HYMANS ROBERTSON

Leicestershire County Council Pension Fund

2019 Valuation: Setting the discount rate

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For and on behalf of Hymans Robertson LLP

Contents

1 Introduction

This paper has been commissioned by and is addressed to Leicestershire County Council in its capacity as Administering Authority to the Leicestershire County Council Pension Fund ("the Fund"). It has been prepared in my capacity as Actuary to the Fund.

The next actuarial valuation of the Fund takes place as at 31 March 2019. This paper has been prepared to facilitate discussions on funding strategy and assumptions for the 2019 valuation. In particular, this paper considers the discount rate to use in the 2019 valuation.

This paper has been prepared solely for the use of the Administering Authority to the Fund, to assist in setting the discount rate assumption at the 2019 formal valuation. This document should not be released or otherwise disclosed to any third party without our prior consent, in which case it should be released in its entirety. Hymans Robertson LLP accepts no liability to any other party, or for any other use, unless we have expressly accepted such liability

Understanding the importance of the discount rate assumption

The discount rate assumption is how we allow at the valuation for future investment returns on the Fund's assets. This is a key element and risk in funding and it's therefore important to develop a good understanding of how future investment returns, or the discount rate, have been modelled and incorporated into the funding strategy.

At the 2019 valuation, the Fund will adopt a risk based approach to setting contribution rates. This approach projects the Fund's future investment returns for the next 20 years under a range of different economic scenarios generated by Hymans Robertson's proprietary Economic Scenario Service. This model projects 5,000 different economic scenarios, on a year by year basis, and then analyses the expected performance of each of the asset classes the Fund holds under each scenario to generate the best possible understanding of the range of possible asset returns over the 20 year period. Therefore, the range of investment returns, or discount rate, over the next 20 years is captured in the risk based modelling. (More details of the parameters of the ESS modelling will be provided as part of the valuation process)

Beyond a 20 year time horizon, the future becomes even more uncertain and we move to valuing future benefit payments by making a single assumption about future investment returns, or a long term target discount rate. The process of setting the long term target discount rate should be made independently of today's economic conditions.

This is discussed in more detail in the rest of this paper.

2 Background

The main purpose of the formal valuation is to review funding plans to ensure they are still fit for purpose, and set contribution rates payable by participating employers. At the 2019 valuation, the Fund will adopt a three step method to setting contribution rates using a risk based approach.

Three-step method for setting contribution rates

The following three-step method will be used to calculate contribution rates for each employer. The three steps allow for individual employer circumstances (e.g. contract length, covenant strength, nature of participation in the Fund, etc):

1 Set a funding target – i.e. how much money does the Fund want to hold to pay future benefits (see below)?

2 Choose a time horizon – i.e. how long does the Fund want to give each employer to reach its funding target?

3 Choose a likelihood of success – i.e. how sure does the Fund want to be that the funding target will be achieved?

Further detail will be given in the Fund's Funding Strategy Statement and in the 2019 valuation report.

Risk based methodology

A risk based approach will be adopted to modelling contribution rates to allow the Fund to understand the likelihood of success associated with each funding plan i.e. step 3 above. Under the risk based approach each employer's future benefit payments, contributions and investment returns are projected into the future under 5,000 possible economic scenarios.

Future inflation and investment returns for each asset class are variables in the projections:

- As pensions are index-linked and salary increases are expected to broadly move relative to the 'cost of living', the projected future benefit payments and contributions are sensitive to the level of future inflation.
- The projected future investment return depends on the investment strategy of the Fund and the return generated by each invested asset.

This approach recognises and reflects that the future is uncertain. This approach differs from previous valuations where a single projection of the future was used, based on assumptions linked to market conditions at the valuation date alone.

Setting the funding target

The individual employer's circumstances and the risk based approach respectively address the second and third steps in the three-step method. The first step, choice of funding target, requires more consideration.

For many employers it is likely that benefits will be paid many years into the future (75 years or more). In principle we could carry out the full scenario-based modelling described above for this entire period, allowing us to determine if each year's benefit payments could be met from the projected assets available.

In practice though, when projecting further and further into the future, the uncertainty surrounding the projections eventually becomes too high to be meaningful. We need to 'draw a line in the sand' after a suitable length of time - 20 years. Projections beyond this point are based on a single set of assumptions. This set of assumptions dictates the funding target, and therefore the level of prudence in these assumptions dictates the amount of assets the Fund wants to hold to pay for future benefits.

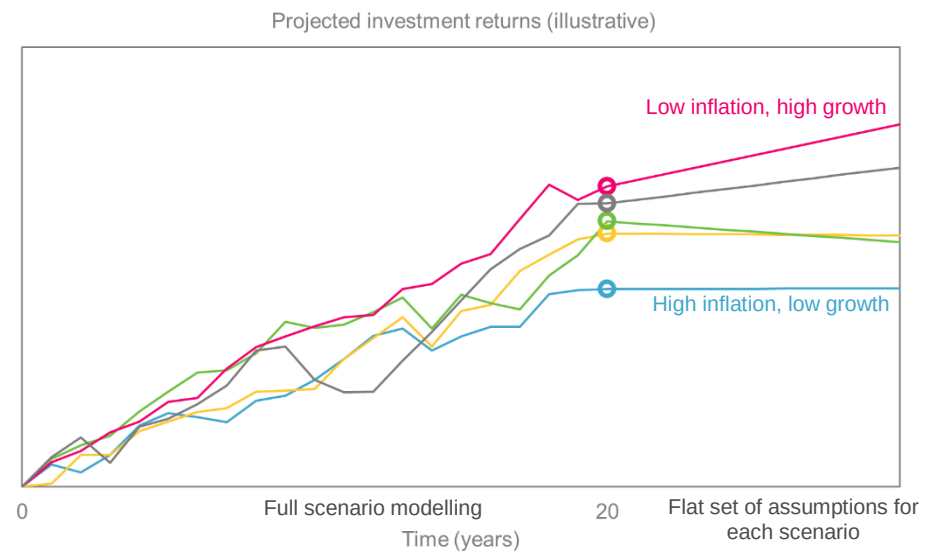
Each of the projected 5,000 scenarios represents different prevailing economic conditions in 20 years. Choosing a single, fixed value for each assumption

would not be appropriate for every scenario: e.g. a high discount rate would not be prudent in scenarios with a weak outlook for economic growth.

Therefore, instead of using a fixed value for each assumption, we need to reference economic indicators to ensure the assumptions remain appropriate for the prevailing economic environment in each future scenario. For convenience, the economic indicators we use are:

- future inflation expectations (for pension increases and salary growth)
- the yield on UK government bonds (for the discount rate).

The chart below illustrates how the investment returns generated by the model vary over time, including the transition to a flat set of assumptions after year 20:



Funding target at the 2016 valuation

The set of financial assumptions used in the funding target at the 2016 valuation is detailed below.

Assumption	Economic parameter	Factor to consider	Value at 2016 valuation (% p.a.)
Discount rate	Fixed interest gilt yield	Level of return above UK gilts	Gilt yield + 1.8%
Pension increases	RPI inflation	Difference between CPI and RPI	RPI less 1.0%
Salary increases	RPI inflation	Level of increases relative to RPI	RPI

It is good governance to review all actuarial assumptions as part of each triennial valuation to ensure they reflect the Fund's risk appetite and investment strategy.

The rest of this paper considers the discount rate assumption to use in the funding target at the 2019 valuation.

3 2019 Valuation discount rate

Methodology

To help the Fund consider the discount rate assumption we have used a model that generates thousands of possible future investment returns for a given investment strategy. In this case we have modelled returns starting from 20 years in the future, to fit in with the risk based methodology outlined in Section 2. Further detail on the model used to generate the expected returns is given in Appendix 1.

As discussed in Section 2, there is no need to consider the investment return for the first 20 years starting from now as this is captured in the risk based modelling. However, we have included some analysis for this time period in Appendix 2 for information purposes.

By analysing the distribution of returns generated by the model over the time period we can determine

- the most likely or 'best estimate' return – we expect the portfolio to do better than this 50% of the time; and
- a prudent estimate of returns – prudence is not defined in the Regulations; our general 'rule of thumb' is to aim for a target where we expect the portfolio to do better than this 66% of the time.

For the purposes of setting the discount rate we use the prudent estimate to be consistent with the Fund's risk appetite and Funding Strategy Statement (and as required by the LGPS Regulations).

The results of this analysis provides a single future investment return assumption from year 20 onwards. However, as discussed in Section 2, at the end of the 20 year projection period there are various economic scenarios and market conditions in force. If we simply assumed the same fixed future return for all scenarios, then there will be cases where the assumed future investment return will be too high and therefore not sufficiently prudent (e.g. in a low growth scenario). Similarly in a high growth scenario, the fixed future return might be too low and therefore too prudent for the Fund's investment and funding plans.

Therefore, we need some way of translating the prudent return so it is appropriate for whichever market condition is in force in 20 years' time.

Our preferred approach is to express the future investment return as a margin above long-term 'risk-free' interest rates. The yield on long-term UK government bonds at year 20 (as generated by our model) is viewed as a suitable estimate of the risk-free interest rate at that time. This approach is justified on the basis that the Fund's investment strategy will include a proportion of risky assets whose long-term returns can be expected to exceed the 'risk-free' rate. Indeed, the Fund will usually have expectations of what the margin is above 'risk-free' when investing in these different asset classes.

The margin is calculated by comparing the prudent overall Fund investment return against the best estimate return on long-dated UK government bonds generated by the same model, both assessed from year 20.

Scenarios modelled

In this paper we have modelled the following asset allocation, which we understand corresponds to the Fund's current long-term strategy:

% allocation	Current strategy
UK equities	8%
Overseas equities	36%
Diversified Growth	4.5%
Infrastructure (equity)	9%
Private equity	4%
Total growth assets	61.5%
Index-linked gilts	7.5%
Total protection assets	7.5%
Multi asset credit	4%
Private lending	10%
Emerging Market Debt	2.5%
Fund of hedge funds	4.5%
Property	10%
Total income generating assets	31.0%
Grand total	**100%**

Results

The following table shows the best estimate and prudent estimate return for the current strategy, **based on projections from year 20 to 40**. For comparison, the yield on UK government bonds in 20 years' time is expected to be above its current level, with a best estimate of around 4% p.a. (compared to 1.5% as at 31 March 2019). The full distribution of returns for each investment strategy is shown in the chart in Appendix 2

% p.a.	Best estimate return	Prudent return (66%)
Current strategy	8.0%	6.7%

Note that the nominal values in the above table are from year 20, and therefore are not intended to be applied to current market conditions.

As described above, to set the 2019 valuation discount rate assumption we need to express these prudent expected returns as a margin above the risk-free rate. This is not as simple as subtracting the best-estimate gilt yield at year 20 (around 4% p.a.) from the prudent returns above, due to the interaction between gilt yields and portfolio returns in the model. Instead, we analyse the margins achieved by each portfolio over years 20 to 40 and calculate the likelihood of achieving three possible values:

Likelihood of achieving this margin from year 20	Margin above risk-free rate (% p.a.) 1.8%	2.0%	2.2%
Current strategy	78%	75%	72%

Relative to CPI as at 31 March 2019 (2.3%) these margins are +1.0%, 1.2% and 1.4% p.a.

Based on a likelihood of success of 66%, the current strategy can support all of the margins modelled.

Comparison with 2016 valuation

The margin used in the discount rate at the 2016 valuation was 1.8% p.a.. This assumption was selected based on a model and analytic principles similar to that used in this paper. The results are shown in the table below for comparison:

#	AOA	Asset split (growth/matching)	Probability of success
1	1.6%	Current (80/20)	73%
2	1.8%	Current (80/20)	71%
3	2.0%	Current (80/20)	69%

Further detail can be found in our paper "2016 valuation – Asset Outperformance Assumption (AOA)" dated 15 December 2015.

Since the 2016 analysis was carried out, the assumptions in the model used to generate future investment returns have been updated to reflect changes in long term market expectations. The analysis has also been updated to provide further insight into the distribution of returns.

Other considerations

Impact of altering the discount rate

Although the quantitative part of our analysis is focussed on the likelihood of success, it is important to consider other factors when choosing the discount rate. In practice any investment portfolio, especially one containing risky assets, will produce a range of returns which are sometimes lower than required according to the discount rate.

If the Fund was to choose a higher discount rate, it would be opting to target a less prudent funding position. Therefore:

- The Fund would gradually **hold less money** than it otherwise would have (all other things being equal).
- Long term asset liability modelling would show an increased likelihood of success under the same contribution strategies (as the funding target is lower so it will cost less to get there).
- For employers not eligible for stabilisation, contributions would be set at a lower level as the target funding position is less prudent (and therefore lower).
- There is less chance of investment performance achieving this return each and every year in the future. If there is any investment underperformance (relative to expectations), all other things being equal, higher than expected contributions would be required to compensate for the lost return.
- Where employers leave the Fund and their cessation valuation is calculated on an ongoing basis (e.g. some contractors), using a higher discount rate will result in less money being retained in the Fund to pay for their members' benefits in future. This increases the risk that the retained funds turn out to be insufficient to pay for these benefits, and therefore increases the risk that any guarantor (usually the awarding authority) will be required to make up a future shortfall. This also increases the risk of an 'exit credit' payment being made to the ceasing employer.
- New academy schools may receive a greater asset share (in % terms) on conversion, as the ceding council will hold back a smaller share of assets to fully-fund its deferred and pensioner members. This increases the risk that the ceding council will need to make additional contributions in future should the retained assets turn out to be insufficient.

Impact on past service funding position

By adding the risk-free rate margin to a suitable estimate of the 'risk-free' interest rate, it can be used to set a discount rate assumption at any date. The same principle of adjusting market related rates by an appropriate amount can be used with the other financial assumptions, i.e. applying a fixed margin to the market-derived inflation expectation (for RPI) to get the pension increase (CPI) and salary increase assumptions. We can therefore calculate the market-related value of the past service liabilities on any date, and compare it to the market value of the Fund's assets on the same day. This provides a high level comparison of today's funding position against the funding target (the 'funding level').

It is important to note that the link between the current funding level and the contribution rate is weaker under the risk-based approach (discussed in section 2) than under the traditional approach using a single set of assumptions. The funding level is therefore less significant as a driver of employer contributions than it used to be.

Furthermore, for comparison purposes, all LGPS funds are likely to be required by the Scheme Advisory Board to report their 2019 valuation funding position on a like-for-like basis i.e. using the same actuarial assumptions. This will reduce the focus, and therefore the importance attached at a national level, from the current funding position on the Fund's own funding basis.

Next steps

For the purpose of the 2019 valuation, it is important to set a discount rate that reflects likely future experience, with an allowance for prudence. The Fund should adopt an assumption that is appropriate based on the current investment strategy, and which will remain appropriate given expected possible future changes to the strategy. The assumption should also reflect the level of prudence the Fund wishes to build into funding plans.

Any concern about the resulting level of employer contribution rates should be addressed by the Fund via consideration of the funding plan's time horizon and likelihood of success, not through the choice of discount rate.

I recommend that the contents of this paper are discussed before any decision is made. Once a decision is made, the reasons for the choice should be documented for audit trail purposes and so that all stakeholders are informed.

Any choice should be reviewed again at the next formal valuation.

I have only considered the specific scenarios set out in this paper. I can carry out further analysis in order to advise on the effect of alternative scenarios if required.

Appendices

Appendix 1 – Model details

I have used Hymans Robertson's proprietary financial model, the Economic Scenario Service ("the ESS") to project a range of possible outcomes for the future behaviour of asset returns and economic variables. Some of the parameters of the ESS are dependent on current market conditions, while other more subjective parameters do not usually change. The key subjective assumptions underlying the ESS are the average level and volatility of equity prices, bond yields, credit spreads and inflation. The model is also affected by other more subtle effects, such as the correlations between asset classes.

The following figures have been calculated using 5,000 simulations of the ESS, calibrated using market data as at 31 March 2019. 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 at that time horizon.

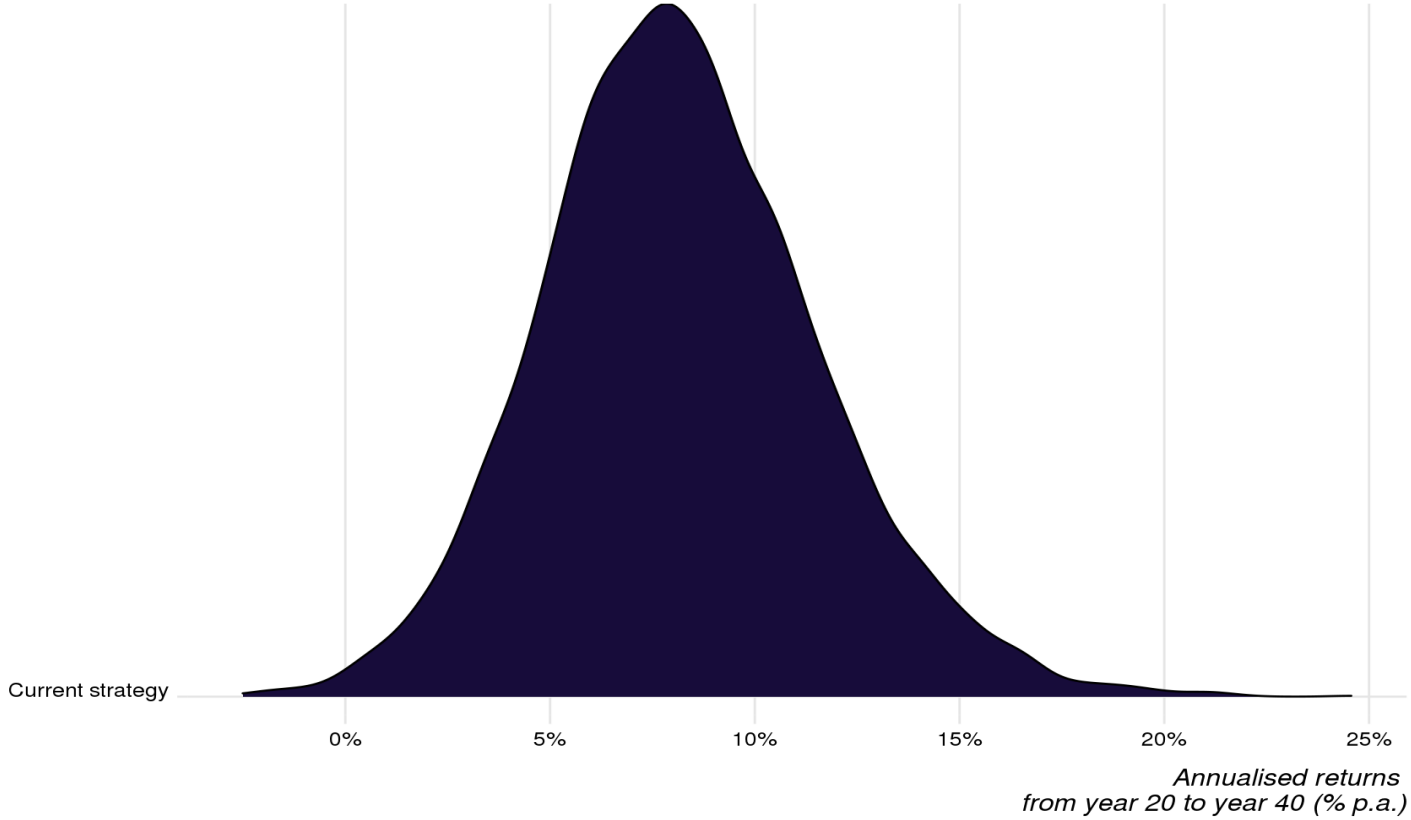
		Annualised total returns									
		Cash	Index Linked Gilts (medium)	Fixed Interest Gilts (medium)	UK Equity	Overseas Equity	Property	CorpMedium A	Inflation	17 year real yield	17 year yield
5 years	16th %'ile	-0.4%	-2.3%	-2.9%	-4.1%	-4.1%	-3.5%	-2.7%	1.9%	-2.5%	0.8%
	50th %'ile	0.7%	0.5%	0.3%	4.0%	4.1%	2.4%	0.8%	3.3%	-1.7%	2.1%
	84th %'ile	2.0%	3.3%	3.4%	12.7%	12.5%	8.8%	4.0%	4.9%	-0.8%	3.6%
10 years	16th %'ile	-0.2%	-1.8%	-1.3%	-1.5%	-1.4%	-1.5%	-0.9%	1.9%	-2.0%	1.2%
	50th %'ile	1.3%	0.0%	0.2%	4.6%	4.7%	3.1%	0.8%	3.3%	-0.8%	2.8%
	84th %'ile	2.9%	1.9%	1.7%	10.9%	10.8%	7.8%	2.5%	4.9%	0.4%	4.8%
20 years	16th %'ile	0.7%	-1.1%	0.1%	1.2%	1.3%	0.6%	0.7%	2.0%	-0.7%	2.2%
	50th %'ile	2.4%	0.3%	1.0%	5.7%	5.8%	4.3%	1.9%	3.2%	0.8%	4.0%
	84th %'ile	4.5%	2.0%	2.0%	10.3%	10.4%	8.1%	3.0%	4.7%	2.2%	6.3%
40 years	16th %'ile	1.7%	0.6%	1.7%	3.3%	3.2%	2.3%	2.3%	2.0%	-0.6%	2.3%
	50th %'ile	3.4%	1.9%	2.5%	6.7%	6.7%	5.2%	3.3%	3.1%	1.0%	4.2%
	84th %'ile	5.3%	3.3%	3.6%	10.4%	10.2%	8.3%	4.6%	4.4%	2.7%	6.7%
	Volatility (Disp) (1 yr)	1%	7%	10%	17%	17%	14%	11%	1%		

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 -2.1% (1.5%) to 0.8% (4.0%).

Appendix 2 – Portfolio returns

Time 20 to 40 years

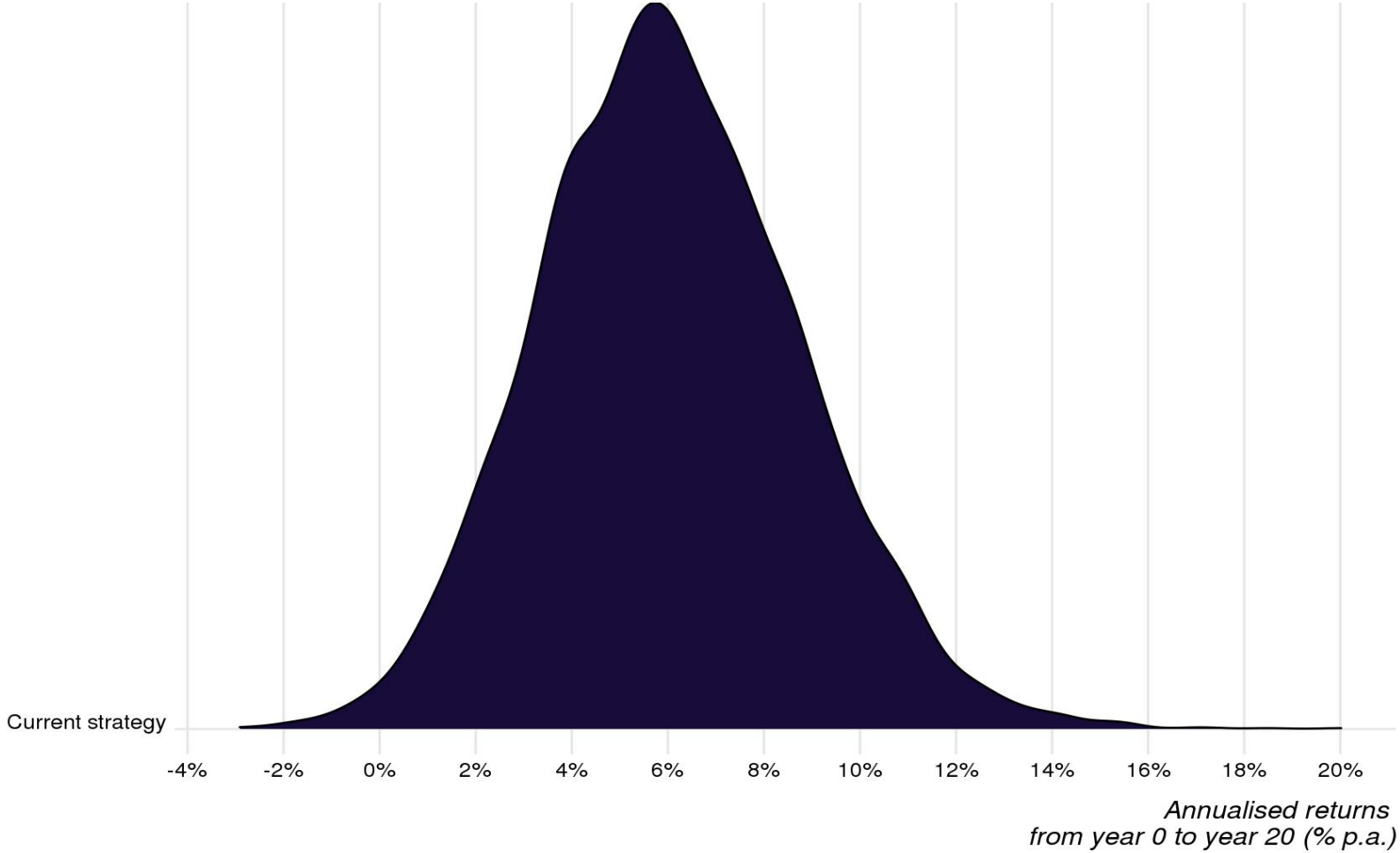
The chart below shows the distribution of returns for year 20 to 40 based on the investment strategy outlined in section 3. The vertical axis in each case is the proportion of simulated outcomes achieving the return on the horizontal axis. The best estimate return is generally at the peak of the distribution, with an equal number of outcomes above and below it. The prudent return lies to the left of this, so that a majority (66%) of outcomes are above it.



The current strategy includes a substantial allocation to riskier growth assets and hence produces a wide range of expected returns. In general, the lower the growth asset allocation, the more predictable the returns so the narrower the distribution.

Time 0 to 20 years

The chart below shows the distribution of returns for year 0 to 20 based on the investment strategy outlined in section 3. For comparison, the yield on long-dated UK Government bonds at the same date as the projection (31 March 2019) is 1.5% p.a.. These returns will be reflected in the risk based approach to contribution rate setting used at the 2019 valuation. These charts are provided for information purposes only.



Appendix 3 – Professional Notes

Reliances and limitations

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 subjective assumptions are the average excess equity return over risk free assets, the volatility of equity returns and the level and volatility of yields, credit spreads, inflation and expected (breakeven) inflation, which affect the projected liability and bond returns. The output of the model is also affected by other more subtle effects, such as the correlations between economic and financial variables. Our expectation (i.e. the average outcome) is that long term real interest rates will gradually rise from their current low levels. The mean reversion in yields also affects expected bond returns.

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. Given the context of this modelling, we have not undertaken any sensitivity analysis to assess how different the results might be with alternative calibrations of the economic scenario generator.

The returns presented here are time weighted returns over the specified period and are unaffected by the timing of any contributions received or pensions paid over that period. Such returns are, in general, a poor estimator of money weighted returns, which are sensitive to the timing of cashflows.

The probability that a specific asset return will be exceeded will not usually equate to the probability that some funding plan based on this return will be sufficient to meet all the pension payments. Complex interactions between the assets, yields and cashflow timings can mean that the two probabilities are materially different, especially for more mature schemes. 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.

We have not explicitly considered the impact on future economic returns and conditions arising from resource and environment issues. However, the stochastic approach means that an allowance for negative future scenarios is in effect built in to the model details as per Appendix 1.

Technical Actuarial Standards

Technical Actuarial Standards (TASs) are issued by the Financial Reporting Council and set standards for certain items of actuarial work, including the information and advice contained in this report. TAS 100 (Principles for Technical Actuarial Work) and TAS 300 (Pensions) are applicable in relation to this report and have been complied with where material.