities with small increases in LDI and Real Assets. They agree with Hymans Robertson that the Fund should consider further reductions of Equities should the funding position continue to improve, but that it is not prudent to anticipate a rise in gilt yields and funding level.

#### **Recommended Strategy**

- 4.32 The proposed investment strategy is presented in the table below. It is based on long term expectations (20+ years) that the asset mix will generate returns comfortably in excess of liabilities. The permitted ranges are the constraints within which nominated officers can implement strategy under delegated authority without referral to the Committee. They are wide enough to avoid unnecessary and potentially costly rebalancing under normal financial conditions, but to enable prompt action in fast moving markets.

**Table 5**

<b>Policy Group</b>	<b>Current Strategy</b>	<b>Proposed Strategy</b>	<b>Current Permitted Range</b>	<b>Proposed Permitted Range</b>
Equities	65%	60%	50% - 70%	50% - 70%
Real Assets	18%	20%	10% - 25%	10% - 30%
Non-Gilt Debt	10%	10%	0% - 20%	0% - 20%
LDI (formerly Gilts)	7%	10%	0% - 20%	0% - 20%
Cash	0%	0%	0% - 10%	0% - 15%
<b>Total</b>	<b>100%</b>	<b>100%</b>		

- 4.33 The strategy modifies the ALM output to reflect adviser consensus that the yield reversion is far from certain, given the policy backdrop that is likely to persist for a substantial portion of the 20-year period modelled. Climate change considerations too impact the outlook with the cost of transitioning being a potential drag on economic growth.
- 4.34 The investment team will continue to monitor the funding level with JISP advisers and adjust exposures of the Policy Groups within the constraints of the permitted ranges. They will provide regular reporting on strategy implementation and refer to Committee for direction should there be a recommendation to operate outwith the permitted ranges or to adjust the strategic weights.

## **5. Financial impact**

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- 5.1 The investment strategy has a significant impact on the investment returns of the pension fund and hence impacts on the funding level and employer contribution rates.
- 5.2 The extent of the financial implications is illustrated in the ALM results shown in the report.

## **6. Stakeholder/Regulatory Impact**

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- 6.1 The Pension Board, comprising employer and member representatives, is integral to the governance of the fund and they are invited to comment on the relevant matters at Committee meetings.
- 6.2 There are no adverse health and safety, governance, compliance or regulatory implications as a result of this report.

## **7. Background reading/external references**

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None.

## **8. Appendices**

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Appendix 1 – Asset Liability Modelling results

# Investment Strategy Review

Falkirk, Fife and Lothian Pension Funds

John Dickson, Senior Partner  
Jordan Irvine, Senior Investment Consultant  
Mark Tighe, Investment Analyst

June 2021



# Introduction

- This paper is addressed to the Pension Committees (“the Committees”) of the Lothian Pension Fund, Falkirk Council Pension Fund and Fife Council Pension Fund (“the Funds”).
- The purpose of this paper is to present the results of the asset liability modelling (ALM) exercise and the potential implications for each Fund.
- We accept that the paper can be part of the Committees’ public papers. However, the results and conclusions are not addressed to any party other than the respective Pension Committees and no other party should rely on any of the content or advice contained in this paper. We accept no liability to any other party unless we have accepted such liability in writing.
- This paper has been prepared in accordance with the relevant professional standards (specifically the Technical Actuarial Standard, TAS 100: Principles for Technical Actuarial Work).
- Details of the Reliances & Limitations associated with this work and the assumptions made are set out as an Appendix.

# Areas we'll explore today

- How likely is it that the current combination of funding and investment strategy delivers 100% funding over an acceptable period?
- Consider alternative investment strategies and their impact on achieving full funding – consider the suitability of the current strategic ranges.
- Assess whether a lower risk investment approach can be adopted given the current strong funding positions?
- Assess whether a lower level of contributions can be achieved in the future?
- Consider the impact of a downside risk event over the next couple of years, how big the deficit could become and any action that should be taken?
- Assess the strategies against different economic scenarios e.g. varying yield and inflation environments.

# High level overview

- All three Funds have seen an improvement in funding position since the 2020 actuarial valuation as a result of strong market returns over this period. Throughout this presentation we have focussed on the long-term funding position as this is most relevant when thinking about contributions and investment strategy.
- Under our central yield assumption, there is significant scope to reduce investment risk across the three Funds. Falkirk's starting funding position is lower than Lothian and Fife, which offers less scope to reduce investment risk. That said, the equity exposure can be reduced by 15% across all three Funds and still retain at least a 75% probability of being fully funded in 2040. In doing so, the downside risk measures reduce materially (c.10% for each Fund).
- There is also some scope to reduce contributions in the future under the central yield assumption; however, Falkirk is limited in its ability to reduce both investment risk and contributions. Any potential reductions in contributions would need to be tested by the Scheme Actuary at next actuarial valuation.
- Under a lower central assumption for long term yields, there is less scope to reduce investment risk. However, based on the current position, both Fife and Lothian could reduce the level of equity exposure by a modest amount.
- If the Funds continue to see an improvement in the funding position, then there will be significant scope to reduce the level of equity exposure whichever of the central yield assumptions are adopted. A sensible next step would be to consider potential de-risking triggers to capture future improvements in the funding position. At the same time, the Committee may need to consider amending the current strategic targets and tolerances.
- As part of this review, we also considered climate scenario analysis. Climate scenario analysis is in its infancy and will continue to improve. However, overall, the proposals to reduce investment risk are well aligned to the green revolution and should therefore encourage positive action to help address climate issues.



# Summary of conclusions

Overall, the results on the central yield assumptions show significant scope for all Funds to be able to reduce equity exposure. However, it is prudent not to allow for the potential improvements to the funding position coming from increasing gilt yields, certainly in the near term. Focussing on the results from the lower yield model retains this element of prudence. Overall, this reduces the scope to reduce equity exposure at least until we see further improvements in the funding positions. On this basis, our conclusions from the modelling for each fund are as follows:

## Lothian

- Although limited, there is scope to reduce equity exposure by 5-10% which would move it towards the centre of the current range. However, as the funding level improves, there will be scope for further reductions in equity exposure. This indicates that it would be useful to set funding level triggers at which the JISP could consider what, if any, action could be taken to reduce risk further.

## Falkirk

- Due to a lower current funding level, there is less scope to reduce equity exposure immediately. However, the current position has an equity allocation above the strategic target of 60%. The results continue to support moving to the strategic target. As with Lothian, future funding improvements will give more scope to reduce equity exposure further; again, indicating that funding level triggers to consider what action to take would make sense.

## Fife

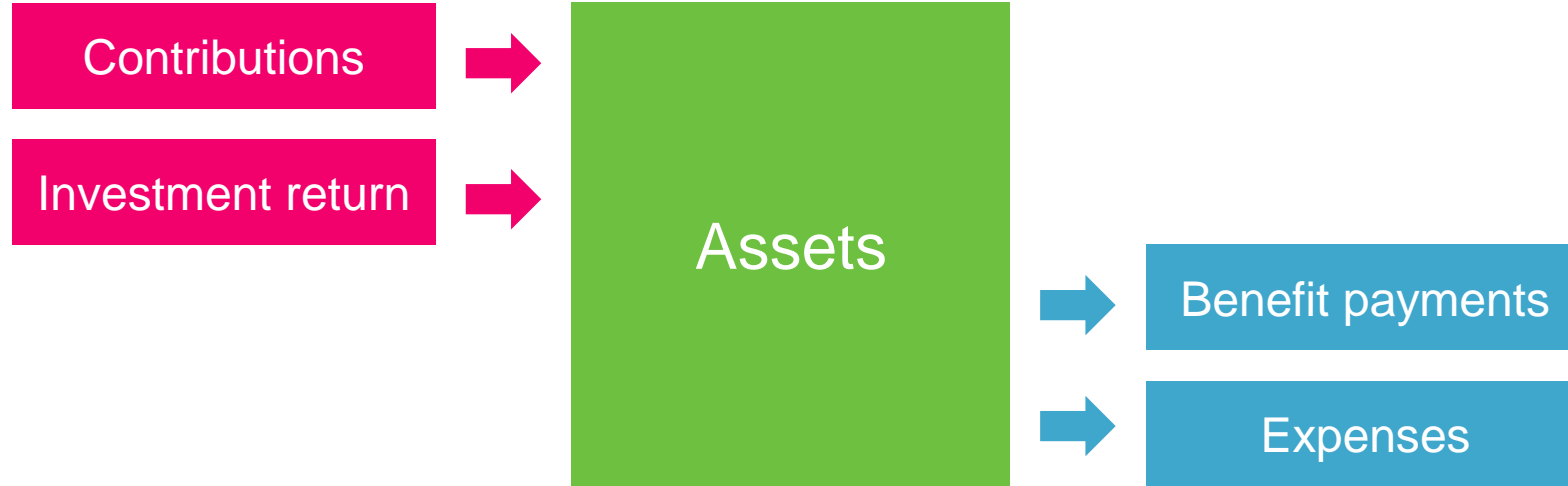
- Like Lothian, even under a lower yield assumption there is scope to reduce equity exposure immediately. We understand the Committee has been reducing the equity exposure recently from 60% to 55%, but our analysis would support reducing this by a further 5%. Funding level improvements will give scope to move even further and, as above, setting funding level triggers to consider future actions makes sense.

We note that the focus is on reducing equity exposure, particularly as improving funding levels afford it. There are many ways of achieving this. We have considered two – switching into the debt or LDI policy groups. Both are broadly equally affordable. There are other approaches, including buying equity protection in the market. We would expect that when the opportunity to reduce equity exposure is triggered, the JISP would consider both whether and how that should be achieved.

# Strategic objectives

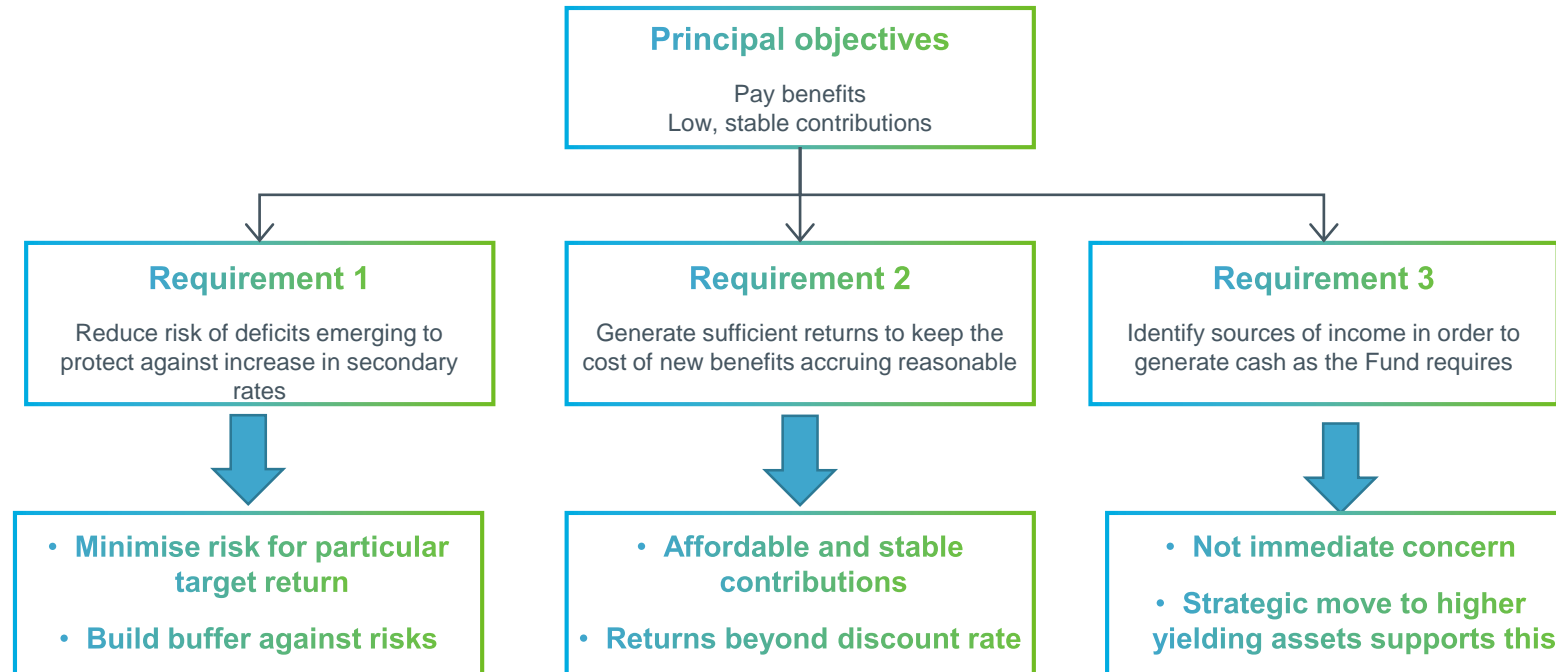


# Funding pension benefits



- Only two sources of funding benefits
- Investing with a long-term investment horizon
- Requirement for “affordable and stable” contributions
- Want attractive real rate of return over the long term

# Strategic priorities

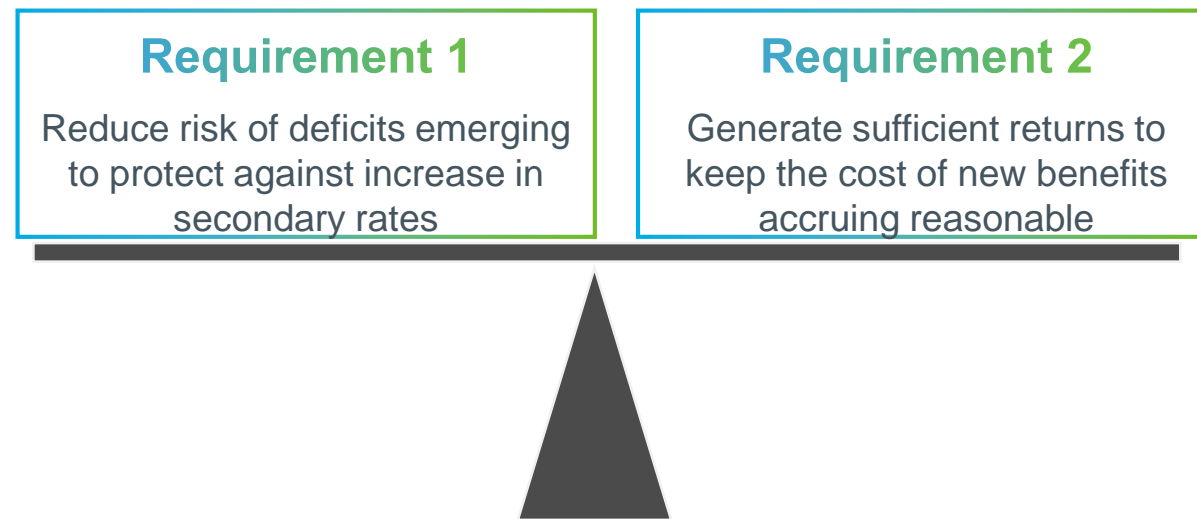


Seeking long-term affordability and stability

# Building towards a “steady state”

## Principal objectives:

- Provide pensions for current and future generations
- Get funding to **a steady state**
  - affordable and stable contributions
  - an appropriate level of investment risk - “target returns”



Getting the balance right for now and the future

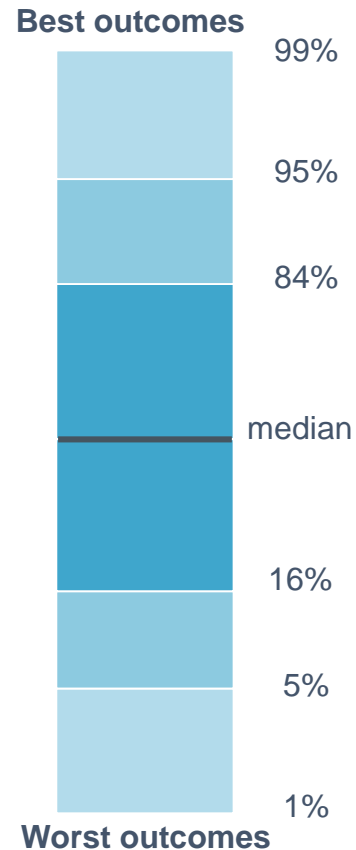
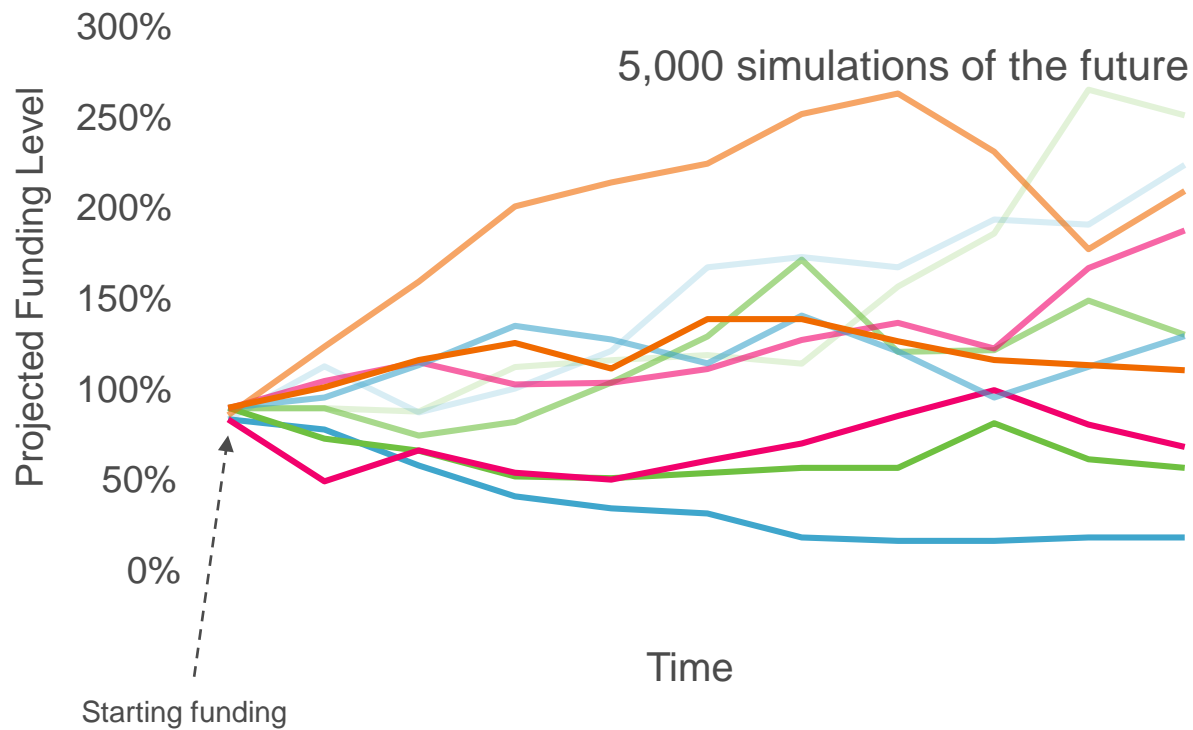
# Approach to modelling

- Aim is to determine the optimum investment strategy by testing the current position against a range of alternatives.
- The key is finding a balance between having enough expected return (to ensure contributions remain affordable) and minimising the risk taken to generate this return (to maintain stability of contributions).
- To test different strategies, we use long-term projection models, projecting forward both liabilities and assets, and use a range of metrics to test the effectiveness of each strategy.
- The model is often referred to as an Asset Liability Model.

# What we have modelled



# Modelling process

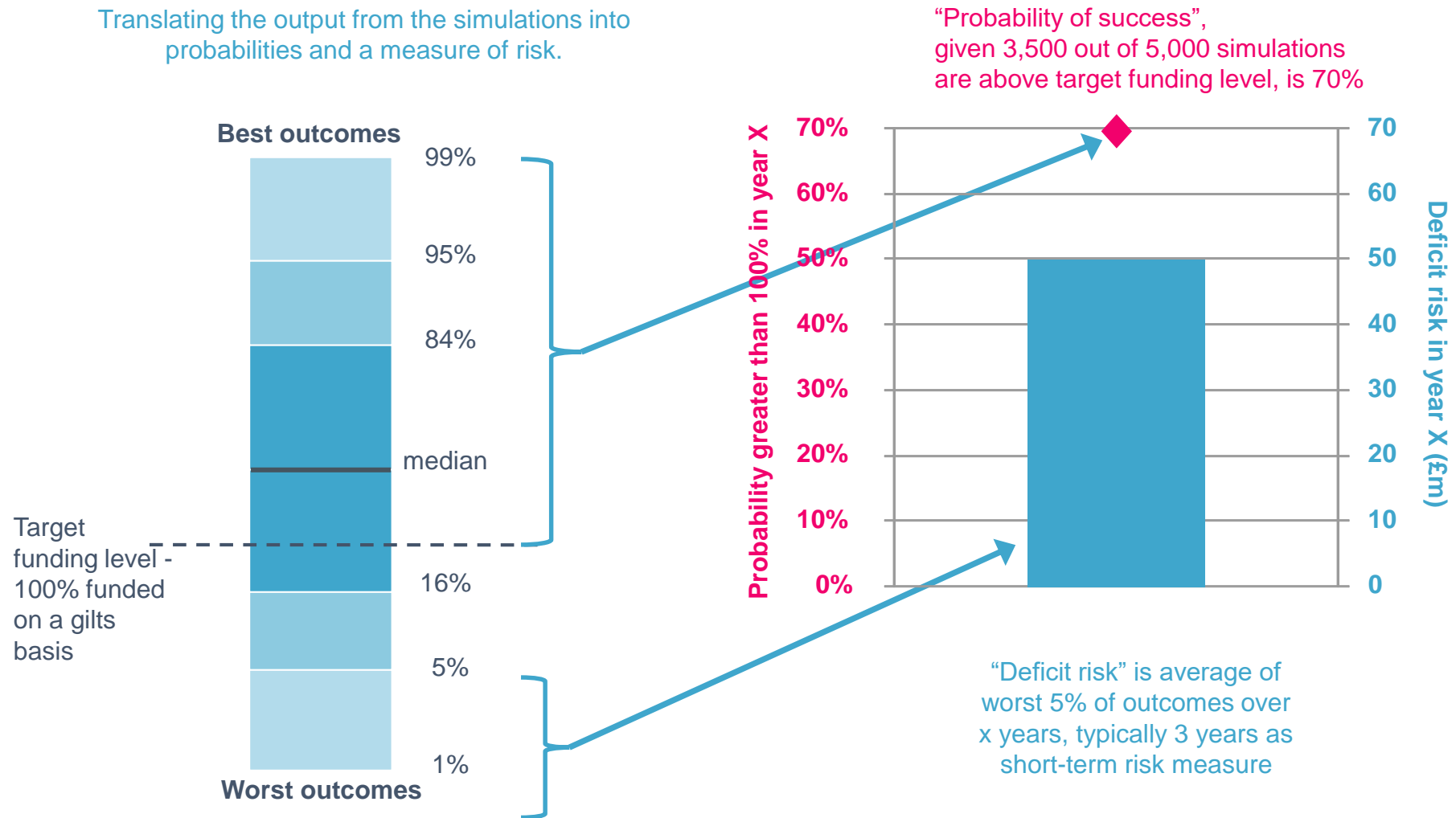


- We run 5,000 simulations of the future for each strategy.
- The modelling uses market-consistent rates of return and volatilities and long-term characteristics of major asset classes.
- Current conditions are viewed as “unusual”, particularly the low level of (real) interest rates. Our central assumption assumes higher long-term yields, but we have also tested the impact of lower levels of long-term yield.
- We rank the 5,000 simulations from best to worst to give a range of potential outcomes and focus on:
  - **Probability of success** – of achieving funding level of 100%
  - **Downside risk** – how bad could it get by next valuation. We consider the worst outcomes over 3 years.



# Understanding the output

Translating the output from the simulations into probabilities and a measure of risk.



# Current strategy and ranges

	Lothian (Main)			Falkirk			Fife		
	Allowable Range			Allowable Range			Allowable Range		
	Low	Target	High	Low	Target	High	Low	Target	High
<b>Equities</b>	50%	<b>65%</b>	70%	50%	<b>60%</b>	70%	45%	<b>50%</b>	65%
<b>Real Assets</b>	10%	<b>18%</b>	30%	10%	<b>20%</b>	30%	10%	<b>20%</b>	25%
<b>Debt</b>	0%	<b>10%</b>	20%	0%	<b>15%</b>	20%	5%	<b>15%</b>	25%
<b>LDI</b>	0%	<b>7%</b>	25%	0%	<b>5%</b>	20%	5%	<b>15%</b>	25%

- We have shown the proposed permitted ranges above, but understand that these are still being considered by the Committee.
- Reflecting the strong positions, we have focussed on lower risk investment strategies in this paper. If interested, we can follow up with results from the re-risked investment strategies.
- We have considered the current contribution schedule for each Fund and the impact of reducing the level of contributions.

# Policy groups modelled

Policy group	Allocation
<b>Equities (beta of 90% for Lothian)</b>	<b>100%</b>
Overseas Equity	83%
UK Equity	8%
Emerging Markets Equity	6%
Private Equity	3%
<b>Real Assets</b>	<b>100%</b>
Infrastructure	55%
Property	40%
Timberland	5%
<b>Debt</b>	<b>100%</b>
Investment Grade Credit	60%
Private lending	20%
Cash	20%
<b>LDI</b>	<b>100%</b>
Index-linked	85%
Nominal	15%

- Note that this is not intended to exactly replicate the structure of the Funds, but gives a broad representation of the risk and return profile
- This provides a framework for comparing varying levels of risk and return
- The framework can be used to analyse the impact on the overall level of risk and return of changes to the strategies
- Structure modelling allows varying asset classes and proportions within each policy group to be investigated in more detail.

# Risk and return assumptions (31 March 2021)

Asset class	Median return (%p.a. 20 year horizon)		1 year volatility (%)
	Nominal	Real (above RPI)	
Global equity (beta = 1)	5.8	3.0	17.4
Global equity (beta = 0.9)	5.8	3.0	15.7
Diversified growth	4.5	1.7	11.9
Property	4.2	1.4	14.2
Private equity	6.8	4.0	28.5
Infrastructure	5.9	3.1	21.0
Private debt	4.9	2.1	4.6
High yield bonds	3.8	1.0	5.9
Corporate bonds (A rated average)	1.6	-1.2	8.0
Cash	2.0	-0.8	0.3
Medium term gilts	1.0	-1.8	7.3
Medium term index-linked gilts	-0.3	-3.1	7.5

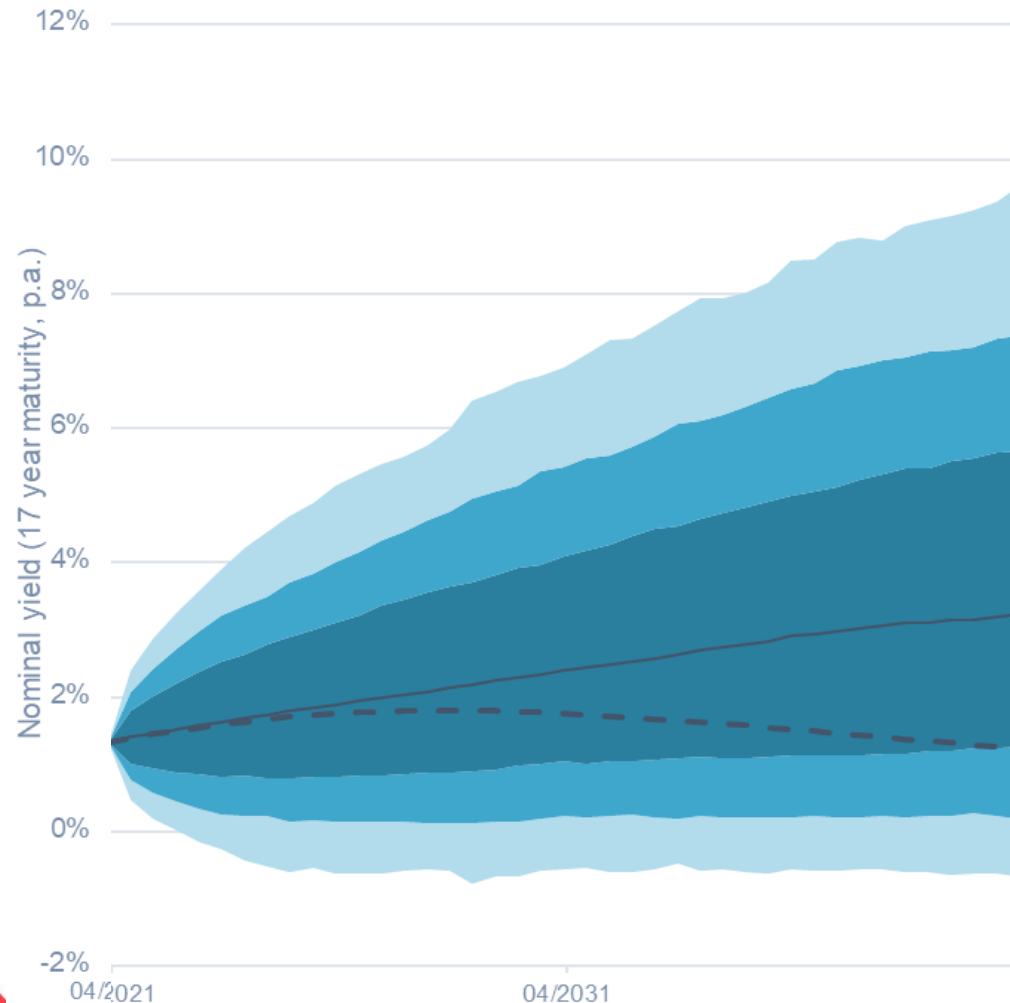
# Difference in funding levels from valuation

	Lothian	Falkirk	Fife
<b>31 March 2020 actuarial valuation</b> <b>(<u>reporting basis</u>)</b>	106% (gilts + 2.23%)	94% (gilts + 2.4%)	97% (gilts + 2.3%)
<b>31 March 2021</b> <b>(<u>long-term basis</u>)</b>	89% (gilts + 1.8%)	78% (gilts + 1.8%)	89% (gilts + 1.8%)

- Two separate funding level bases:
  - **Reporting basis** – shown historically and reported in the 2020 actuarial valuation.
  - **Long-term basis** – used by the actuary when considering funding position and contribution schedule.
- We have used the long-term basis in our modelling as this is most relevant to today's discussion when thinking about contributions and investment strategy.
- The initial funding levels used in the modelling are shown in the second row
- For illustration purposes, we have shown the funding levels on the reporting basis as at the 2020 actuarial valuation in the first row

# Yield assumptions

## Nominal yields



- Due to the uncertainty around the appropriate level of yield normalisation, we assume short and long maturity nominal rates tend towards one of three distinct levels or regimes (on average), set at: the long-term historical average (4.5% p.a.); broadly in line with current levels (1.5% p.a.); and an intermediate level (3.0% p.a.).
- Our central assumption is a blend of the three regimes 60/20/20 and gives us a central long-term yield assumption of c3.5% p.a.
- Our yield assumption impacts the probability metrics as we assume that some of the improvements comes from liabilities being valued at a higher discount rate.
- However, we also show the analysis on the low yield regime, so that the impact of the assumption can be understood by the Committee.

# Key metrics in the output

## Probability of success:

- Probability of reaching funding level of 100% over 20 years (i.e. reflecting the Fund's long-term objective approach)
- We focus on strategies which deliver at least a 2/3rds probability of success.

## Downside risk:

- We have measured the downside risk over a 3-year period (i.e. at the next valuation). This is calculated as the median deficit in 2023 less the average of the worst 5% of deficit outcomes in 2023.
- We have considered the probability that the funding level falls below 65% by 2023. Very broadly, this could be viewed as a level at which the Fund's would start questioning whether further contributions are needed.

# Climate scenarios

- Our three scenarios differ by the level of governments' policy responses, rather than CO<sub>2</sub> emissions or temperature rises
- We focus on the high-level economic impact of these policies over next twenty years
- We also make a simple allowance for the impact on longevity based on Club Vita analysis

## Green revolution

- Concerted policy action before 2025
- Businesses forced to adjust quickly to greater regulation and higher standards
- Negative short-term impact on growth, inflation and equity returns
- Return to 'normality' in the long run
- 5% increase to liabilities after 20 years due to mortality impact

## Delayed transition

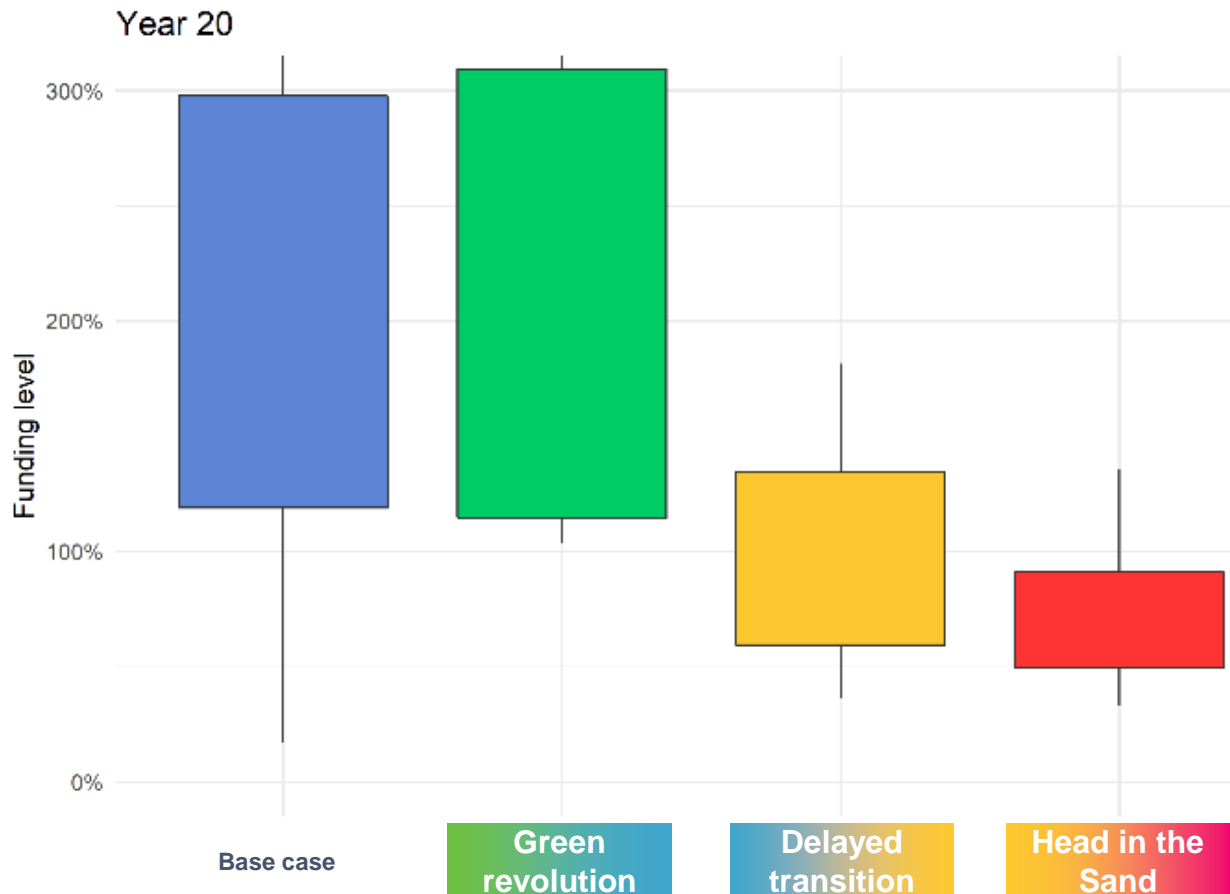
- No policy action for around 10 years
- Action is weaker and negative impact lasts longer as physical risks more damaging
- Greater impact on economies and businesses
- Return to 'normality' in the long run
- 4% decrease to liabilities after 20 years due to mortality impact

## Head in the Sand

- No or minimal policy action
- Short term boost to returns and growth due to lower spending on investment
- Physical risks begin to take a toll in the medium term
- Sustained period of weaker performance in the medium-long term
- 12% decrease to liabilities after 20 years due to mortality impact



# Comparison vs baseline at year 20 (Lothian)



## Comments

- Wide range of outcomes under all climate scenarios – still very uncertain
- Similar expected funding level in year 20 between the Green Revolution and core output
- Delayed Transition and Head in the Sand results are materially worse. This is largely driven by the expected impact on equity returns. We therefore expect a strategy with lower investment risk (lower equity exposure) to fare marginally better in each of these scenarios. Based on this modelling, reducing the equity exposure would mitigate the more pessimistic climate scenarios.
- Ultimately the Funds will benefit most from a green revolution and should therefore actively encourage positive action to help address climate issues.

# Modelling results: Lothian

# Current position

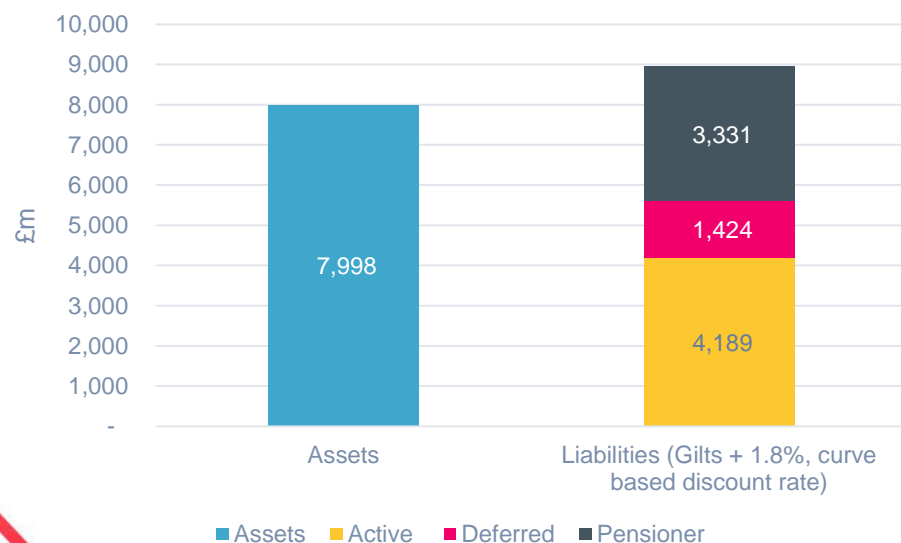
## Key inputs to ALM

	31 March 2021
Assets	£7,998m
Liabilities (Gilts +1.8%)	£8,945m
Funding level	89%
Surplus / (Deficit)	(£947m)
Required investment income*	0.1% p.a.

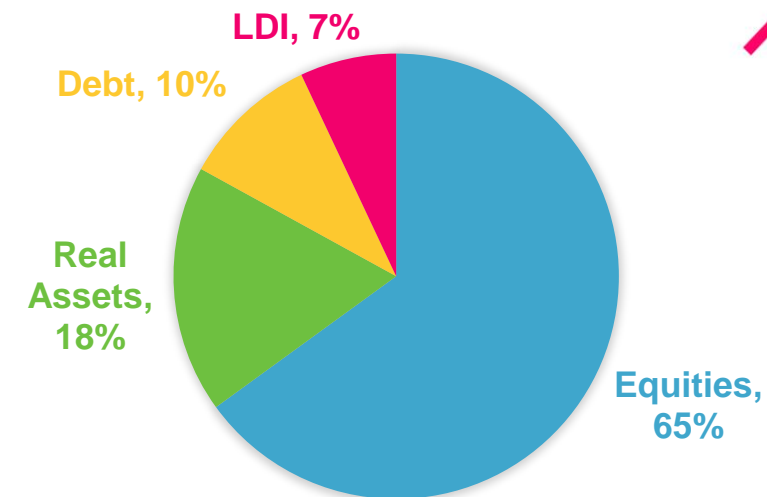
Note that throughout the analysis, liabilities have been derived using gilt curves.

\*Based on 3-year forecast benefit outgo and contribution income as at 2020 actuarial valuation

## Funding position at 31 March 2021

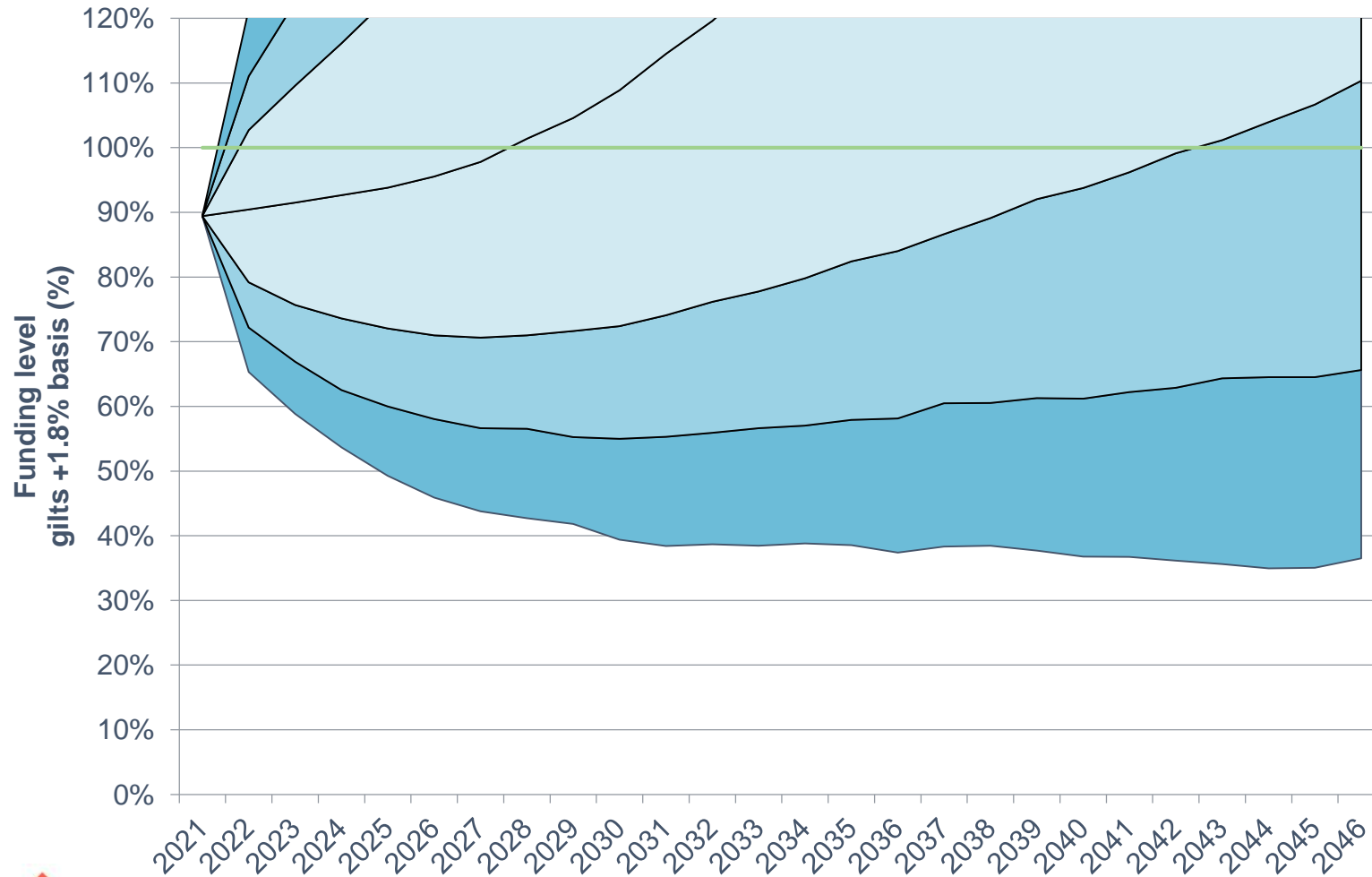


## Current allocation



- We understand the Committee are considering reducing equities to 60%, reallocating 2% to real assets and 3% to LDI.
- Equities are modelled with a beta of 0.9 and currently account for the majority of the Fund's target allocation.
- Real assets portfolio is a combination of Property, infrastructure and timber.
- Debt portfolio is a combination of investment grade credit, private lending and cash.
- LDI portfolio is index-linked gilts with a small allocation to nominal gilts.

# Funding level projection



## Comments

- Assumes:
  - Discount rate of gilts + 1.8% p.a.
  - Current allocation
  - Current contribution schedule
  - Equity beta of 0.9
  - Central yield assumptions
- Full funding expected in 7 years (2028)
- 2/3<sup>rd</sup> probability of full funding in 12 years (2033)
- 82% probability of being at least 100% funded in 2040
- 4% probability of funding falling below 65% in 2023

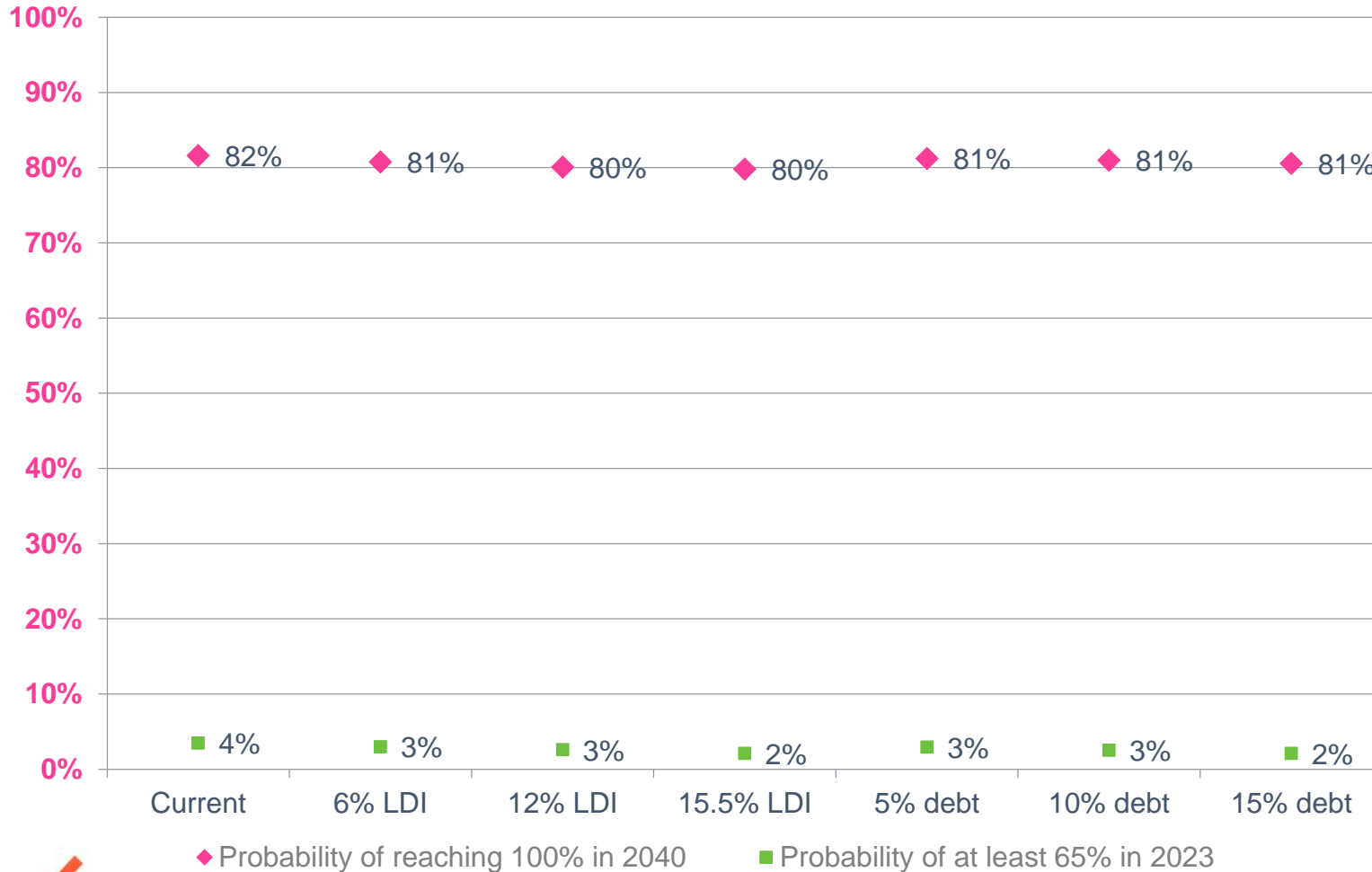
# Alternative strategies

We modelled a number of alternative investment strategies with lower exposure to equities. We have tested the impact of reinvesting this into debt or LDI. The six investment strategies we would like to focus on are illustrated in the table below.

- **Strategy 1: 6% LDI**
- **Strategy 2: 12% LDI**
- **Strategy 3: 15.5% LDI**
- **Strategy 4: 5% debt**
- **Strategy 5: 10% debt**
- **Strategy 6: 15% debt**

	Current Allocation	6% LDI	12% LDI	15.5% LDI	5% debt	10% debt	15% debt
<b>Equities</b>	65%	60%	55%	50%	60%	55%	50%
<b>Real Assets</b>	18%	17%	16%	17.5%	17%	16%	15%
<b>Debt</b>	10%	10%	10%	10%	15%	20%	25%
<b>LDI</b>	7%	13%	19%	22.5%	8%	9%	10%

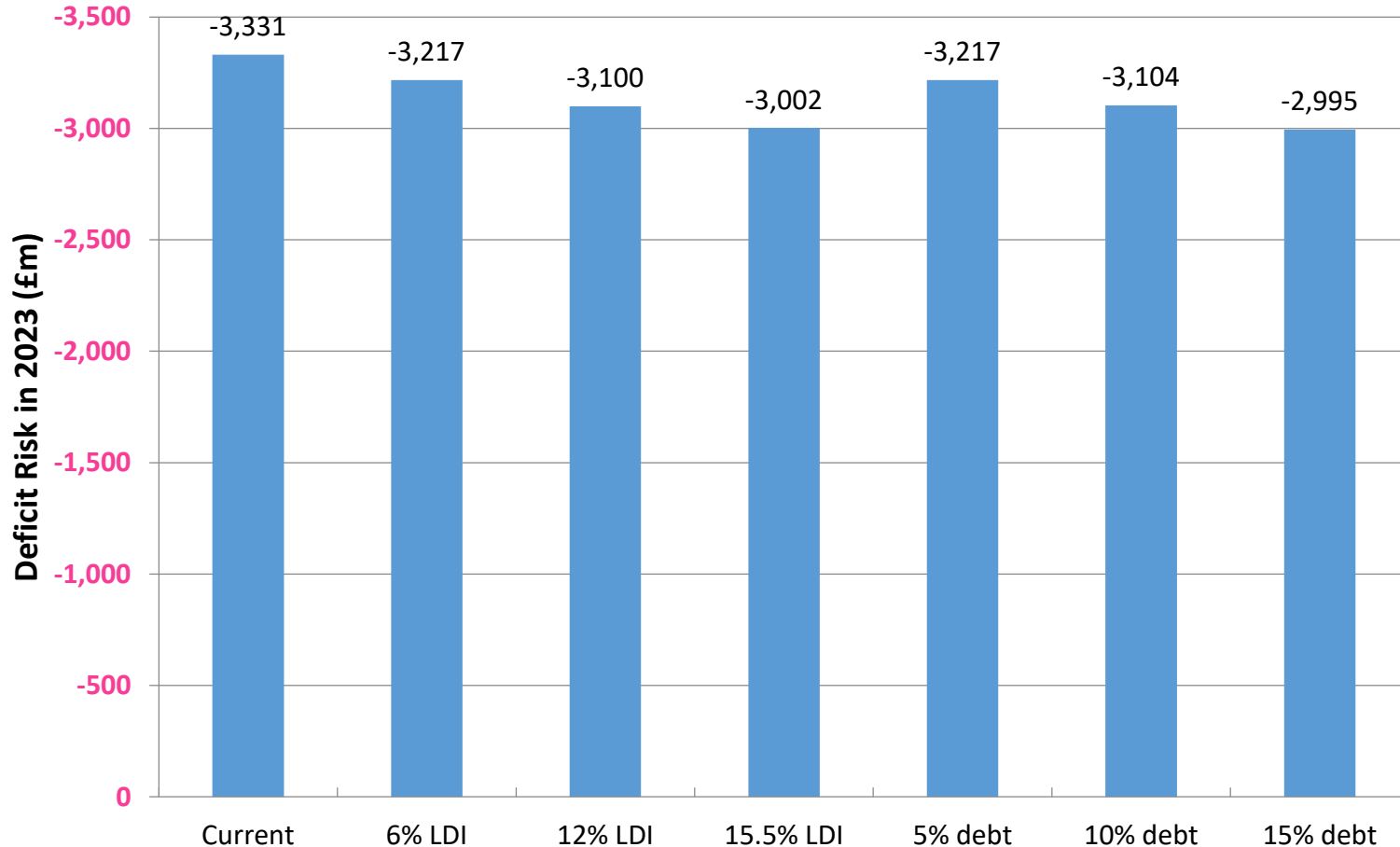
# Probability of success / "failure"



## Comments

- Assumes:
  - Discount rate of gilts + 1.8% p.a.
  - Current contribution schedule
  - Equity beta of 0.9
  - Central yield assumption
- Strong likelihood of reaching long-term objectives under central yield assumption.
- Under all strategies the probability of success is materially greater than the 2/3rds target and suggests there is scope to reduce investment risk.
- There is a very low probability that Fund's funding position will fall to below 65% (a 24% fall from the current position) by 2023.

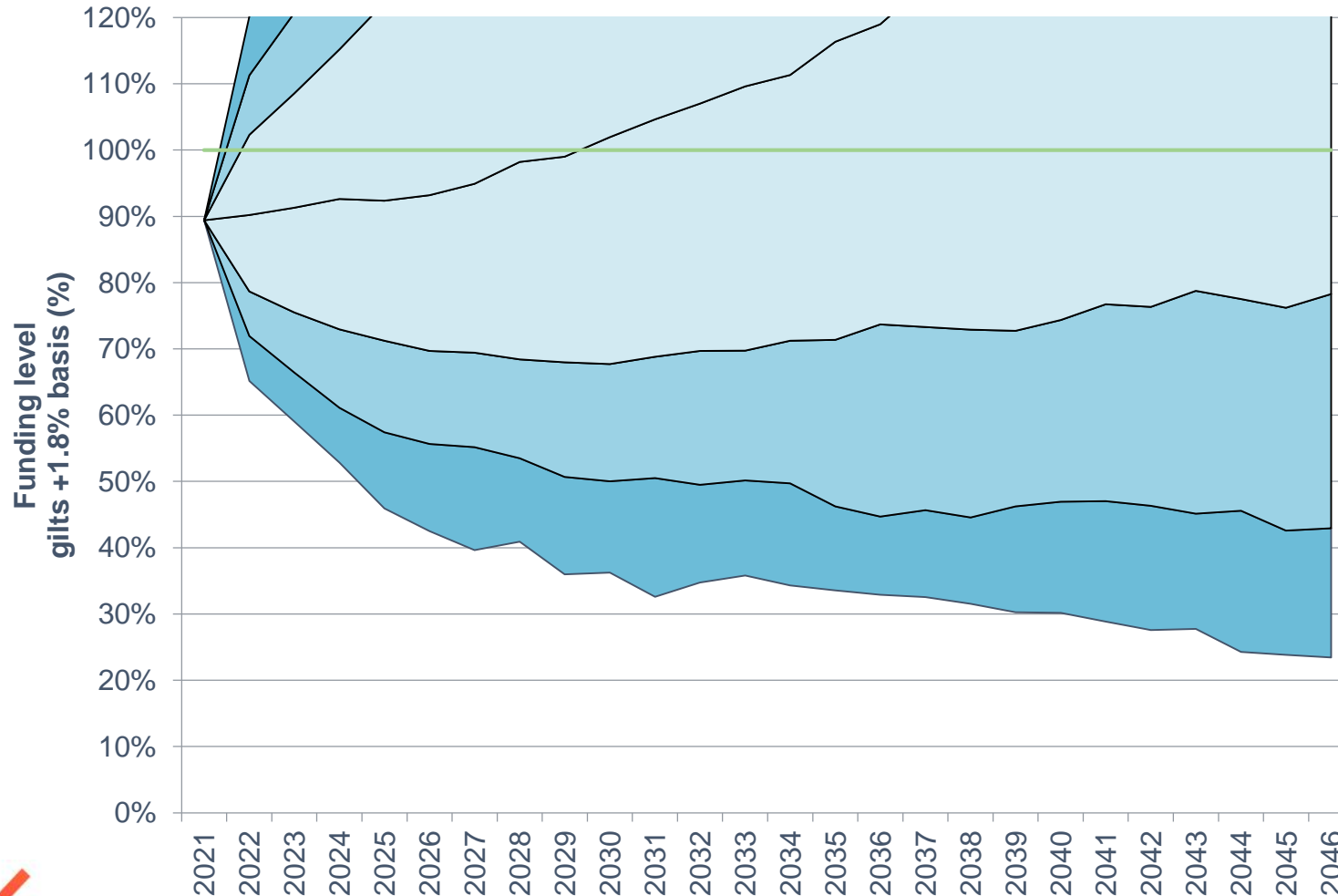
# Downside risk



## Comments

- Assumes:
  - Discount rate of gilts + 1.8% p.a.
  - Current contribution schedule
  - Equity beta of 0.9
  - Central yield assumptions
- 15% reduction in equities would reduce the downside deficit risk by over £300m (a 10% reduction in the risk) whilst still broadly maintaining 80% probability of being 100% funded in 20 years.

# Low yield: Funding level projection

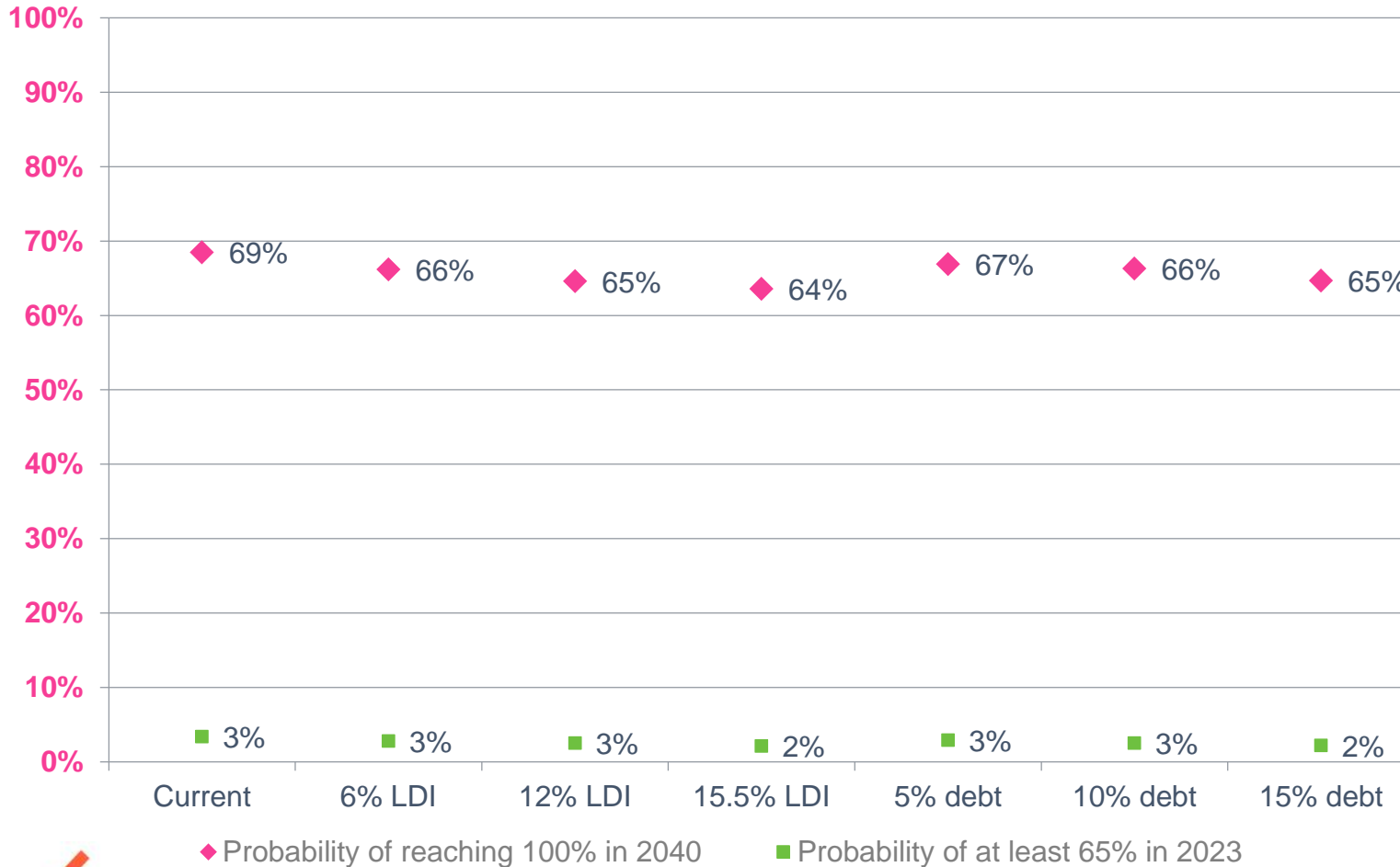


## Comments

- Assumes:
  - Discount rate of gilts + 1.8% p.a.
  - Current allocation
  - Current contribution schedule
  - Equity beta of 0.9
  - Low yield assumptions
- Full funding expected in 9 years (2030)
- 2/3<sup>rd</sup> probability of full funding in 17 years (2038)
- 69% probability of being at least 100% funded in 2040
- 3% probability of funding falling below 65% in 2023



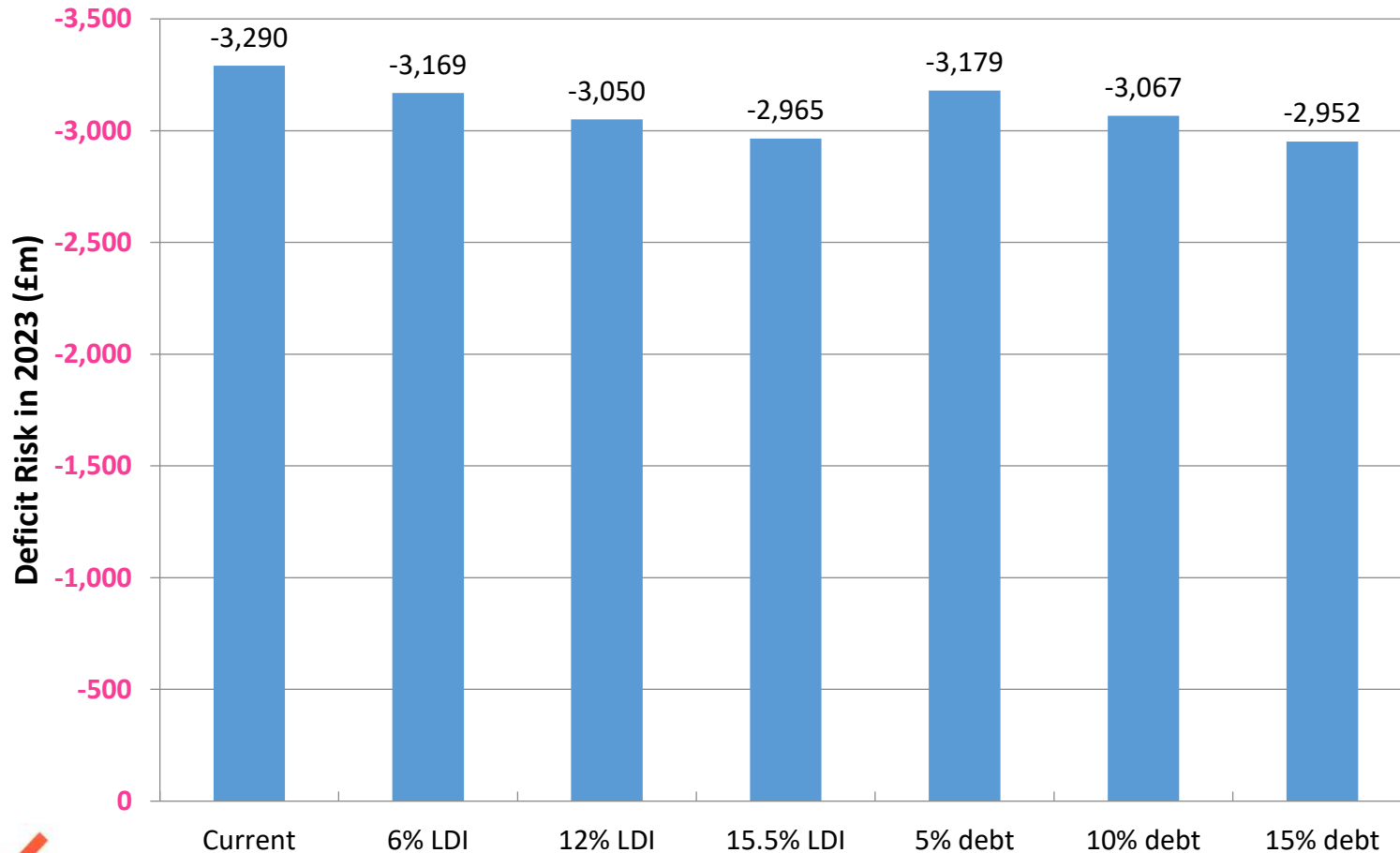
# Low yield: Probability of success / "failure"



## Comments

- Assumes:
  - Discount rate of gilts + 1.8% p.a.
  - Current contribution schedule
  - Equity beta of 0.9
  - Low yield assumptions
- Under the low yield assumption there is less scope to reduce equity risk, though potentially still scope to reduce the equity exposure by 5-10%.
- There remains a very low probability that the Fund's funding position will fall to below 65% (a 24% fall from current position) by 2023.

# Low yield: Downside risk



## Comments

- Assumes:
  - Discount rate of gilts + 1.8% p.a.
  - Current contribution schedule
  - Equity beta of 0.9
  - Low yield assumptions
- 15% reduction in equities would reduce the downside deficit risk by over £300m (a 10% reduction in the risk).

# Impact of varying contributions

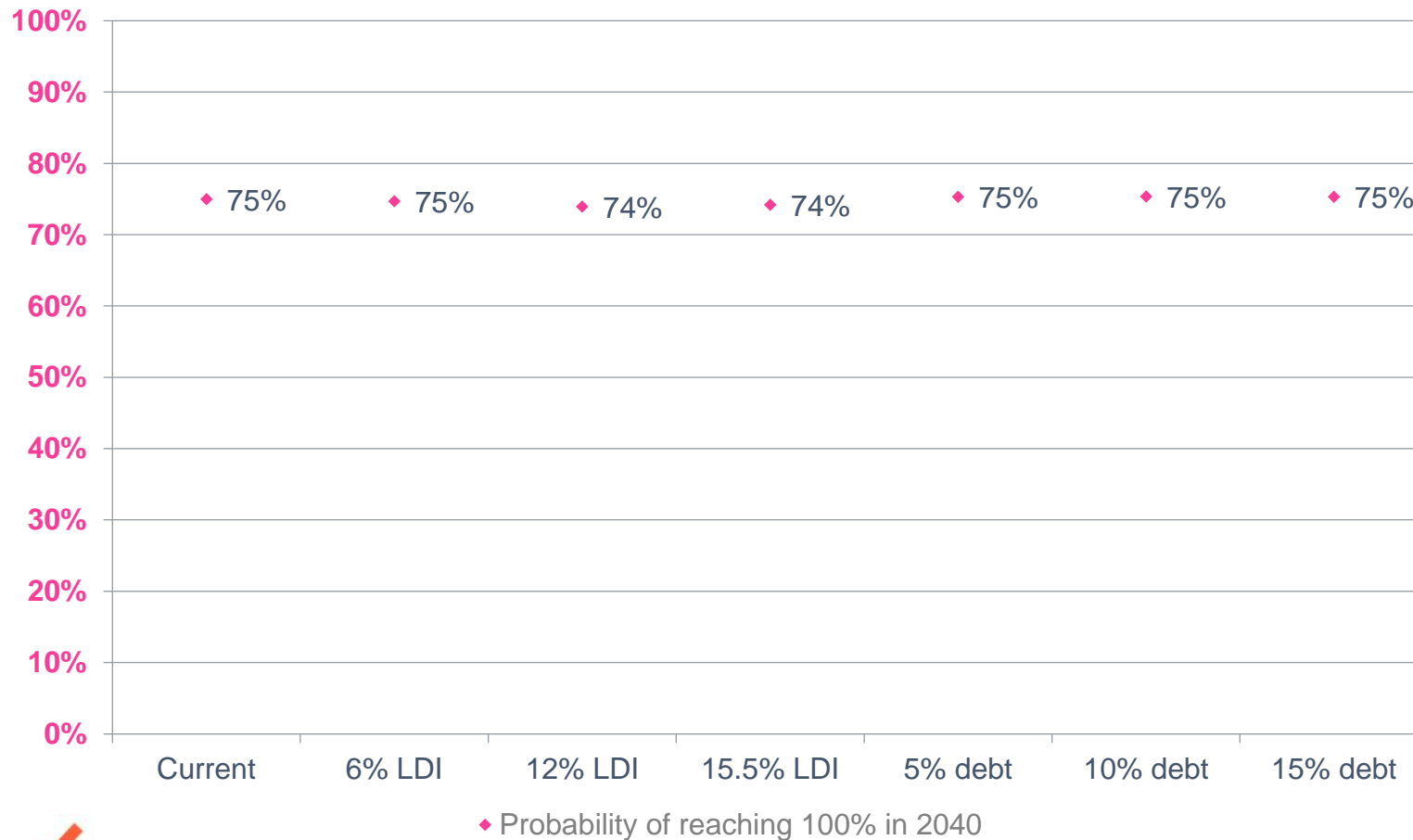
Probability of reaching <u>100%</u> in 2040	Current allocation		12% LDI	
	Central yield	Low yield	Central yield	Low yield
Current contributions (21.6% of pay)	82%	69%	80%	65%
20% of pay	78%	64%	77%	60%

## Comments

- Assumes:
  - Current allocation
  - Discount rate of gilts + 1.8% p.a.
  - Equity beta of 0.9
- Under the central yield assumption there is scope to reduce both investment risk and contributions.
- However, under the low yield assumption there is little scope to reduce contributions from the current level.
- Any potential reductions in contributions would need to be tested by the Scheme Actuary at next actuarial valuation.

# Central yield: impact of equity market shock

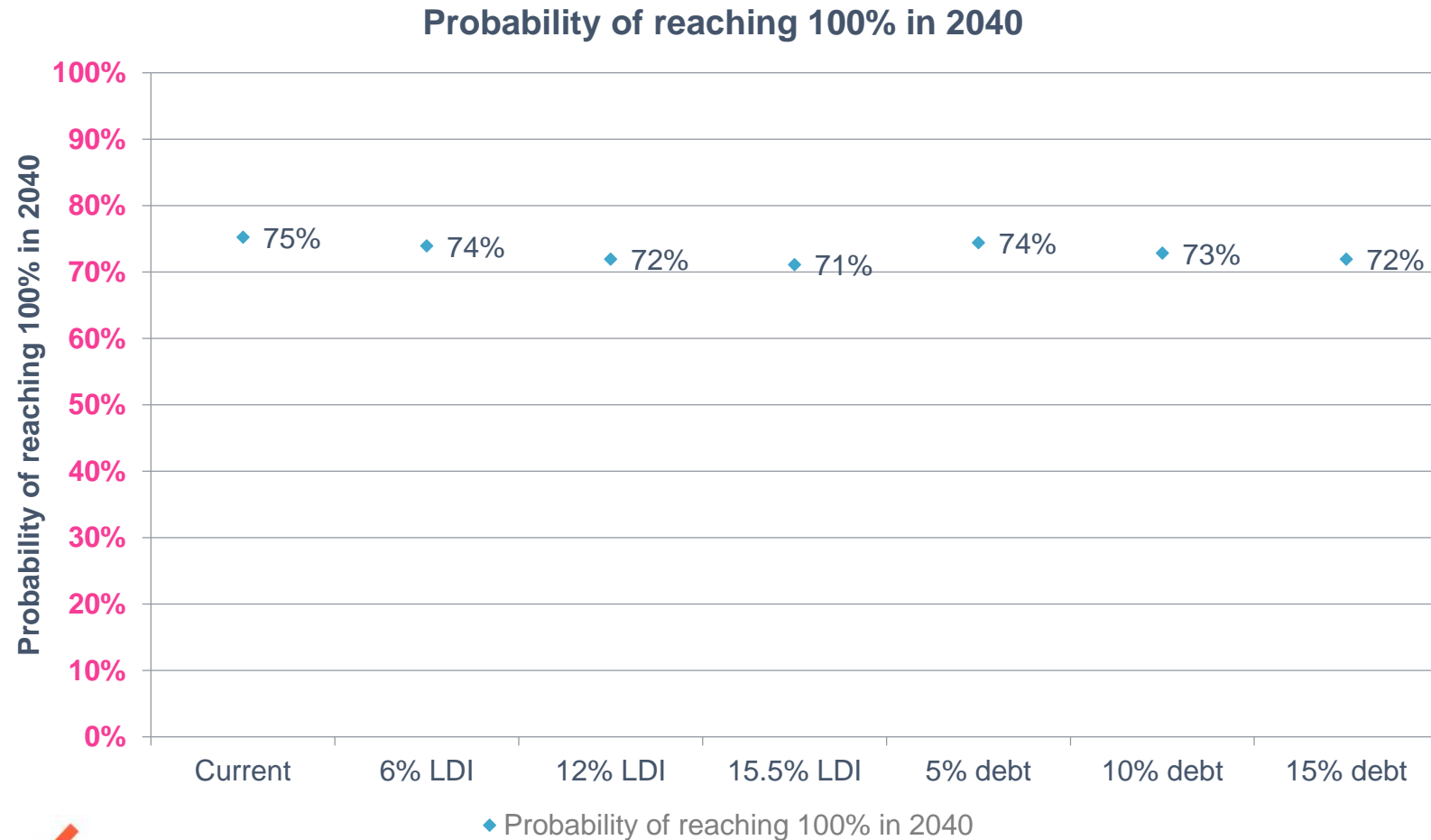
Probability of reaching 100% in 2040



## Comments

- Assumes:
  - Discount rate of gilts + 1.8% p.a.
  - Current contribution schedule
  - Current allocation
  - Equity beta of 0.9
- Under our central yield assumption there is scope to materially reduce investment risk.
- However, on this slide we consider the probability of success following a 20% fall in equity markets.
- In the lower risk strategies, the initial hit to the funding level is lessened due to the lower equity exposure.
- As a result, the overall chance of reaching full funding (after a 20% fall in equity markets) is broadly similar across the strategies. Note that in lower risk strategies, the ability to re-risk could further improve the probability of success.
- Whilst probability of successes are not materially impacted, the level of downside risk (tail events) will reduce as a result of reducing the level of investment risk.

# Low yield: impact of funding level increase



## Comments

- Assumes:
  - Discount rate of gilts + 1.8% p.a.
  - Current contribution schedule
  - Current allocation
  - Equity beta of 0.9
- This chart shows the probability of reaching full funding if we see a 10% improvement in the funding position from here.
- Under the low yield assumption, there is potentially scope to reduce equity exposure by 5-10% based on the current funding position.
- However, if we continue to see an improvement in the funding position then there will be even more scope to reduce the investment risk.

# Conclusions

- Lothian has material scope to reduce investment risk and perhaps, in the future, contributions **under the central yield assumption**. Reducing the equity risk exposure by 15% reduces the downside deficit risk by over £300m whilst still maintaining 80% probability of being 100% funded in 20 years.
- **Stripping out the impact of yield reversion** reduces the immediate scope to reduce investment risk, albeit a modest reduction in equities (5-10%) could still be justified.
- However, if we continue to see an improvement in the Fund's funding position there will be a more compelling case to reduce the equity exposure further. Under this scenario, the Committee could reduce equity exposure by as much as 15%, reallocate to LDI and still have a 70% probability of being fully funded in 2040.
- Currently, the allocation to equities is towards the higher end of the range at 65%. We understand that the Committee is currently considering reducing the equity allocation to 60% and our analysis would support this. If we continue to see an improvement in the funding position then we believe the equity exposure could be reduced to 50%.
- We believe the Committee should consider funding level triggers which further moves could be considered. Whilst we have considered the impact of a 10% improvement on the funding position, there is scope to set triggers sooner than this.
- If a reduction in the equity allocation is triggered, the current strategic ranges would need to be reviewed as the actual equity allocation is likely to be towards the lower end of the current range.
- Looking ahead to the next valuation, there is a very low probability of the funding level falling below 65% (the point at which further contributions would be likely).

# Appendix 1: sensitivity analysis



# Sensitivity analysis - Lothian

## Impact of different inflation scenarios

	Central inflation assumption	Deflation (3% of scenarios)	0-2% inflation (25% of scenarios)	2-4% inflation (47% of scenarios)	4%+ inflation (25% of scenarios)
Probability of reaching <u>100%</u> in 2040	82%	82%	81%	81%	83%
Average worst 5% deficit outcomes at 31 March 2023	-£3,331m	-£3,044m	-£3,440m	-£3,281m	-£3,287m

## Impact of different hedging levels

	Current	0% rates / 25% inflation	25% rates / 25% inflation	0% rates / 50% inflation	50% rates / 50% inflation
Probability of reaching <u>100%</u> in 2040	82%	79%	77%	76%	68%
Average worst 5% deficit outcomes at 31 March 2023	-£3,331m	-£2,829m	-£3,484m	-£2,563m	-£3,262m

## Comments

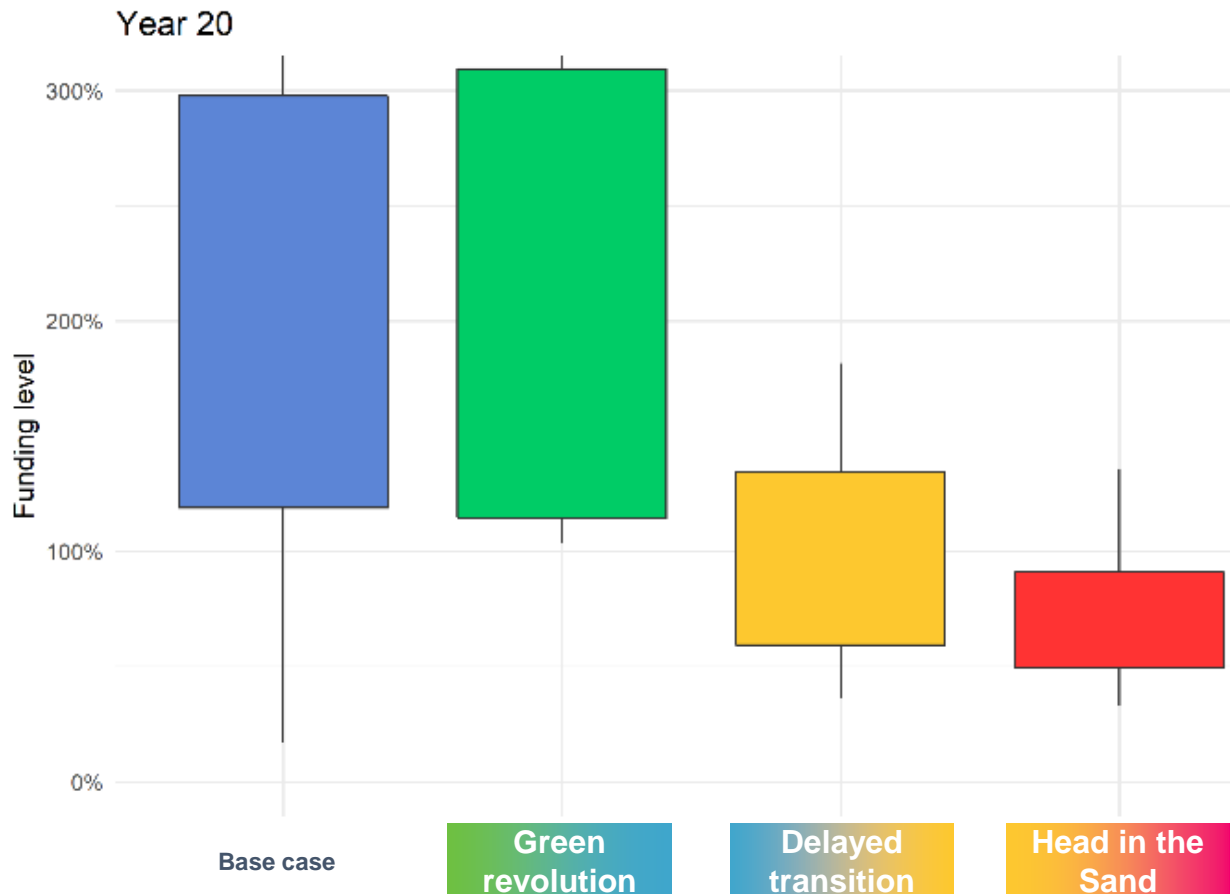
- Assumes:
  - Discount rate of gilts + 1.8% p.a.
  - Current contribution schedule
  - Current allocation
- The probability of success and downside risk metrics remain broadly unchanged under different inflation regimes.
- Inflation hedging in isolation helps to reduce the downside risk, but we see a significant drop in probability of success measures.
- Hedging interest rates reduces both probability of success and increases downside risks.



# Appendix 2: sensitivity analysis



# Comparison vs baseline at year 20 (Lothian)



## Comments

- Wide range of outcomes under all climate scenarios – still very uncertain
- Similar expected funding level in year 20 between the Green Revolution and core output
- Delayed Transition and Head in the Sand results are materially worse. This is largely driven by the expected impact on equity returns. We therefore expect a strategy with lower investment risk (lower equity exposure) to fare marginally better in each of these scenarios. Based on this modelling, reducing the equity exposure would mitigate the more pessimistic climate scenarios.
- Ultimately the Funds will benefit most from a green revolution and should therefore actively encourage positive action to help address climate issues.

# Appendix 3: Reliances & Limitations



# Reliances & Limitations (1)

## Cashflows

- In projecting forward the evolution of the Fund, we have used estimated cashflows generated using our actuarial valuation system, based on information provided as part of the 2020 actuarial valuation of the Fund including the LGPS regulations.
- Except where stated, we do not allow for any variation in actual experience away from the demographic assumptions underlying the cashflows. Variations in demographic assumptions (and experience relative to those assumptions) can result in significant changes to the funding level and contribution rates. We allow for variations in inflation (RPI or CPI as appropriate), inflation expectations (RPI or CPI as appropriate), interest rates and asset class returns. Cashflows into and out of the Fund are projected forward in annual increments, are assumed to occur in the middle of each year and do not allow for inflation lags. Investment strategies are assumed to be rebalanced annually.
- There are a number of different types of increases applied before and after retirement to benefits payable from the Fund. We have made some simplifying assumptions when modelling the various types of increases.
- We have estimated future service benefit cashflows and projected salary roll for new entrants after the valuation date such that payroll remains constant in real terms (i.e. full replacement). There is a distribution of new entrants introduced at ages between 25 and 65, and the average age of the new entrants is assumed to be 40 years. All new entrants are assumed to join and then leave service at SPA, which is a much simplified set of assumptions compared with the modelling of existing members. The base mortality table used for the new entrants is an average of mortality across the LGPS and is not client specific, which is another simplification compared to the modelling of existing members. Nonetheless, we believe that these assumptions are reasonable for the purposes of the modelling given the highly significant uncertainty associated with the level of new entrants.
- In modelling some of the LGPS benefits, we have assumed;
- *Salary growth is assumed to have a floor of 0% and to be modelled in line with inflation plus (or minus) any additions applied.*
- *S148 salaries / national average earnings is assumed NOT have a floor and is projected in line with our projections of national average earnings and valued in line with inflation plus any additions applied.*
- *Non-accruing and accruing CARE benefits increase in line with CPI (no floor).*

# Reliances & Limitations (2)

## Economic Scenario Service

- The distributions of outcomes depend significantly on the Economic Scenario Service (ESS), our (proprietary) stochastic asset model. This type of model is known as an economic scenario generator and uses probability distributions to project a range of possible outcomes for the future behaviour of asset returns and economic variables. Some of the parameters of the model are dependent on the current state of financial markets and are updated each month (for example, the current level of equity market volatility) while other more subjective parameters do not change with different calibrations of the model.
- Key assumptions include:
  - The average excess equity return over the risk free asset and its volatility which affects growth asset returns
  - The level and volatility of yields, credit spreads, inflation and expected (breakeven) inflation, which affect the projected value placed on the liabilities and bond returns.
  - The gap between CPI and RPI. Target rates for CPI (inflation and inflation expectations) are RPI – 1% p.a. pre 2030, and RPI – 0% p.a. post 2030, which trends towards a long term CPI assumption of 2% p.a.
  - The output of the model is also affected by other more subtle effects, such as the correlations between economic and financial variables.
  - We expect that long-term real interest rates will gradually rise from their current low levels. This is based on a selection of yield normalisation levels (which can be interpreted as representing low, medium and high economic growth scenarios) reflecting the fundamental uncertainty around long term average yield levels. Higher long-term yields would mean a lower value placed on liabilities and hence an improvement in the current funding position unless the Fund is fully hedged.
- While the model allows for the possibility of scenarios that would be extreme by historical standards, including very significant downturns in equity markets, large systemic and structural dislocations are not captured by the model. Such events are unknowable in effect, magnitude and nature, meaning that the most extreme possibilities are not necessarily captured within the distributions of results.
- A summary of economic simulations used is included further on in this document. We would be happy to provide fuller information about the scenario generator, and the sensitivities of the results to some of the parameters, on request.

# Reliances & Limitations (3)

## Investment strategy and contributions

- The investment strategies and contributions modelled have been agreed as part of the scoping process and documented above.
- The most important assumption for the assets is which asset class to use for each of the assets. We have therefore agreed this during the scoping stage and further details are in the 'What we have modelled' section.
- We have modelled the impact of hedging by considering hypothetical portfolio that matches the changes in the value and cashflows of the liabilities on a gilts basis – for the following stochastic factors: interest rates and inflation. Where we have modelled the Fund's "LDI" hedge of interest rates and inflation, we have assumed the Fund uses a "delta" hedge approach. In practice and in our modelling, this means that a 100% hedge of interest rates and inflation leaves a residual risk arising from holding an imperfect (delta) hedge versus the gilts liabilities. It also allows for a potential reserve "unwinding" effect (positive or negative depending on the form of pension increases) due to any present valuation placed on caps and floors, vs the future paths taken in the modelling. The modelling of a "delta" hedge is therefore not equivalent to assuming "perfect" hedging where the overall risks would collapse to zero in the aforementioned scenario.
- Investment strategy is likely to change with significant changes in funding level, but unless stated otherwise we have not considered the impact of this in order to focus on the high-level investment strategy decision.
- The returns that could be achieved by investing in any of the asset classes will depend the exact timing of any investment/disinvestment, the costs associated with buying or selling these assets and liquidity of the asset classes. The model implicitly assumes that all returns are net of fees and ignores these other factors.
- Unless stated otherwise, we have assumed that all contributions are made and not varied throughout the period of projection irrespective of the funding position. In practice the contributions are likely to vary especially if the funding level changes significantly.
- In the modelling we have assumed that the Fund will update their contributions as in the data request form. Where stabilised contributions are applicable, our modelling assumes these will be updated annually and will come into force one year later. For stabilised contributions, the rate at which the contribution changes is capped and floored. There is no guarantee that such capping or flooring will be appropriate in future; this assumption has been made so as to illustrate the likely impact of practical steps that may be taken to limit changes in contribution rates over time. The contributions would be based on the theoretical rate of accrual and the deficit contributions spread over a fixed period. We have assumed that the Actuary to the Fund will make his or her calculations using broadly the same methodology as that currently used but note that this is a source of uncertainty that we have not attempted to measure in the model other than where noted specifically.

# Reliances & Limitations (4)

## Climate change scenarios – purpose

The purpose behind the modelling is to show the impact of three preconceived climate change scenarios and to promote engagement and discussion around the possible outcomes and impacts for the Fund around these scenarios. The modelling does not provide a framework for testing different courses of action by the Fund (via its funding and investment strategy) to mitigate against the risks discussed in this paper, due to the way in which the analysis has been constructed.

## Climate change scenarios – method

We have used the Fund's ALM results (see the May 2021 Investment Review) to explore the impact on the Funds' solvency in the event that three pre-specified climate change scenarios occur. The Reliances and Limitations that apply to the Fund's ComPASS modelling also apply here.

The climate change scenario modelling assumes that economic and financial relationships are not broken and that climate outcomes exist within the extremes of the 5000 scenarios modelled for the ALM (as generated by our Economic Scenario Service (ESS)). Although the ESS captures a wide range of future financial conditions, it has not been calibrated to allow for climate change explicitly. **Importantly, this modelling does not place a likelihood of each of these scenarios occurring and the number of simulations captured under each scenario shouldn't be used as such.**

The longevity impact has been included approximately by scaling the liabilities linearly such that by time 20 the full impact is realised. In each year of the projection, this means that the liabilities are being adjusted to reflect updated beliefs about future longevity but the projected cashflows being paid out are not being modified away from the base ALM scenario. The longevity impacts are assumed to be the same in 20 years' time as they are today.

# Reliances & Limitations (5)

The modelling uses an existing ALM, where the Fund's assets and liabilities have been projected forward under 5000 future financial conditions (including the ESS, our economic scenario generator), and highlights any simulations that satisfy the constraints which define each climate change scenario. The conditions are shown in the tables below:

	<b>Economic Factor</b>	<b>Annualised returns (years 1 to 10)</b>	<b>Annualised returns (years 1 to 20)</b>
Head in the Sand:	Global equity	< median + 2%	< median – 3%
	Inflation	> median	> median + 0.5%
	Credit Spreads	> median – 0.5%	> median + 0.5%
	Real yields	< median – 0.25%	< median – 0.5%

	<b>Economic Factor</b>	<b>Annualised returns (years 11 to 13)</b>	<b>Annualised returns (years 1 to 20)</b>
Delayed transition:	Global equity	< median – 5%	< median – 3%
	Inflation	> Median +1%	unconstrained
	Credit Spreads	> median + 1%	unconstrained
	Real yields	< median – 1%	unconstrained

	<b>Economic Factor</b>	<b>Annualised returns (years 1 to 3)</b>	<b>Annualised returns (years 1 to 20)</b>
Green Revolution:	Global equity	< median - 2%	> median – 1%
	Inflation	> median + 0.5%	< median + 1%
	Credit Spreads	> median + 1%	unconstrained
	Real yields	< median	< median + 1%



# Expected Rate of Returns and Volatilities

The following figures have been calculated using 5,000 simulations of the Hymans Robertson Economic Scenario Service, calibrated using market data as at 31 March 2021. All returns are shown net of fees. Percentiles refer to percentiles of the 5,000 simulations and are the annualised total returns over 5, 10 and 20 years, except for the yields which refer to the (simulated) yields in force at that time horizon.

		Annualised total returns											Inflation (CPI)	17 year real yield (CPI)	17 year yield	
		Cash	Index Linked Gilts (medium)	Fixed Interest Gilts (medium)	UK Equity	Overseas Equity	Private Equity	Property	Emerging Markets Equity	Infrastructure Equity	Multi Asset Credit (sub inv grade)	Senior Loans (sub inv grade)				High Yield Debt
5 years	16th %ile	-0.3%	-3.2%	-2.5%	-3.9%	-3.6%	-7.1%	-3.5%	-7.0%	-5.0%	0.5%	1.2%	-0.4%	1.0%	-2.2%	0.8%
	50th %ile	0.4%	-0.3%	0.1%	4.3%	4.4%	5.1%	2.5%	4.6%	4.1%	3.3%	3.7%	2.3%	2.6%	-1.4%	1.9%
	84th %ile	1.2%	2.6%	2.6%	12.3%	12.4%	18.9%	8.8%	16.5%	14.1%	5.2%	5.2%	4.2%	4.1%	-0.4%	3.1%
10 years	16th %ile	0.1%	-2.5%	-1.1%	-0.9%	-1.0%	-3.1%	-1.3%	-3.2%	-1.8%	1.8%	2.0%	0.8%	1.0%	-1.7%	1.0%
	50th %ile	1.1%	-0.5%	0.3%	4.8%	5.0%	5.8%	3.2%	5.3%	4.9%	3.7%	3.9%	2.8%	2.6%	-0.5%	2.4%
	84th %ile	2.3%	1.6%	1.6%	10.7%	10.9%	15.6%	8.0%	13.7%	12.0%	5.3%	5.7%	4.3%	4.3%	0.7%	4.1%
20 years	16th %ile	0.6%	-2.0%	0.2%	1.4%	1.3%	0.4%	0.8%	0.0%	0.9%	3.0%	3.2%	2.2%	0.8%	-0.7%	1.3%
	50th %ile	2.0%	-0.3%	1.0%	5.8%	5.8%	6.8%	4.2%	6.0%	5.9%	4.6%	4.9%	3.8%	2.3%	1.0%	3.2%
	84th %ile	3.6%	1.5%	1.7%	10.4%	10.3%	13.6%	8.1%	12.5%	11.0%	6.3%	6.8%	5.4%	3.9%	2.7%	5.7%

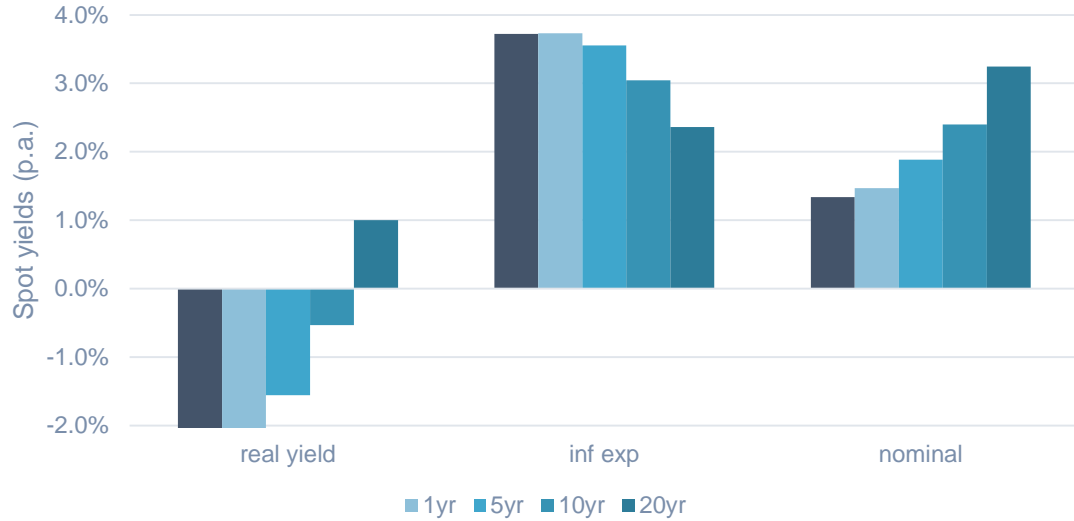
The current calibration of the model indicates that a period of outward yield movement is expected. For example, over the next 20 years our model expects the 17 year maturity annualised real (nominal) interest rate to rise from -2.3% (1.3%) to 1.0% (3.2%)

# Risk and return assumptions (31 March 2017)

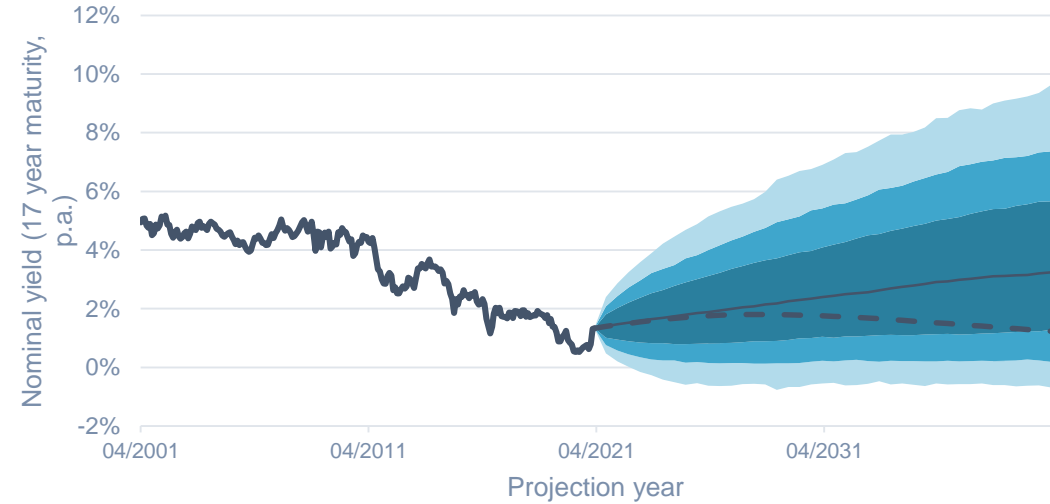
Asset class	Median return (%p.a. 20 year horizon)		1 year volatility (%)
	Nominal	Real (above RPI)	
Global equity (beta = 1)	5.5	2.4	18.3
Global equity (beta = 0.9)	5.5	2.4	16.5
Diversified growth	4.1	1.0	14.1
Property	3.7	0.6	14.2
Private equity	6.8	3.7	29.3
Infrastructure	4.6	1.5	20.1
Private debt	6.2	3.1	7.2
High yield bonds	5.1	2.0	7.8
Corporate bonds (A rated average)	2.1	-1.0	10.1
Cash	2.5	-0.6	0.5
Med gilts	1.3	-1.8	9.5
Med ILGs	0.5	-2.6	7.1

# ESS vs. market implied yields - 31.03.21

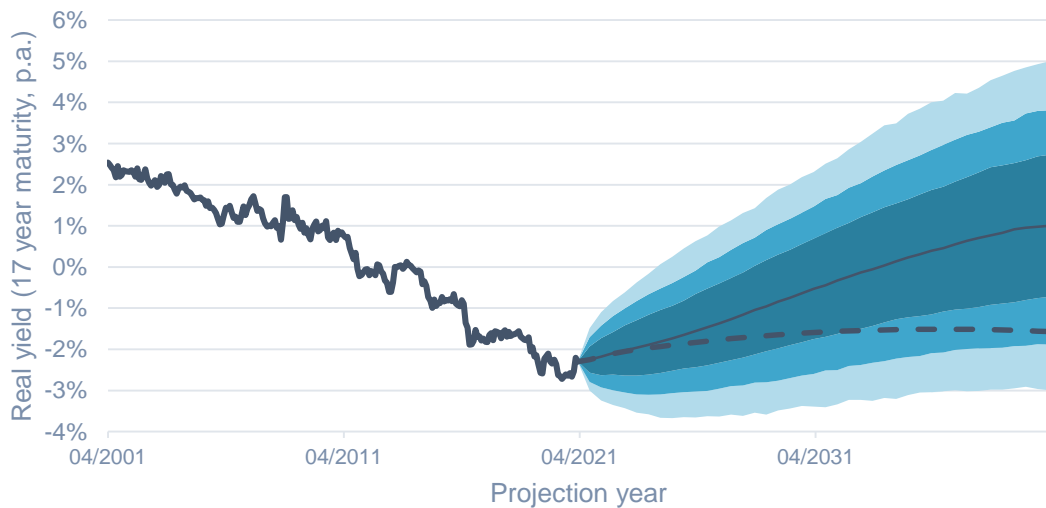
Evolution of (17yr maturity) gilt yields



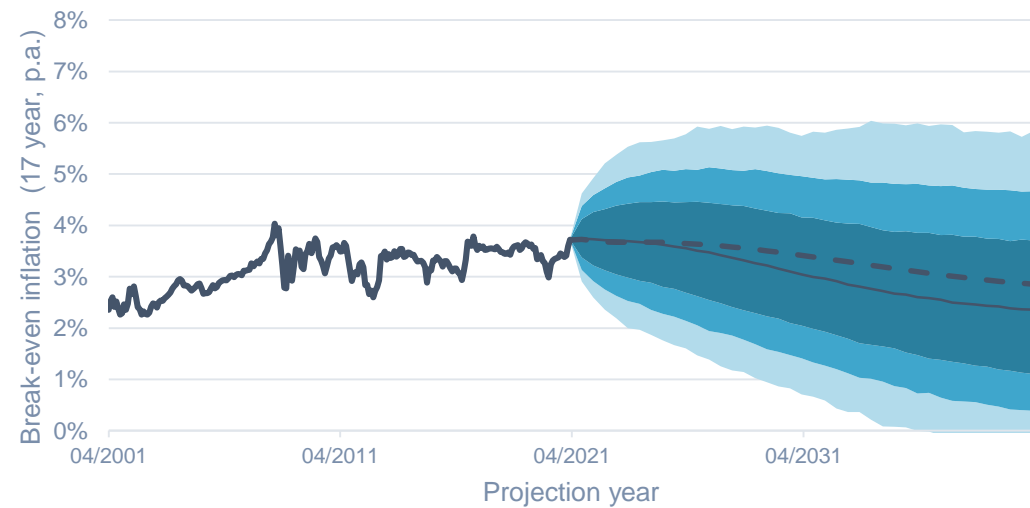
Nominal yields



Real yields



Break-even inflation



# Risk warnings

Please note the value of investments, and income from them, may fall as well as rise. This includes equities, government or corporate bonds, and property, whether held directly or in a pooled or collective investment vehicle. Further, investments in developing or emerging markets may be more volatile and less marketable than in mature markets. Exchange rates may also affect the value of an overseas investment. As a result, an investor may not get back the amount originally invested. Past performance is not necessarily a guide to future performance.

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