Mercer

The Pensions Regulator

Superfund capital requirements: 31.12.2022 asset liability modelling

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Introduction

Mercer has been appointed by The Pensions Regulator (TPR) to provide asset liability modelling analysis to consider aspects regarding superfund capital requirements. These include:

1. Update the asset-liability modelling analysis carried out shortly before the interim regime came into effect in June 2020, to understand the impact of changes in market conditions.
2. Review the implications of profit extraction from superfunds on future funding levels

This paper is divided into the following sections:

- Section 1 – Investment strategies
- Section 2 – Interim regime – updated capital buffers
- Section 3 – Probability of meeting benefits (POMB) analysis
- Section 4 – Conclusions

Investment strategies

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Investment Strategies

Asset Liability Modelling

We have set out below the investment strategies we have modelled. Strategies A and C have similar levels of expected excess return. Strategy B has a higher level of expected excess return and a higher volatility. Strategy E follows a credit based investment strategy, not dissimilar to that an insurer may adopt.

Asset bucket	Asset class	Strategy A	Strategy B	Strategy C	Strategy E
Equity	Global Listed	10%	3%	5%	-
	Private	-	4%	-	-
Infrastructure	Equity	-	20%	-	-
	Renewables	-	2%	-	-
Debt	Investment-grade credit	20%	-	20%	45% [1]
	Liquid multi-asset credit	15%	-	-	-
	ARBS Investment grade	15%	-	-	-
	Private credit	-	9%	10%	20%
	Investment grade ABS	-	3%	10%	-
	High yield ABS	-	2%	-	-
	Listed global high yield and loans	-	3%	5%	-
	Commercial real estate debt	-	-	5%	-
	Infrastructure debt	-	-	5%	-
	Structured credit	-	-	-	5%
Property	Property	-	4%	-	-
LDI	LDI	40%	50%	40%	30%

[1] Mapped as to GBP IG credit (all grades), 20% 5 year duration , 15% 10 year duration , 10% 15 year duration

Investment Strategies
Asset Liability Modelling

The risk and return metrics for each of the investment strategies set out on the previous page are shown below under **31 December 2022** capital market assumptions.

Return / risk metrics[1]	Strategy A	Strategy B	Strategy C	Strategy E
Expected return (10 year median p.a.)	Gilts + 1.4%	Gilts + 2.0%	Gilts + 1.5%	Gilts + 1.7%
Absolute volatility (1 year) [2]	10.3%	11.4%	10.1%	9.6%
Volatility vs liabilities (1 year) [2,3]	5.1%	6.7%	5.1%	5.5%
Interest rate hedge ratio [3]	100%	100%	100%	100%
Inflation hedge ratio [3]	100%	100%	100%	100%

[1] As at 31 December 2022
[2] We suggest focusing on volatilities relative to liabilities.
[3] Relative to Gilts + 0.5% liabilities

- The expected returns (relative to gilts) of Strategy A and Strategy C have remained relatively in line with those in our 30 September 2019 analysis. However, the expected return for Strategy B has risen from Gilts + 1.8% to Gilts +2.0%. Strategy E was not modelled in our 2019 analysis.
- In terms of absolute volatility (1 year), all strategies have seen a significant increase. Strategy C has witnessed the largest increase, with absolute volatility rising from 4.9% in the September 2019 analysis to 10.1% in the December 2022 analysis.
- Similarly, relative volatility vs liabilities has also increased for all strategies. Strategy C saw an increase from 3.1% to 5.1%. This increase in volatility is broadly based across all asset classes. Credit spread volatility has only increased modestly under our assumptions, with the GBP all stocks investment grade spread volatility increasing from 4.6% at September 2019 to 4.8% at December 2022.

Interim regime – updated capital buffers

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Capital Buffers Adequacy – 31 December 2022

Investment Strategy A

Strategy	A
Profile	50/50
Funding basis	G+0.5% | G+0.75%
Buffer	13% | 14% | 15% |16%
Distributions	N

- We have projected the **assets and liabilities** on the **gilts + 0.5% and gilts + 0.75%** bases with the asset allocation of **Strategy A.**
- The table below sets out the 99th and 50th percentile funding levels, where there is **no allowance for profit distributions** and without considering the potential need for intervention. No Longevity Risk is considered in this analysis.

Basis	Initial Buffer	Percentile	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	15 years	20 years	Probability of full funding in 10 years
Gilts+0.5%	13%	99th	103.1%	101.2%	100.1%	99.3%	99.1%	99.3%	99.7%	99.5%	99.7%	100.7%	103.8%	110.7%	99.1%
		50th	115.4%	117.3%	118.9%	120.7%	122.7%	124.9%	127.5%	130.4%	133.6%	137.4%	164.1%	211.8%	
	14%	99th	104.0%	102.2%	101.2%	100.3%	100.3%	100.3%	101.0%	100.9%	101.2%	102.2%	106.5%	114.5%	99.3%
		50th	116.4%	118.4%	120.1%	122.0%	124.0%	126.3%	129.0%	132.0%	135.4%	139.3%	167.2%	216.9%	
	15%	99th	105.0%	103.2%	102.2%	101.3%	101.3%	101.5%	102.3%	102.3%	102.8%	103.6%	108.9%	118.4%	99.5%
		50th	117.5%	119.5%	121.3%	123.2%	125.3%	127.8%	130.5%	133.6%	137.2%	141.2%	170.2%	222.4%	
Gilts+0.75%	14%	99th	103.7%	101.7%	100.4%	99.3%	98.9%	98.9%	99.1%	98.5%	98.3%	99.0%	99.9%	102.2%	98.8%
		50th	116.2%	117.9%	119.3%	120.8%	122.5%	124.5%	126.8%	129.2%	132.1%	135.6%	159.5%	202.3%	
	15%	99th	104.7%	102.7%	101.4%	100.3%	100.0%	99.9%	100.3%	99.9%	99.8%	100.5%	102.2%	106.2%	99.1%
		50th	117.2%	119.0%	120.5%	122.0%	123.9%	125.9%	128.3%	130.8%	134.0%	137.4%	162.5%	207.5%	
	16%	99th	105.7%	103.7%	102.4%	101.3%	101.2%	101.1%	101.6%	101.3%	101.3%	101.9%	104.5%	109.8%	99.3%
		50th	118.2%	120.1%	121.7%	123.3%	125.2%	127.4%	129.8%	132.5%	135.7%	139.3%	165.5%	212.5%	

Focusing on an objective of having the 99th percentile at least 100% at year 5:
Under a G+0.5 % basis a 14% market risk buffer is sufficient for Strategy A. A 15% buffer would be needed under a G+0.75% basis
These approaches also satisfy secondary test of the 99th percentile being greater than 100% at year 10 and equivalently P(full funding at year 10) >99%

Funding Level categorized as follows: < 97% ▼ = red; 97-100% ▬ =amber; ≥100% ● =green

Capital Buffers Adequacy – 31 December 2022

Investment Strategy B

Strategy	B
Profile	50/50
Funding basis	G+0.5% | G+0.75%
Buffer	22% | 23% | 24% | 25%
Distributions	N

- We have projected the **assets and liabilities** on the **gilts + 0.5% and gilts + 0.75%** bases with the asset allocation of **Strategy B.**
- The table below sets out the 99th and 50th percentile funding levels, where there is **no allowance for profit distributions** and without considering the potential need for intervention. No Longevity Risk is considered in this analysis.

Basis	Initial Buffer	Percentile	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	15 years	20 years	Probability of full funding in 10 years
Gilts+0.5%	22%	99th	107.4%	104.1%	101.8%	100.2%	99.9%	99.2%	98.9%	99.1%	98.1%	97.6%	100.1%	104.9%	98.8%
		50th	125.4%	128.7%	131.9%	135.5%	139.3%	143.5%	148.0%	153.3%	159.8%	166.5%	217.0%	308.2%	
	23%	99th	108.2%	105.0%	102.7%	101.2%	100.8%	100.3%	100.2%	100.3%	99.4%	98.9%	102.4%	108.3%	98.9%
		50th	126.5%	129.8%	133.1%	136.8%	140.7%	144.9%	149.6%	155.1%	161.7%	168.6%	220.3%	314.2%	
	24%	99th	109.1%	106.0%	103.6%	102.2%	101.9%	101.5%	101.2%	101.9%	100.7%	100.4%	104.4%	111.4%	99.0%
		50th	127.5%	130.9%	134.4%	138.1%	142.1%	146.4%	151.2%	156.9%	163.5%	170.6%	223.6%	320.1%	
Gilts+0.75%	23%	99th	108.0%	104.5%	102.0%	100.1%	99.5%	98.6%	98.3%	98.1%	96.7%	95.5%	96.2%	97.3%	98.6%
		50th	126.2%	129.2%	132.3%	135.6%	139.1%	142.9%	147.1%	152.2%	158.2%	164.5%	211.7%	297.7%	
	24%	99th	108.9%	105.5%	102.9%	101.2%	100.4%	99.7%	99.3%	99.6%	97.8%	97.0%	98.4%	100.7%	98.8%
		50th	127.3%	130.4%	133.5%	136.8%	140.4%	144.4%	148.7%	153.9%	160.1%	166.5%	215.0%	303.5%	
	25%	99th	109.7%	106.4%	103.9%	102.2%	101.5%	100.8%	100.6%	100.9%	99.1%	98.7%	100.5%	103.0%	98.9%
		50th	128.3%	131.5%	134.7%	138.1%	141.8%	145.8%	150.3%	155.7%	161.9%	168.6%	218.4%	309.2%	

Focusing on an objective of having the 99th percentile at least 100% at year 5:
Under a G+0.5 % basis a 23% market risk buffer is sufficient for Strategy B. A 24% buffer would be needed under a G+0.75% basis
The additional long term risk in this investment strategy means the secondary test at year 10 is more challenging particularly on a G+0.75% basis.

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Funding Level categorized as follows: < 97% ▼ = red; 97-100% ▬ =amber; ≥100% ● =green

Capital Buffers Adequacy – 31 December 2022

Investment Strategy C

Strategy	C
Profile	50/50
Funding basis	G+0.5% | G+0.75%
Buffer	11% | 12% | 13% | 14%
Distributions	N

- We have projected the **assets and liabilities** on the **gilts + 0.5% and gilts + 0.75%** bases with the asset allocation of **Strategy C.**
- The table below sets out the 99th and 50th percentile funding levels, where there is **no allowance for profit distributions** and without considering the potential need for intervention. No Longevity Risk is considered in this analysis.

Basis	Initial Buffer	Percentile	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	15 years	20 years	Probability of full funding in 10 years
Gilts+0.5%	11%	99th	100.1%	99.1%	98.5%	98.5%	99.7%	100.4%	101.5%	102.3%	103.5%	105.7%	113.9%	126.3%	99.7%
		50th	113.8%	115.8%	117.6%	119.4%	121.4%	123.4%	125.8%	128.4%	131.5%	134.9%	159.9%	203.9%	
	12%	99th	101.1%	100.1%	99.5%	99.6%	100.8%	101.6%	102.7%	103.6%	104.9%	107.1%	116.0%	129.1%	99.8%
		50th	114.9%	117.0%	118.8%	120.7%	122.7%	124.8%	127.3%	130.1%	133.3%	136.9%	163.0%	209.2%	
	13%	99th	102.0%	101.1%	100.5%	100.5%	102.0%	103.0%	104.0%	105.0%	106.2%	108.5%	118.2%	131.7%	99.9%
		50th	115.9%	118.1%	120.0%	121.9%	124.0%	126.3%	128.9%	131.7%	135.1%	138.9%	166.0%	214.3%	
Gilts+0.75%	12%	99th	100.8%	99.6%	98.7%	98.5%	99.5%	100.0%	100.7%	101.2%	101.9%	103.8%	109.8%	118.9%	99.5%
		50th	114.6%	116.4%	118.0%	119.5%	121.2%	123.0%	125.1%	127.3%	130.1%	133.1%	155.3%	194.5%	
	13%	99th	101.8%	100.6%	99.6%	99.5%	100.6%	101.3%	102.0%	102.5%	103.3%	105.2%	112.2%	121.7%	99.7%
		50th	115.7%	117.5%	119.2%	120.8%	122.5%	124.4%	126.6%	129.0%	131.9%	135.1%	158.4%	199.7%	
	14%	99th	102.8%	101.5%	100.6%	100.4%	101.7%	102.5%	103.2%	103.9%	104.5%	106.7%	114.4%	124.4%	99.8%
		50th	116.7%	118.7%	120.4%	122.0%	123.9%	125.9%	128.2%	130.7%	133.7%	137.1%	161.5%	204.9%	

Focusing on an objective of having the 99th percentile at least 100% at year 5:
Under a G+0.5 % basis a 12% market risk buffer is sufficient for Strategy C. A 13% buffer would be needed under a G+0.75% basis
These approaches also satisfy secondary test of the 99th percentile being greater than 100% at year 10 and equivalently P(full funding at year 10) >99.5%

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Capital Buffers Adequacy – 31 December 2022

Investment Strategy E

Strategy	E
Profile	50/50
Funding basis	G+0.5% | G+0.75%
Buffer	9% | 10% | 11%| 12% | 13%
Distributions	N

- We have projected the **assets and liabilities** on the **gilts + 0.5% and gilts + 0.75%** bases with the asset allocation of **Strategy E**.
- The table below sets out the 99th and 50th percentile funding levels, where there is **no allowance for profit distributions** and without considering the potential need for intervention. No Longevity Risk is considered in this analysis.

Basis	Initial Buffer	Percentile	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	15 years	20 years	Probability of full funding in 10 years
Gilts+0.5%	9%	99th	97.1%	96.5%	97.0%	96.6%	98.9%	99.5%	100.6%	101.8%	102.7%	104.7%	112.2%	123.2%	99.7%
		50th	112.5%	114.8%	116.8%	118.7%	120.8%	123.1%	125.8%	128.5%	131.6%	135.4%	161.3%	207.3%	
	10%	99th	98.0%	97.4%	98.0%	97.8%	100.0%	100.7%	101.7%	102.9%	103.8%	106.0%	113.9%	125.7%	99.8%
		50th	113.5%	115.9%	118.0%	119.9%	122.1%	124.5%	127.3%	130.2%	133.4%	137.4%	164.5%	212.8%	
	11%	99th	99.0%	98.4%	99.0%	98.7%	101.1%	101.8%	102.8%	104.2%	105.1%	107.4%	115.7%	127.8%	99.9%
		50th	114.6%	117.0%	119.2%	121.2%	123.5%	126.0%	128.9%	131.8%	135.2%	139.4%	167.7%	218.1%	
Gilts+0.75%	11%	99th	98.7%	97.9%	98.2%	97.6%	99.6%	100.1%	100.8%	101.9%	102.3%	104.3%	110.2%	118.6%	99.7%
		50th	114.3%	116.5%	118.3%	120.0%	122.0%	124.1%	126.5%	129.1%	132.0%	135.6%	160.0%	203.1%	
	12%	99th	99.5%	98.8%	99.1%	98.6%	100.7%	101.1%	101.8%	103.1%	103.6%	105.6%	112.0%	121.2%	99.8%
		50th	115.4%	117.6%	119.5%	121.3%	123.3%	125.6%	128.1%	130.7%	133.8%	137.6%	163.2%	208.4%	
	13%	99th	100.4%	99.8%	100.0%	99.4%	101.7%	102.2%	103.0%	104.3%	104.9%	106.9%	113.6%	123.3%	99.9%
		50th	116.5%	118.7%	120.7%	122.5%	124.7%	127.1%	129.6%	132.4%	135.6%	139.6%	166.3%	213.6%	

Focusing on an objective of having the 99th percentile at least 100% at year 5:
Under a G+0.5 % basis a 10% market risk buffer is sufficient for Strategy E. A 12% buffer would be needed under a G+0.75% basis
These approaches also satisfy secondary test of the 99th percentile being greater than 100% at year 10 and equivalently P(full funding at year 10) >99.5%

Funding Level categorized as follows: < 97% ▼ = red; 97-100% ▬ =amber; ≥100% ● =green

Capital Buffers Adequacy – 31 December 2022

Gilts + 0.5% funding basis

Strategy	A+B+C+E
Profile	50/50
Funding basis	G+0.5%
Buffer	Y
Distributions	N

- This repeats the analysis on the previous pages with a 2% lower starting buffer for each strategy on **Gilts+0.5% basis**. This assumes a Hedge Ratio of 100% of Liabilities on a Gilts+0.5% basis. No Longevity Risk is considered in this analysis.

Investment Strategy	Buffer	Probability of Full Funding											
		1 year	2 years	3 years	4 years	**5 years**	6 years	7 years	8 years	9 years	**10 years**	**15 years**	**20 years**
Strategy A *Gilts + 1.4%*	**14%**	99.8%	99.6%	99.2%	99.1%	**99.1%**	99.1%	99.2%	99.2%	99.2%	99.3%	99.6%	99.7%
	12%	99.6%	99.1%	98.7%	98.3%	**98.5%**	98.5%	98.5%	98.6%	98.6%	98.8%	99.1%	99.4%
Strategy B *Gilts + 2.0%*	**23%**	100.0%	99.8%	99.4%	99.2%	**99.2%**	99.1%	99.0%	99.0%	98.9%	98.9%	99.1%	99.3%
	21%	99.9%	99.6%	99.2%	98.8%	**98.7%**	98.6%	98.7%	98.7%	98.7%	98.6%	98.8%	99.1%
Strategy C *Gilts + 1.5%*	**12%**	99.3%	99.0%	98.9%	98.9%	**99.2%**	99.3%	99.5%	99.6%	99.6%	99.8%	99.9%	100.0%
	10%	98.6%	98.1%	98.2%	98.2%	**98.6%**	98.7%	99.0%	99.2%	99.3%	99.6%	99.8%	99.9%
Strategy E *Gilts + 1.7%*	**10%**	98.1%	98.1%	98.2%	98.4%	**99.0%**	99.2%	99.3%	99.5%	99.6%	99.8%	100.0%	100.0%
	8%	96.5%	96.8%	97.1%	97.5%	**98.4%**	98.4%	98.8%	99.1%	99.3%	99.6%	99.9%	100.0%

With lower buffers, there is a significantly higher likelihood of not being fully funded, particularly in the early years.

Capital Buffers Adequacy – 31 December 2022

Gilts + 0.75% funding basis

Strategy	A+B+C+E
Profile	50/50
Funding basis	G+0.75%
Buffer	Y
Distributions	N

- This repeats the analysis on the previous pages with a 2% lower starting buffer for each strategy on **Gilts+0.75% basis**. This assumes a Hedge Ratio of 100% of Liabilities on a Gilts+0.75% basis. No Longevity Risk is considered in this analysis.

Investment Strategy	Buffer	Probability of Full Funding											
		1 year	2 years	3 years	4 years	**5 years**	6 years	7 years	8 years	9 years	**10 years**	**15 years**	**20 years**
Strategy A *Gilts + 1.4%*	**15%**	99.9%	99.7%	99.3%	99.1%	**99.0%**	99.0%	99.1%	99.0%	98.9%	99.1%	99.2%	99.4%
	13%	99.7%	99.2%	98.8%	98.3%	**98.4%**	98.3%	98.3%	98.3%	98.4%	98.4%	98.7%	98.9%
Strategy B *Gilts + 2.0%*	**24%**	100.0%	99.8%	99.5%	99.2%	**99.1%**	99.0%	98.9%	99.0%	98.8%	98.8%	98.9%	99.0%
	22%	99.9%	99.7%	99.2%	98.8%	**98.7%**	98.5%	98.6%	98.5%	98.5%	98.4%	98.5%	98.7%
Strategy C *Gilts + 1.5%*	**13%**	99.6%	99.2%	98.9%	98.9%	**99.2%**	99.2%	99.4%	99.4%	99.5%	99.7%	99.8%	99.9%
	11%	98.9%	98.3%	98.3%	98.2%	**98.6%**	98.6%	98.9%	99.0%	99.2%	99.4%	99.7%	99.8%
Strategy E *Gilts + 1.7%*	**12%**	98.8%	98.6%	98.8%	98.6%	**99.1%**	99.2%	99.3%	99.5%	99.6%	99.8%	99.9%	100.0%
	10%	97.9%	97.8%	97.8%	97.9%	**98.6%**	98.6%	98.9%	99.1%	99.3%	99.6%	99.8%	100.0%

With lower buffers, there is a significantly higher likelihood of not being fully funded, particularly in the early years.

Summary

- The following table summarises the results from the previous slides as well as comparing them to our previous analysis as at 30 September 2019.

	Gilts + 0.5% Basis		Gilts + 0.75 Basis
Investment Strategy	**Buffer (30/09/2019)**	**Buffer (31/12/2022)**	**Buffer (31/12/2022)**
Strategy A *Gilts + 1.4% / Gilts + 1.4%**	**15%**	**14%**	**15%**
Strategy B *Gilts + 1.8% / Gilts + 2.0%**	**25%**	**23%**	**24%**
Strategy C *Gilts + 1.5% / Gilts + 1.5% **	**15%**	**12%**	**13%**
Strategy E *- / Gilts + 1.7% **	**-**	**10%**	**12%**

* Expected Returns based on the 31/09/2019 and 31/12/2022 analyses, respectively.

- Minimum buffers have reduced for all strategies A, B and C compared to the 2019 analysis, by 1% to 3%.
- The changes are largely driven by higher spreads and as a result, greater expected excess returns relative to gilts, although the impact of this has been offset slightly by higher asset volatility. Overall, the higher level of expected return has had a stronger effect than the higher level of volatility on minimum buffer levels.

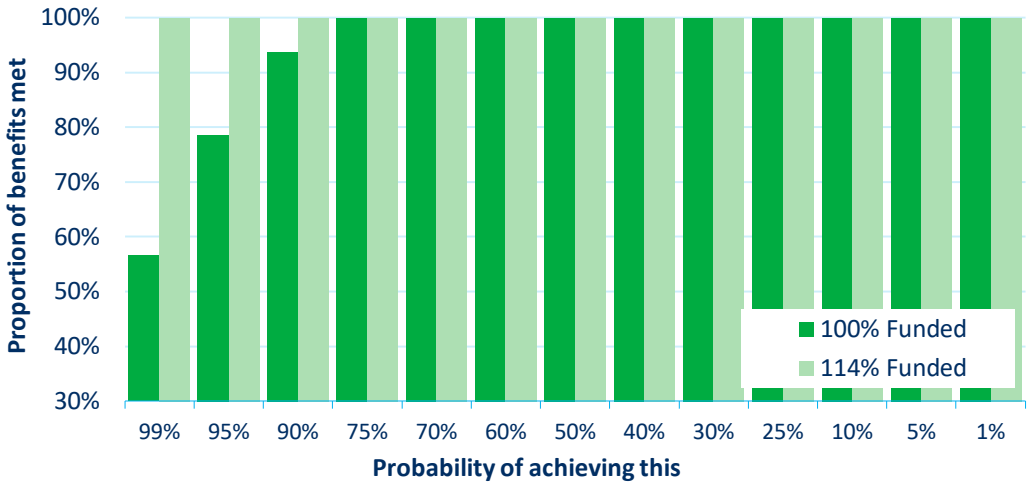
Probability of meeting benefits (POMB) analysis

POMB Analysis – Strategy A - Gilts+0.5%

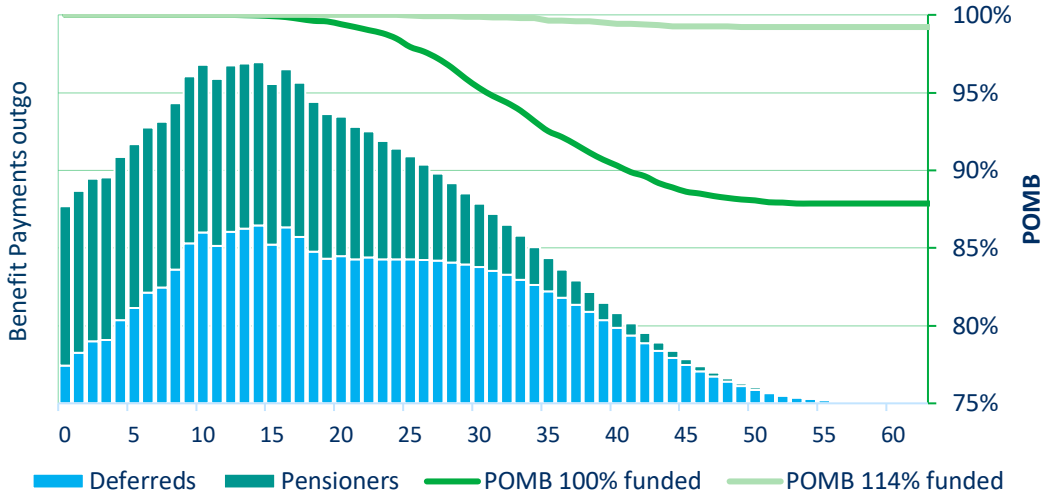
Scenario details

Liability Profile	50% Pensioner / 50% Deferred
Funding Basis (initial asset value)	Gilts +0.5%
Investment Strategy	A
Longevity Risk modelled	Yes
Initial Funding Level	100% and 100% + **14% buffer**

Long term asset projection



Probability of meeting benefits (POMB)



Commentary

The asset projection chart (top right) shows how the assets develop under our simulations.

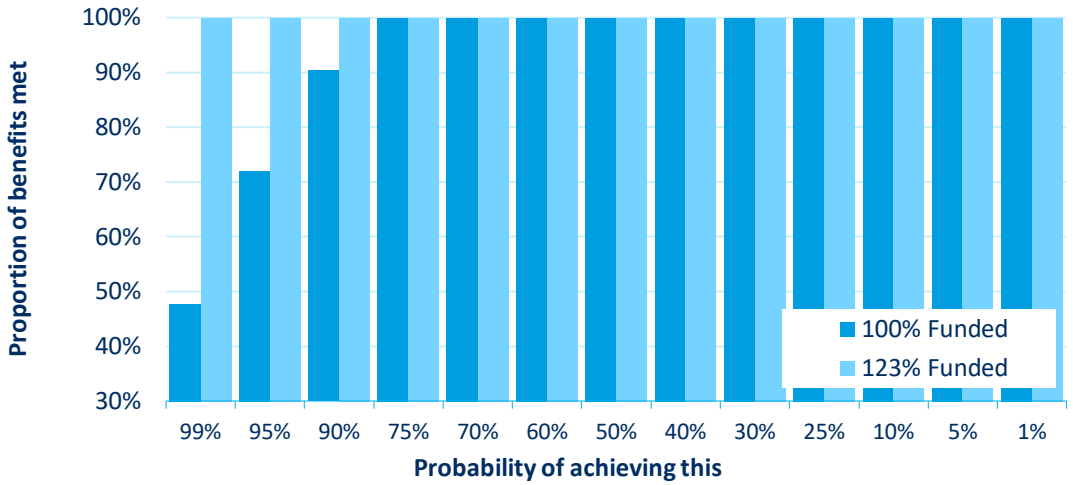
The chart on the bottom left shows the probability of having assets remaining at each time point. The green line ultimately reaches, at year 80, a POMB of 87.9% for a scenario where the scheme is initially 100% funded. The light green line reaches, at year 80, a POMB of 99.2% for a scenario where the scheme is initially 100% funded with a 14% buffer.

POMB Analysis – Strategy B - Gilts+0.5%

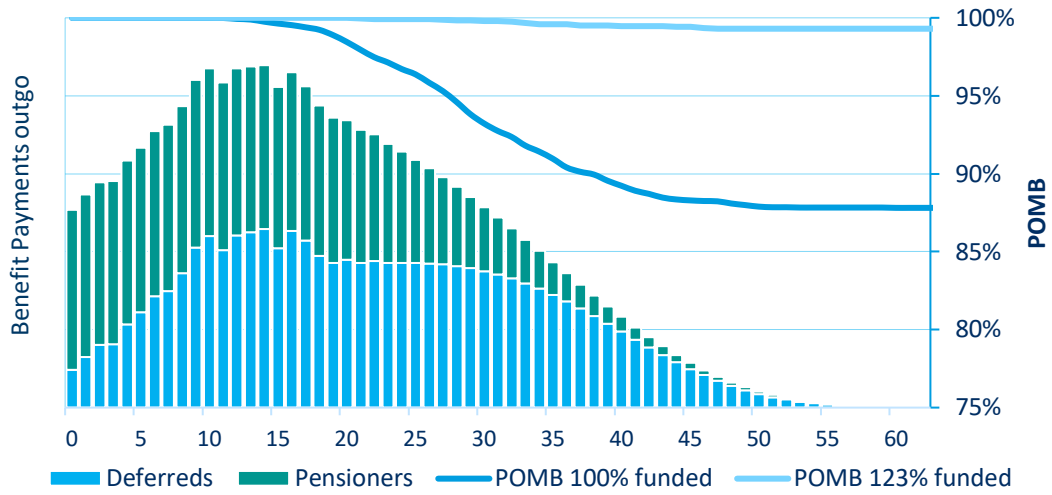
Scenario details

Liability Profile	50% Pensioner / 50% Deferred
Funding Basis (initial asset value)	Gilts +0.5%
Investment Strategy	B
Longevity Risk modelled	Yes
Initial Funding Level	100% and 100% + **23% buffer**

Long term asset projection



Probability of meeting benefits (POMB)



Commentary

The asset projection chart (top right) shows how the assets develop under our simulations.

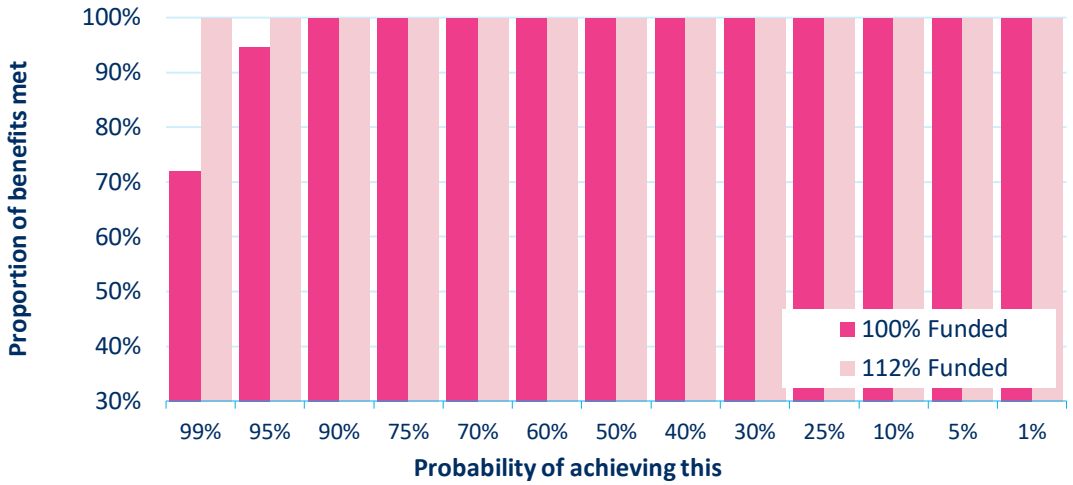
The chart on the bottom left shows the probability of having assets remaining at each time point. The blue line ultimately reaches, at year 80, a POMB of 87.8% for a scenario where the scheme is initially 100% funded. The light blue line reaches, at year 80, a POMB of 99.3% for a scenario where the scheme is initially 100% funded with a 23% buffer.

POMB Analysis – Strategy C - Gilts+0.5%

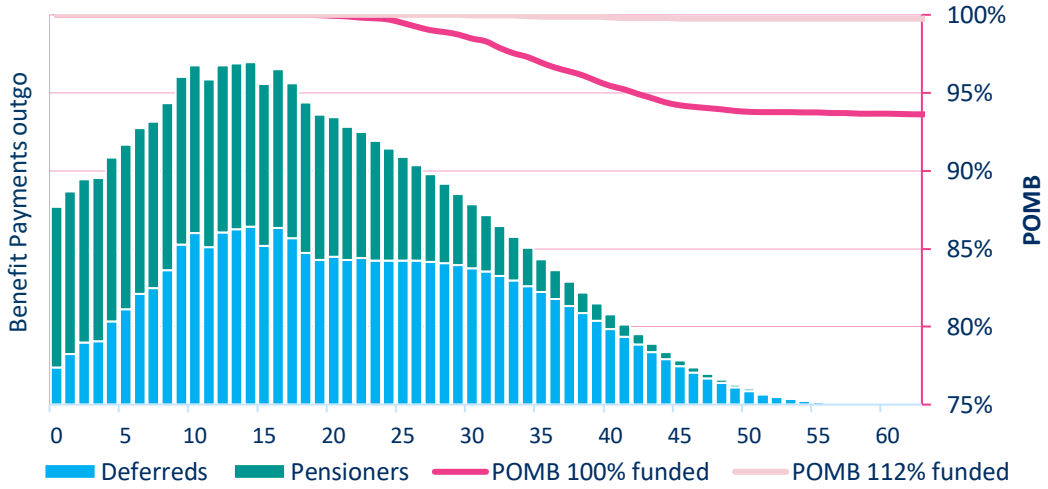
Scenario details

Liability Profile	50% Pensioner / 50% Deferred
Funding Basis (initial asset value)	Gilts +0.5%
Investment Strategy	C
Longevity Risk modelled	Yes
Initial Funding Level	100% | 100% + **12% buffer**

Long term asset projection



Probability of meeting benefits (POMB)



Commentary

The asset projection chart (top right) shows how the assets develop under our simulations.

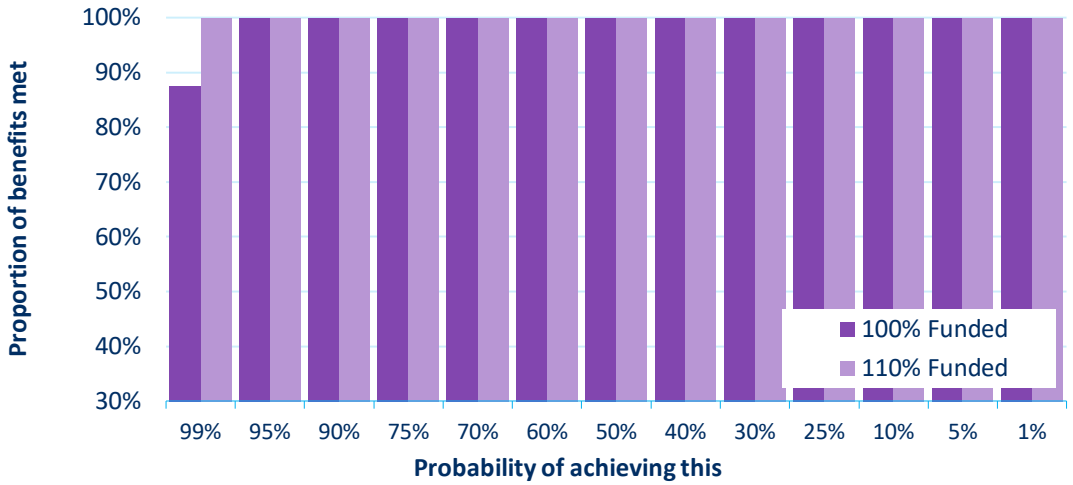
The chart on the bottom left shows the probability of having assets remaining at each time point. The pink line ultimately reaches, at year 80, a POMB of 93.6% for a scenario where the scheme is initially 100% funded. The light pink line reaches, at year 80, a POMB of 99.8% for a scenario where the scheme is initially 100% funded with a 12% buffer.

POMB Analysis – Strategy E - Gilts+0.5%

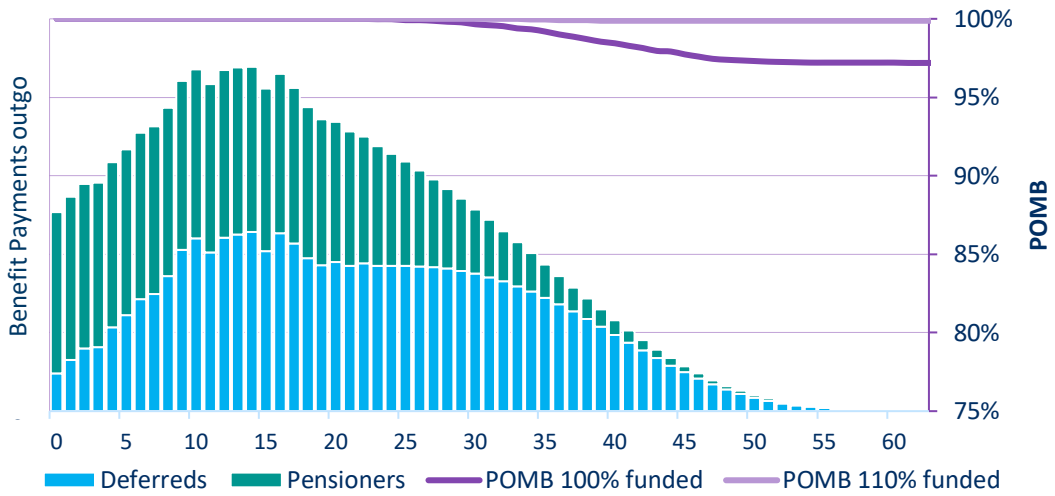
Scenario details

Liability Profile	50% Pensioner / 50% Deferred
Funding Basis (initial asset value)	Gilts +0.5%
Investment Strategy	E
Longevity Risk modelled	Yes
Initial Funding Level	100% | 100% + **10% buffer**

Long term asset projection



Probability of meeting benefits (POMB)



Commentary

The asset projection chart (top right) shows how the assets develop under our simulations.

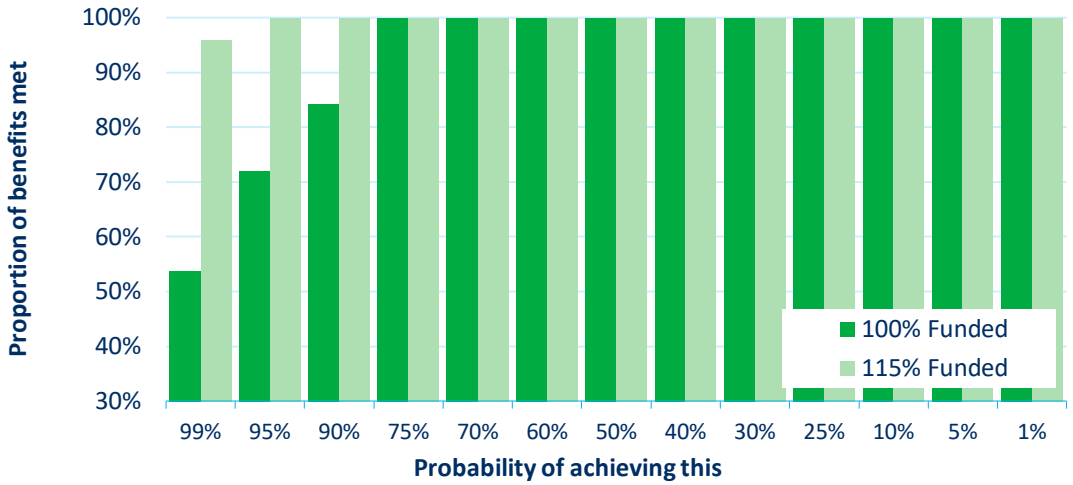
The chart on the bottom left shows the probability of having assets remaining at each time point. The purple line ultimately reaches, at year 80, a POMB of 97.2% for a scenario where the scheme is initially 100% funded. The light purple line reaches, at year 80, a POMB of 99.9% for a scenario where the scheme is initially 100% funded with a 10% buffer.

POMB Analysis – Strategy A - Gilts+0.75%

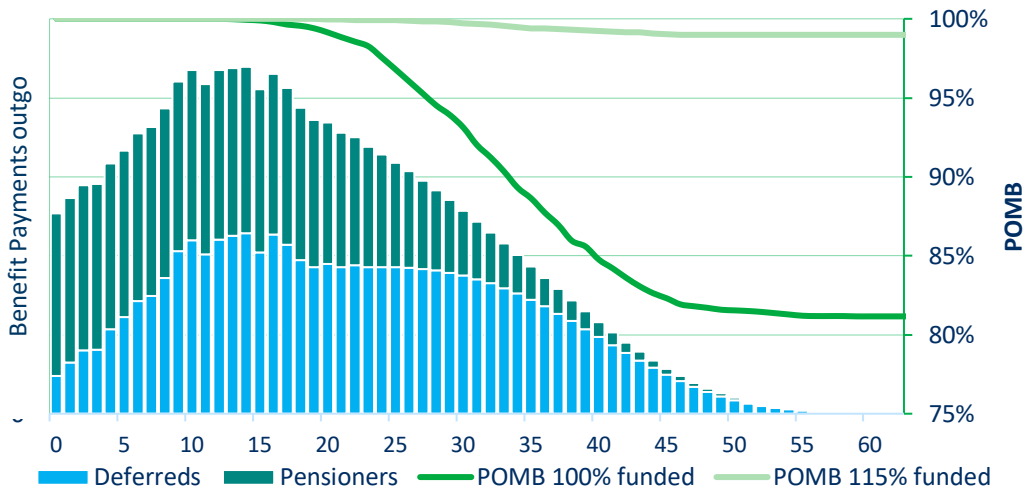
Scenario details

Liability Profile	50% Pensioner / 50% Deferred
Funding Basis (initial asset value)	Gilts +0.75%
Investment Strategy	A
Longevity Risk modelled	Yes
Initial Funding Level	100% | 100% + **15% buffer**

Long term asset projection



Probability of meeting benefits (POMB)



Commentary

The asset projection chart (top right) shows how the assets develop under our simulations.

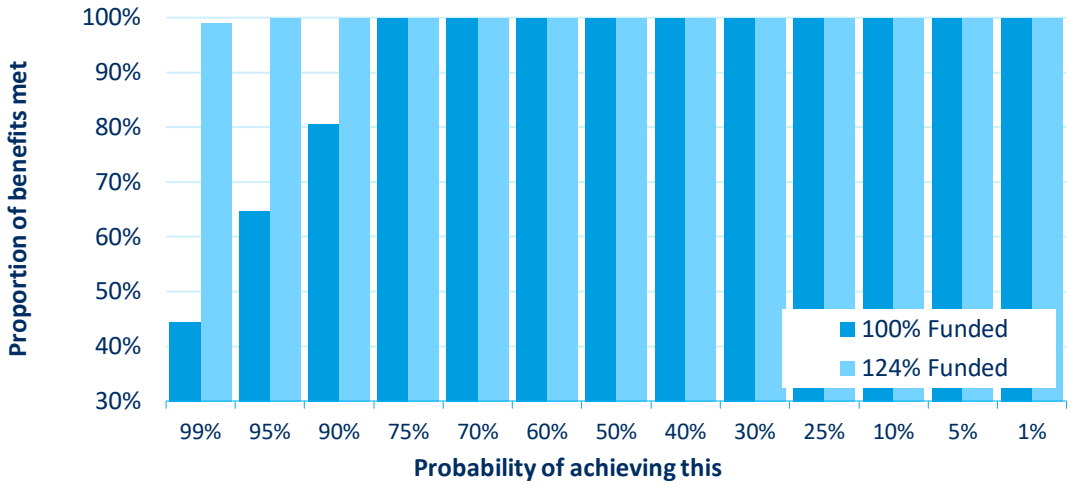
The chart on the bottom left shows the probability of having assets remaining at each time point. The green line ultimately reaches, at year 80, a POMB of 81.2% for a scenario where the scheme is initially 100% funded. The light green line reaches, at year 80, a POMB of 98.8% for a scenario where the scheme is initially 100% funded with a 15% buffer.

POMB Analysis – Strategy B - Gilts+0.75%

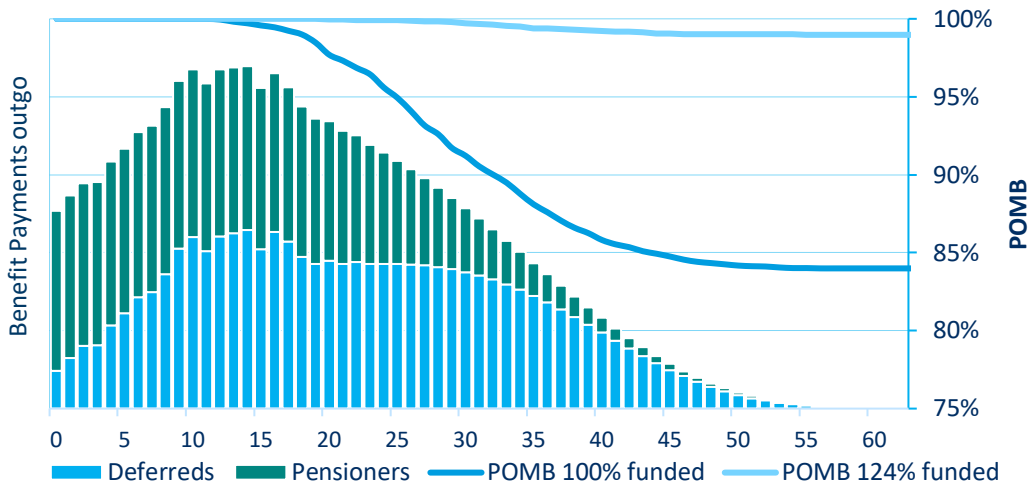
Scenario details

Liability Profile	50% Pensioner / 50% Deferred
Funding Basis (initial asset value)	Gilts +0.75%
Investment Strategy	B
Longevity Risk modelled	Yes
Initial Funding Level	100% | 100% + **24% buffer**

Long term asset projection



Probability of meeting benefits (POMB)



Commentary

The asset projection chart (top right) shows how the assets develop under our simulations.

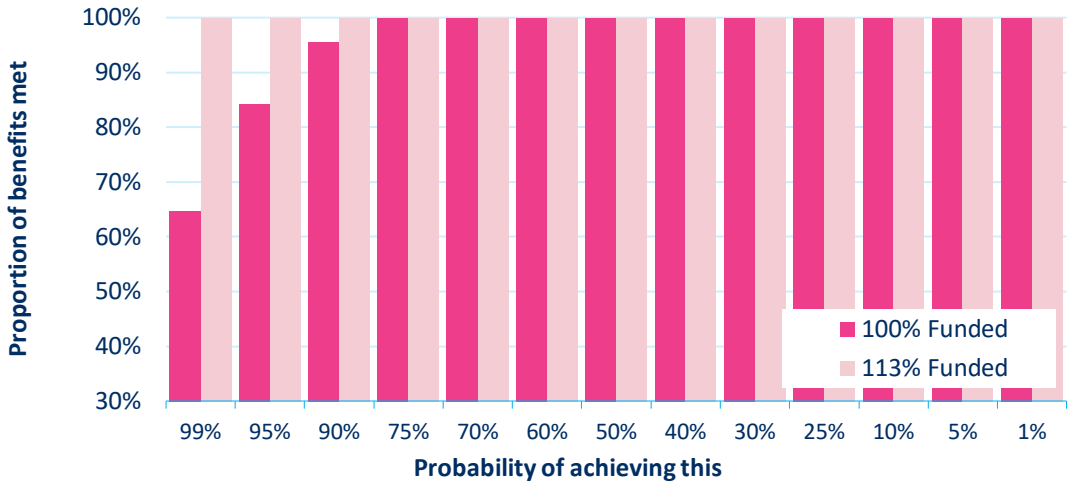
The chart on the bottom left shows the probability of having assets remaining at each time point. The blue line ultimately reaches, at year 80, a POMB of 84.0% for a scenario where the scheme is initially 100% funded. The light blue line reaches, at year 80, a POMB of 99.0% for a scenario where the scheme is initially 100% funded with a 24% buffer.

POMB Analysis – Strategy C - Gilts+0.75%

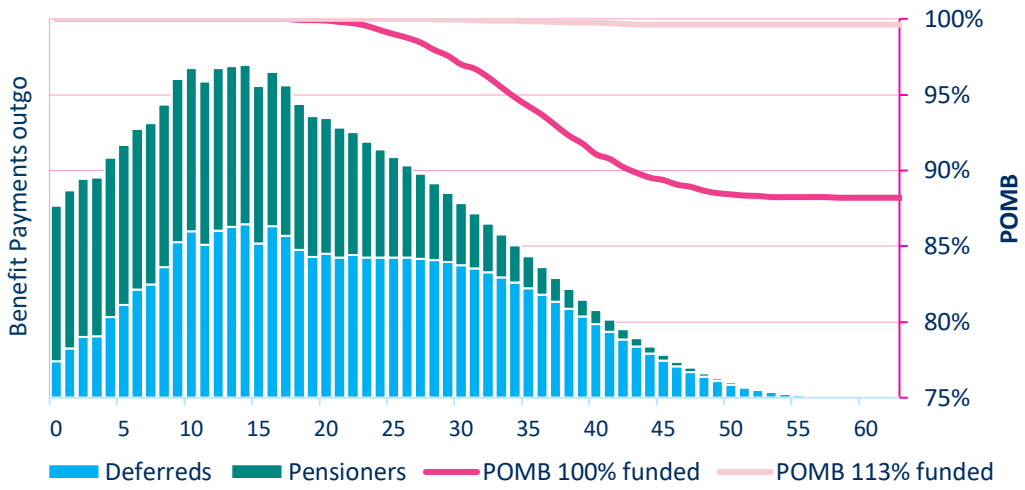
Scenario details

Liability Profile	50% Pensioner / 50% Deferred
Funding Basis (initial asset value)	Gilts +0.75%
Investment Strategy	C
Longevity Risk modelled	Yes
Initial Funding Level	100% | 100% + **13% buffer**

Long term asset projection



Probability of meeting benefits (POMB)



Commentary

The asset projection chart (top right) shows how the assets develop under our simulations.

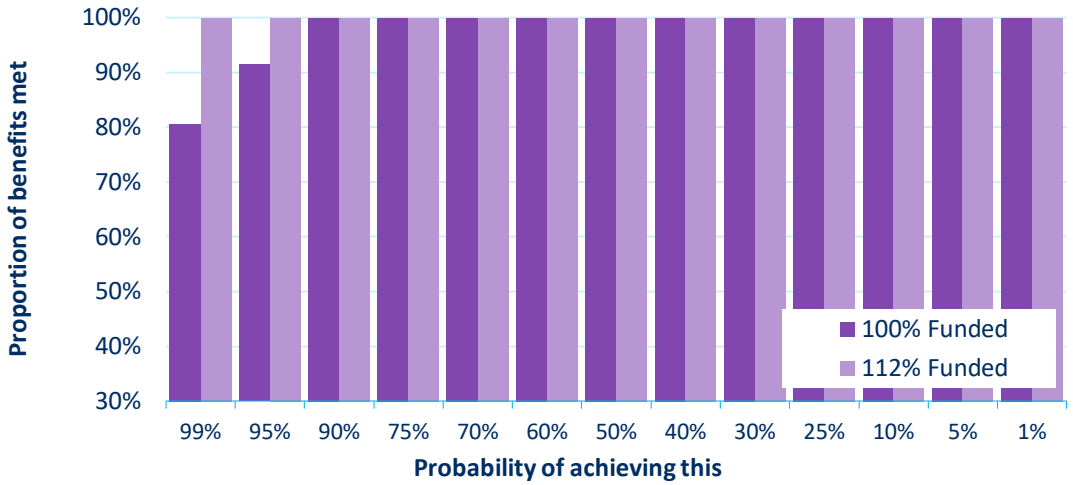
The chart on the bottom left shows the probability of having assets remaining at each time point. The pink line ultimately reaches, at year 80, a POMB of 88.2% for a scenario where the scheme is initially 100% funded. The light pink line reaches, at year 80, a POMB of 99.6% for a scenario where the scheme is initially 100% funded with a 13% buffer.

POMB Analysis – Strategy E - Gilts+0.75%

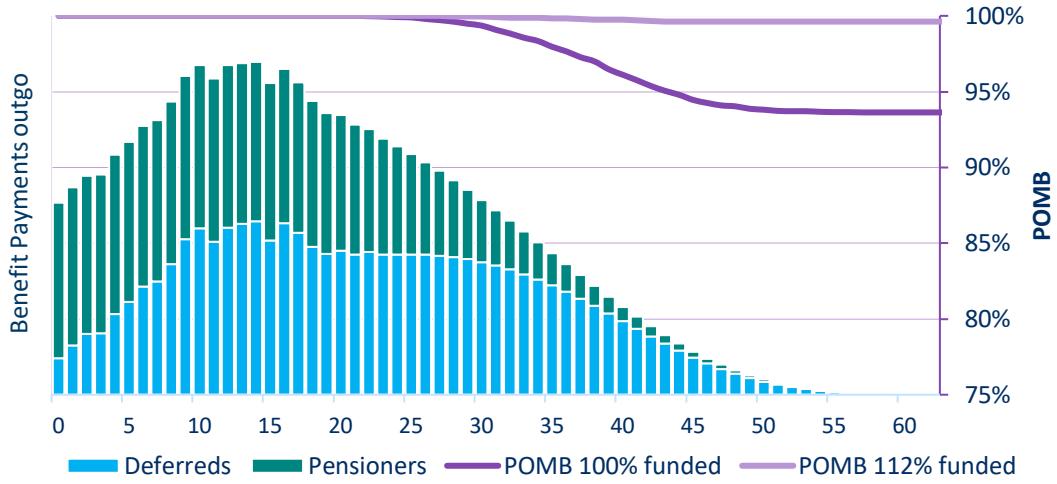
Scenario details

Liability Profile	50% Pensioner / 50% Deferred
Funding Basis (initial asset value)	Gilts +0.75%
Investment Strategy	E
Longevity Risk modelled	Yes
Initial Funding Level	100% | 100% **+ 12% buffer**

Long term asset projection



Probability of meeting benefits (POMB)



Commentary

The asset projection chart (top right) shows how the assets develop under our simulations.

The chart on the bottom left shows the probability of having assets remaining at each time point. The purple line ultimately reaches, at year 80, a POMB of 93.6% for a scenario where the scheme is initially 100% funded. The light purple line reaches, at year 80, a POMB of 99.8% for a scenario where the scheme is initially 100% funded with a 12% buffer.

Summary

- The following table summarises the results from the previous slides as well as comparing them to our previous analysis as at 31/09/2019.

Without Buffer (Assets equal to Liability)	Gilts + 0.5% Basis		Gilts + 0.75% Basis
Investment Strategy	**POMB (31/09/2019)**	**POMB (31/12/2022)**	**POMB (31/12/2022)**
Strategy A *Gilts + 1.4% / Gilts + 1.4%**	86.6%	87.9%	81.2%
Strategy B *Gilts + 1.8% / Gilts + 2.0%**	86.1%	87.8%	84.0%
Strategy C *Gilts + 1.5% / Gilts + 1.5% **	92.8%	93.6%	88.2%
Strategy E *- / Gilts + 1.7% **	-	97.2%	93.6%

With Buffer	Gilts + 0.5% Basis		Gilts + 0.75% Basis
Investment Strategy	**POMB (31/09/2019)**	**POMB (31/12/2022)**	**POMB (31/12/2022)**
Strategy A *Gilts + 1.4% / Gilts + 1.4%**	99.0%	99.2%	98.8%
Strategy B *Gilts + 1.8% / Gilts + 2.0%**	99.1%	99.3%	99.0%
Strategy C *Gilts + 1.5% / Gilts + 1.5% **	99.5%	99.8%	99.6%
Strategy E *- / Gilts + 1.7% **	-	99.9%	99.8%

* Expected Returns based on the 31/09/2019 and 31/12/2022 analyses, respectively.

- The probability of depletion, without any buffers, for all four strategies is summarised in the table above (left), while the results with the recommended buffers are displayed in the table above (right).
- Comparing to the 2019 results, on a Gilts + 0.5% basis without buffers, the general trend has been an increase in the POMB for all three strategies A, B and C by about 1%. Whilst the 2022 buffers are 1-3% lower on a gilts + 0.5% basis, the POMB increases by 0.2-0.3%.
- Conversely, if the Gilts + 0.75% basis is used to determine buffers, the POMB is similar or slightly lower than those in 2019. In all cases the risk of failure with buffer is very low, under a very long term projection (80 years).

Conclusions

4

Key Conclusions

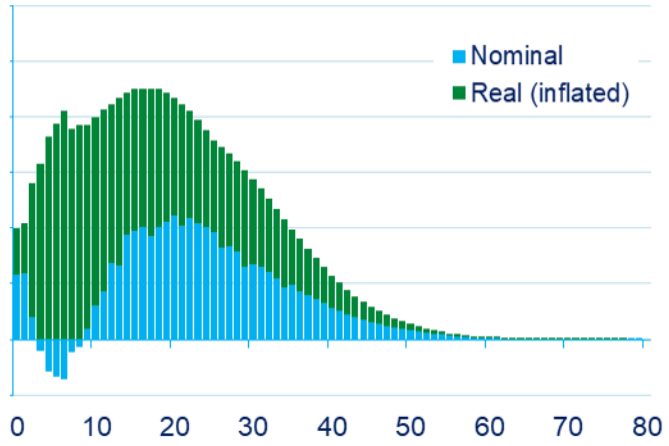
Discount rate as at 31 December 2022	The analysis as at 31 December 2022 is supportive of allowing the discount rate to be increased from Gilts + 0.5% to Gilts + 0.75%. This reflects that buffers set at a level sufficient to meet the Year 5 test under the interim regime achieve very low probabilities of long-term failure and in general the probability of long-term failure is below 1%. Investment strategy A had higher likelihoods of long-term failure, which appears to reflect its lower level of expected return. We expect if it was rescaled to target a higher excess return this characteristic would reduce.
Periodic review of discount rate	If a higher discount rate was to be adopted, a process for periodic review should be considered. The key difference between 31 December 2022 and 30 September 2019 market conditions (the latter being used as a reference point for the published interim regime methodology) is the higher levels of excess expected returns over risk-free rates, and higher levels of asset volatility. As these factors vary, a lower or higher discount rate may be appropriate to maintain a similar balance between long-term failure risk and the buffer required to satisfy the Year 5 test under the interim regime.
Capital buffers	Minimum capital buffers have reduced for all strategies A, B and C compared to the 2019 analysis. The changes are largely driven by higher spreads and as a result, greater expected excess returns relative to gilts, although the impact of this has been offset slightly by higher asset volatility. Overall, the higher level of expected return has had a stronger effect than the higher level of volatility on minimum buffer levels.
POMB analysis	Comparing to the 2019 results, on a Gilts + 0.5% basis without buffers, the general trend has been an increase in the POMB for all three strategies A, B and C. Conversely, if the Gilts + 0.75% basis is used to determine buffers, the POMB is similar or slightly lower than those in 2019. In all cases the risk of failure with buffer is very low, under a very long term projection.

Appendix 1: Assumptions

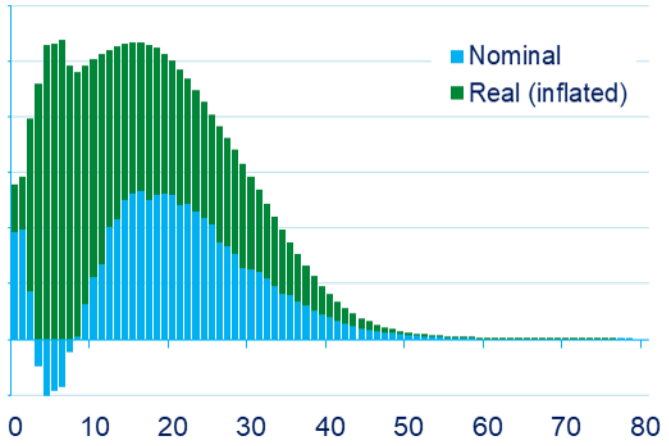
Cashflow Profiles – 31 December 2022

- The charts below illustrate the proposed cashflow profile used within the asset-liability modelling analysis, split by nominal and real cashflows. The pensioner proportions under the profiles are 50%, 80% and 20% (from left to right).
- The demographic assumptions underlying these profiles are set out in the table below.

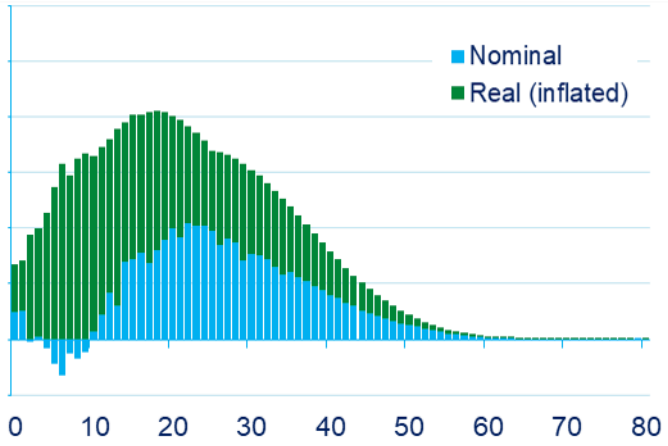
CASHFLOW PROFILE 1
50% PENSIONERS - 50% DEFERREDS



CASHFLOW PROFILE 2
80% PENSIONERS - 20% DEFERREDS



CASHFLOW PROFILE 3
20% PENSIONERS - 80% DEFERREDS



Assumptions	
Commutation	We have assumed that 20% of the total value being a lump sum is equivalent to c. 25% of a member's pension being commuted (spouse's pension isn't commutable and this is estimated to be c. 20% of total value).
Proportion married	85%
Spouse's fraction	50%
Expenses	We have assumed an allowance for expenses is capitalized into the liability value and expenses are proportional to benefit cashflow.

Assumptions underlying liability cashflow profiles

- The table below shows the main assumptions that were used to construct the liability cashflow profiles.

Assumption	
Pre and post retirement discount rate	Gilts + 0.5% p.a.
Pension increases	Assumptions derived in line with best-estimate assumptions
Mortality	• Pensioners: 100% of S2PA, CMI2018 Core parameters, LTR 1.75% • Deferreds: 100% of S2PA, CMI2018 Core parameters, LTR 1.75%
RPI – CPI wedge	• None • CPI linked cashflows modelled as RPI cashflows
Mortality risk	• Not modelled
Mortality age rating	• 0 years
Mortality weighting	• 100% for males and females
Guarantee	• 5 years
RPI	• Assumption derived in line with best-estimate, with no IRP
Spouse's age	• Females are assumed to be 3 years younger than males
Membership profile gender	• 60% of liabilities are associated with males and 40% with females

Liability durations – 31 December 2022

Cashflow Profile	Duration (years, G+0.5% basis)	Inflation Proportion
80% Pensioners 20% Deferreds	13.2	61.8%
50% Pensioners 50% Deferreds	14.6	62.3%
20% Pensioners 80% Deferreds	16.5	61.3%

Capital market assumptions as at 31 December 2022

- Our asset/liability and capital market modelling is driven by economic simulations generated on the basis of the following assumptions. These assumptions represent our best view based on historical and forward looking analysis and are combined with market conditions to calibrate our models.
- The 31 December 2022 assumption set has been used. The risk-return characteristics are summarised in the table below. The annualized returns are over a 10-year horizon and expressed relative to cash. Volatility is over a 1-year horizon and expressed in absolute terms.

Assumption	Standard deviation (p.a.)	Mean excess return (p.a.)	Median excess return (p.a.)
Fixed interest gilts	11.7%	0.1%	-0.2%
Index-linked gilts	9.9%	-0.4%	-0.9%
Sterling non-gilts	8.1%	1.3%	1.1%
Developed Global Equity (Hedged)	17.6%	4.6%	3.5%
Emerging Market Equity	25.1%	6.5%	4.3%
Conventional Property	15.0%	3.1%	2.2%
High Lease Value Property	8.9%	1.8%	1.5%
Hedge Funds (Standard)	7.3%	2.2%	2.1%
High Yield Debt (Hedged)	13.0%	2.6%	2.3%
Emerging Market Debt (LC)	15.8%	3.2%	2.2%
Emerging Market Debt (HC)	10.9%	2.7%	2.4%
Infrastructure Unlisted Equity	17.1%	4.3%	3.3%
Junior Private Debt	16.0%	4.7%	4.0%
Senior Private Debt	12.3%	3.4%	3.0%
Private Equity	27.1%	6.8%	4.0%
Multi Asset Credit	10.9%	3.9%	3.7%
Absolute Return Fixed Income	3.2%	1.5%	1.4%
Investment-grade Credit	5.8%	1.2%	1.3%
Investment-grade ABS	4.8%	1.2%	1.3%

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