Merseyside Pension Fund

Investment Strategy Review

Asset liability modelling results

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23 October 2013

Agenda

- Introduction to setting an investment strategy
- What we've modelled
  - Current
  - Extremes
  - Diversification
  - Focus on liability management
- Introduction to flight planning

Aims, purpose and objective of the Fund

Aims

- Keep contribution rate constant, reasonable and affordable
- Meet all liabilities as they fall due
- Maximise returns within reasonable risk parameters

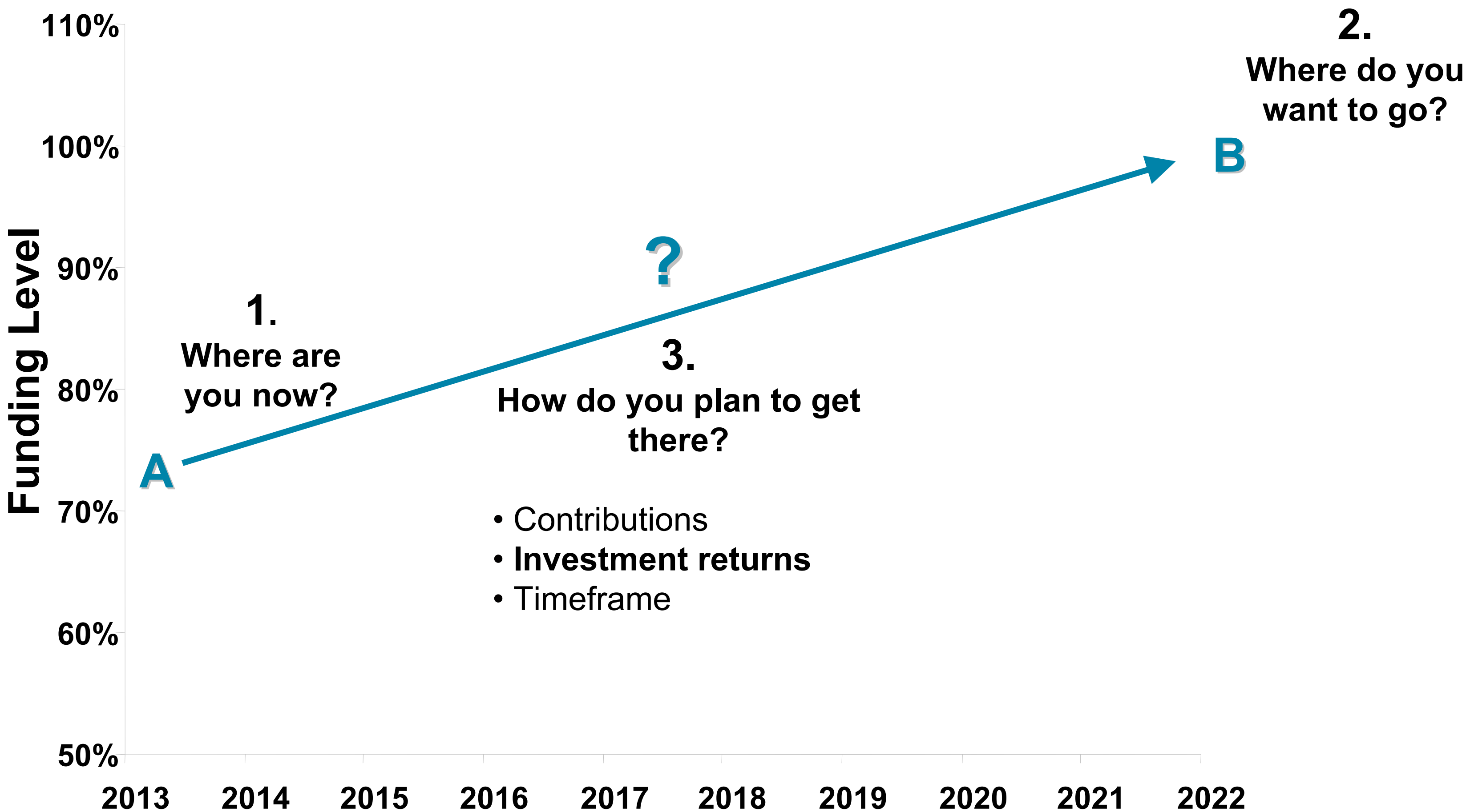
Purpose

- Pay out monies in respect of Fund benefits (etc)

Objective

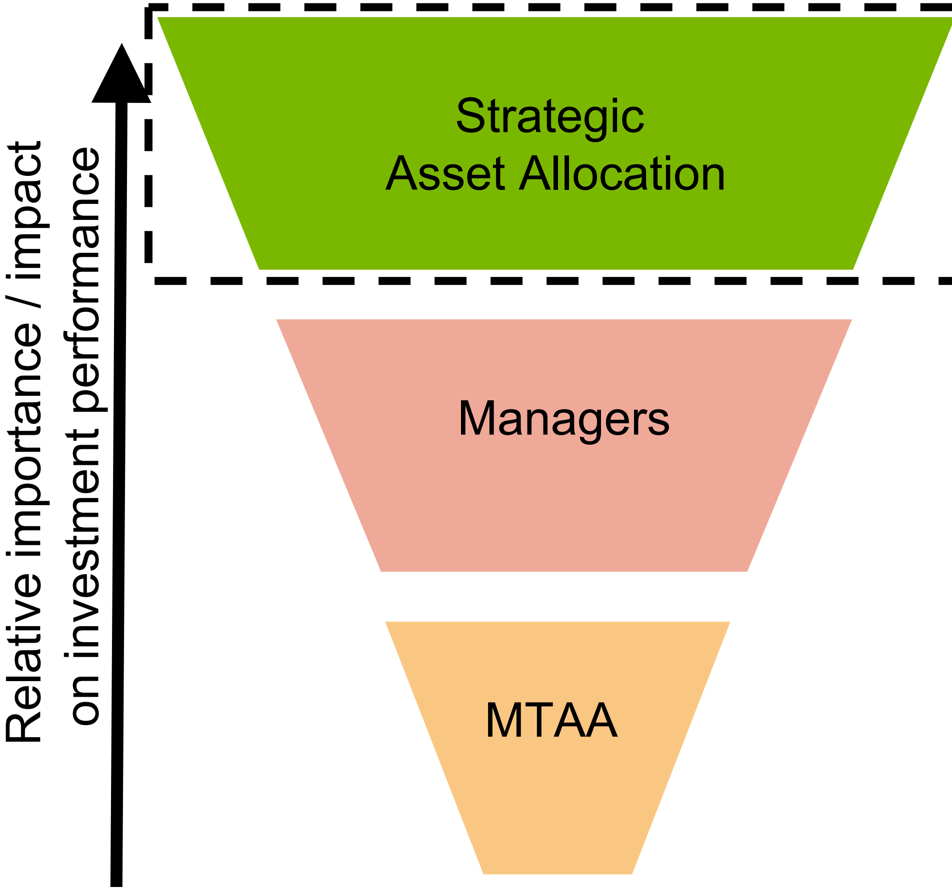
- To achieve and then maintain sufficient assets to cover 100% of accrued liabilities (the "funding target") assessed on an ongoing basis

What is an investment strategy?



The current focus is on recovering the deficit long term (without making it considerably worse short term)

Strategic asset allocation is key



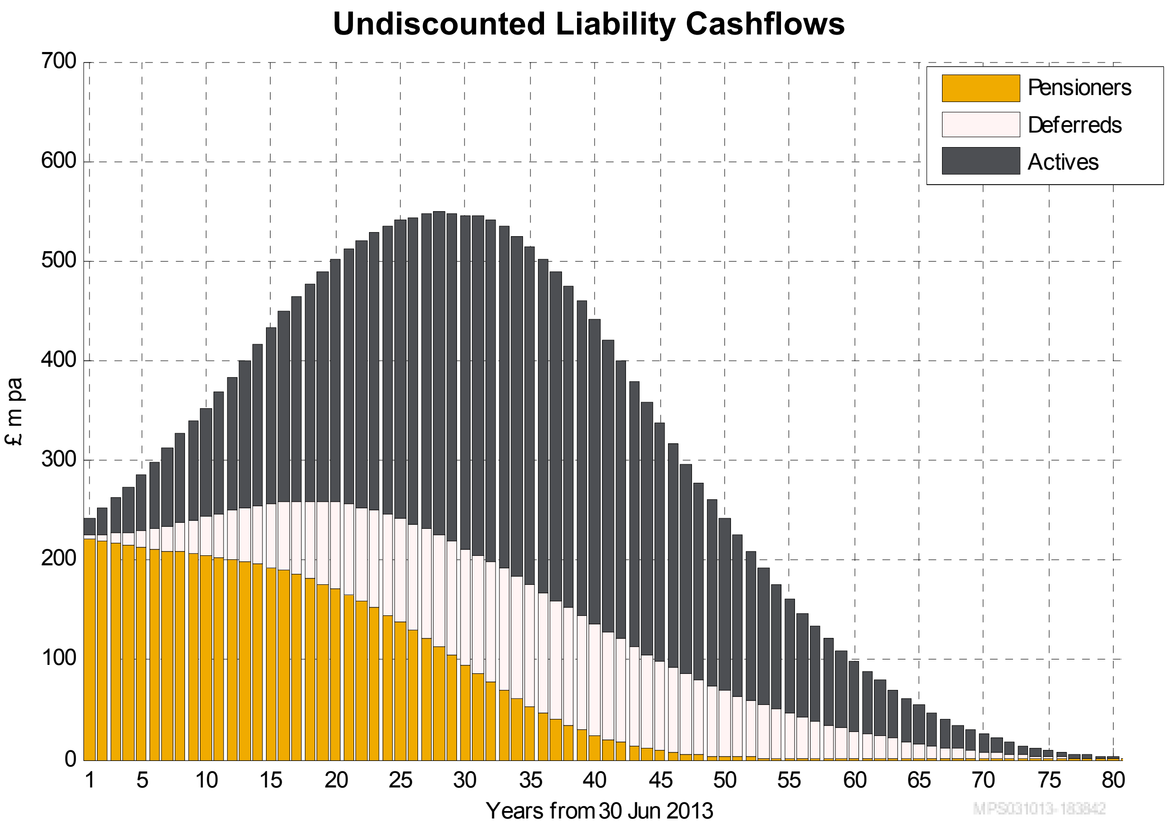
Strategic Asset Allocation
Set a long term strategic asset allocation based on the deficit recovery plan and investment objectives identified

Manager Structure
Aim to add value through active management. Time typically spent on manager selection and monitoring manager performance.

Medium Term Asset Allocation
Aim to add value by exploiting market pricing inefficiencies.
Asset classes rarely fairly valued.

Understanding your liabilities

- Present value of liabilities measured on initial proposed valuation basis at 31 March 2013: **£7,950m**



- Gilt yields fall = liabilities rise
- Inflation rises = liabilities rise

Note: data uses an approximation of the Merseyside Pension Fund and Aon Hewitt's assumptions.

Our capital market assumptions (30 June 2013)

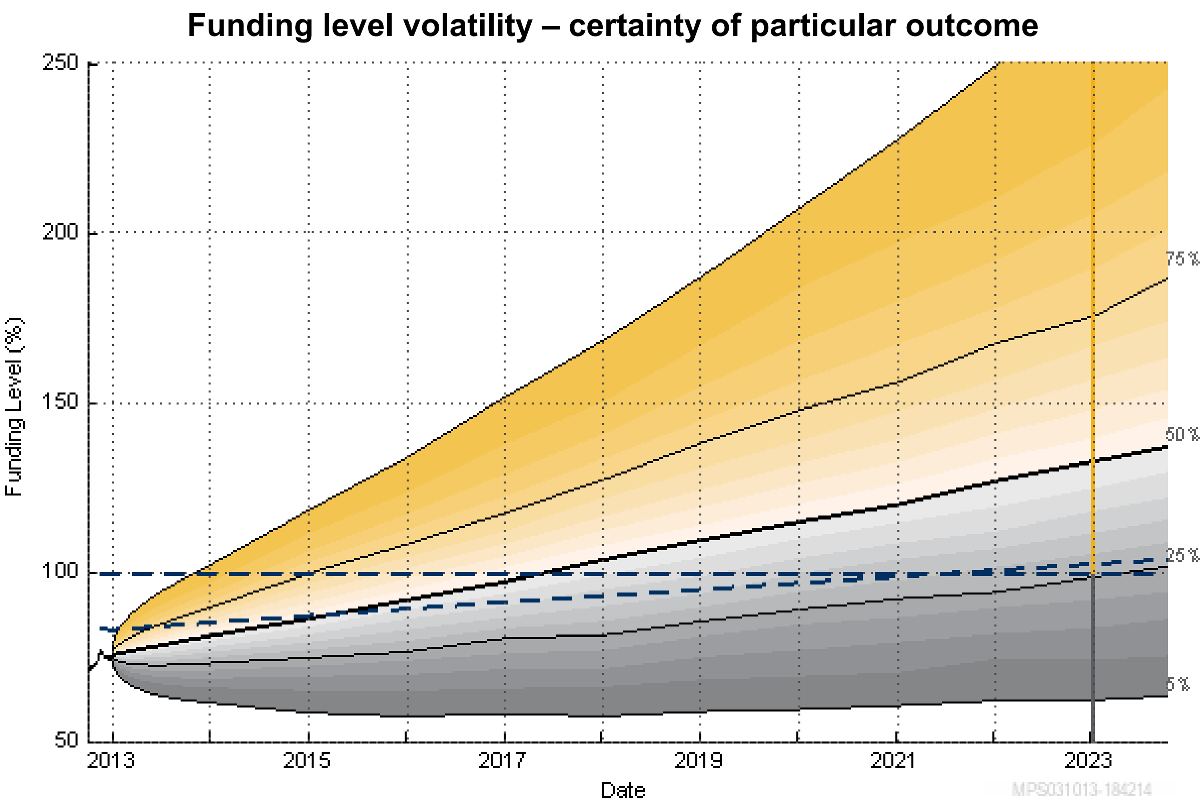
	Return	Volatility
15 yr Inflation Linked Bonds	2.40%	9.00%
15 yr Fixed Income Bonds	3.00%	11.00%
10 yr Investment Grade Corporate Bonds	4.10%	9.00%
Real Estate/Property	7.40%	14.50%
US High Yield	5.00%	14.00%
Emerging Market Debt	5.40%	12.00%
UK Equities	8.00%	20.00%
US Equities	7.40%	19.00%
Europe ex UK Equities	7.70%	20.00%
Japan Equities	6.60%	20.00%
Canada Equities	8.00%	20.00%
Switzerland Equities	7.30%	20.00%
Emerging Market Equities	9.30%	28.50%
Global Private Equity	9.60%	26.00%
Global Fund or Hedge Fund	5.40%	8.00%

Key	
IL	Domestic 15yr Inflation-Linked Government Bonds
FI	Domestic 15yr Fixed Income Government Bonds
CB	Domestic 10yr Investment Grade Corporate Bonds
RE	Domestic Real Estate/Property
UK Eq	UK Equities
US Eq	US Equities
Eur Eq	Europe ex UK Equities
Jap Eq	Japan Equities
Can Eq	Canada Equities
CHF Eq	Switzerland Equities
EM Eq	Emerging Markets Equities
Gbl PE	Global Private Equity
Gbl FoHF	Global Fund of Hedge Funds

Representative Correlations

	IL	FI	CB	RE	UK Eq	US Eq	Eur Eq	Jap Eq	Can Eq	CHF Eq	EM Eq	Gbl PE	Gbl FoHF
IL	1	0.5	0.4	0.1	-0.1	-0.1	-0.1	0	-0.1	-0.1	0	0	0
FI		1	0.8	0.1	-0.2	-0.2	-0.2	-0.1	-0.2	-0.2	-0.1	0	0
CB			1	0.1	0.1	0.1	0.1	0	0.1	0.1	0	0.1	0
RE				1	0.4	0.4	0.4	0.3	0.4	0.4	0.3	0.3	0.3
UK Eq					1	0.85	0.85	0.7	0.85	0.85	0.8	0.6	0.6
US Eq						1	0.85	0.7	0.85	0.85	0.8	0.7	0.6
Eur Eq							1	0.7	0.85	0.85	0.8	0.6	0.6
Jap Eq								1	0.7	0.7	0.6	0.4	0.5
Can Eq									1	0.8	0.8	0.6	0.6
CHF Eq										1	0.8	0.6	0.6
EM Eq											1	0.6	0.5
Gbl PE												1	0.4
Gbl FoHF													1

Risk and Return



Return

- Investment strategy needs to provide return to support discount rate and recovery plan.
- To what extent will you rely on additional investment returns to reduce deficit?
- Striving for more return means bearing more risk .

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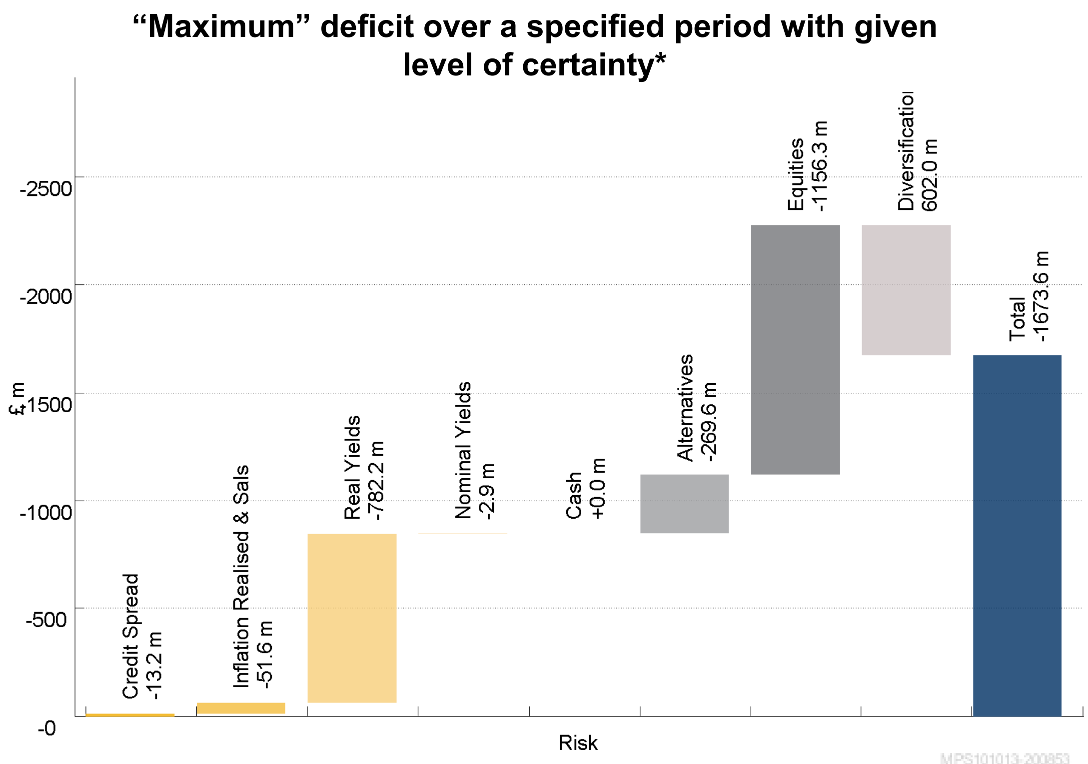
Risk and Return



* One year Value at Risk at 5% level

Risk

- Focus on risks relative to liabilities.
- What risks are you most concerned about?
- What is an unacceptable level of risk?
- Where is it most efficient to "spend" your risk?
- Unrewarded versus rewarded risk.

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What we modelled – Liability information

- **Funding position**
- At 31 March 2013, using the preliminary valuation, the Scheme had a deficit of £2,131m and was 73% funded (discount rate below)
- We have approximately rolled forward the data used in the 2011 ISR and recalibrated the model to the above liability valuations and discount rate. The model then projects forward from this point
- At 30 June 2013 assumed funding level was 76% with deficit of £1,777m

- **Actuarial assumptions**
- Consistent with initial proposed basis for 31 March 2013 valuation
- Discount rate of long dated gilt yield +1.4% (pre & post) for past service
- Discount rate of CPI+3.0% (pre & post) for future service
- Payroll as in valuation report

- **Assumed contributions**
- Regular employer contributions of 13.90% p.a. (i.e. c. £116m p.a. increasing in line with salary)
- Plus deficit contributions of £107m p.a. increasing at RPI + 0.5% for 22 years

What we modelled

- Current position
- Impact of changing investment strategy, including
  - Extreme allocations
  - Increasing alternatives while decreasing different asset classes to do so
  - Focus on liability management

Key measures:

- Ongoing funding level and/or deficit volatility at key dates:
  - 1 year
  - 3 years
  - 10 years
  - 22 years
- Value at Risk
- Possible impact on deficit contributions

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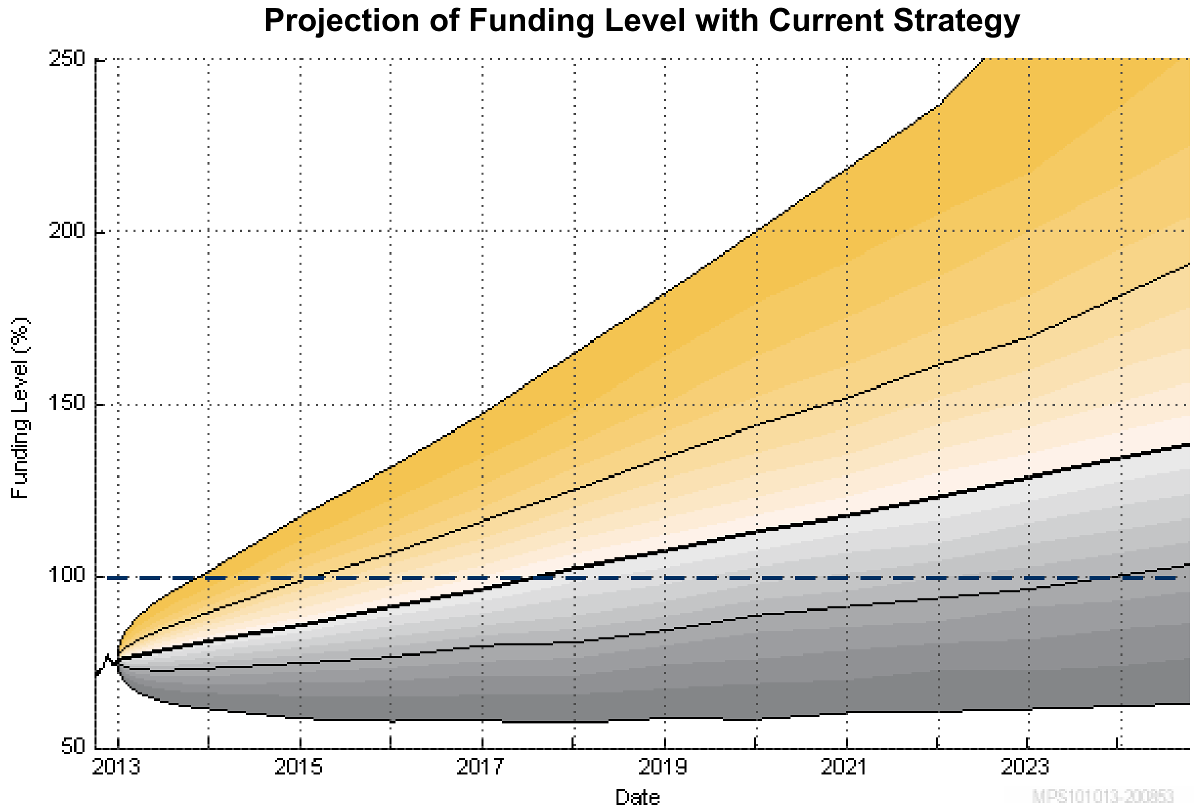
What we modelled - Current investment strategy

	Current portfolio
10 year expected absolute return (median)	8.5%
10 year expected absolute standard deviation	13.5%
10 year expected return above ongoing liabilities (median)	4.0%
10 year expected relative standard deviation	14.1%
1 year 95% Value at risk (VaR)	£1,674m
Probability fully funded by 30/06/2016	36%
Worst case (95th percentile) deficit contribution rate at 30/06/2016	£274m
Probability fully funded by 30/06/2023 (10 yrs)	72%
Worst case (95th percentile) deficit at 30/06/2023 (10 yrs)	£4,351m
Probability fully funded by 30/06/2035 (22 yrs)	90%
Worst case (95th percentile) deficit at 30/06/2035 (22 yrs)	£4,764m

Asset	Benchmark
UK Equities	**25**
Overseas Equities	**30**
US Equities	8
European Equities	8
Japan	4
Pacific	4
Emerging Markets	6
Fixed Interest	**20**
UK Gilits	0
Overseas Gilits	0
UK Index Linked	12
Unconstrained Bonds	8
Corporate Bonds	0
Property	**10**
Alternatives	**14**
Private Equity	4
Hedge Funds	5
Thematics Fund of Funds	3
Infrastructure	2
Cash	**1**
TOTAL	**100**

Source: Merseyside Pension Fund SIP 2010

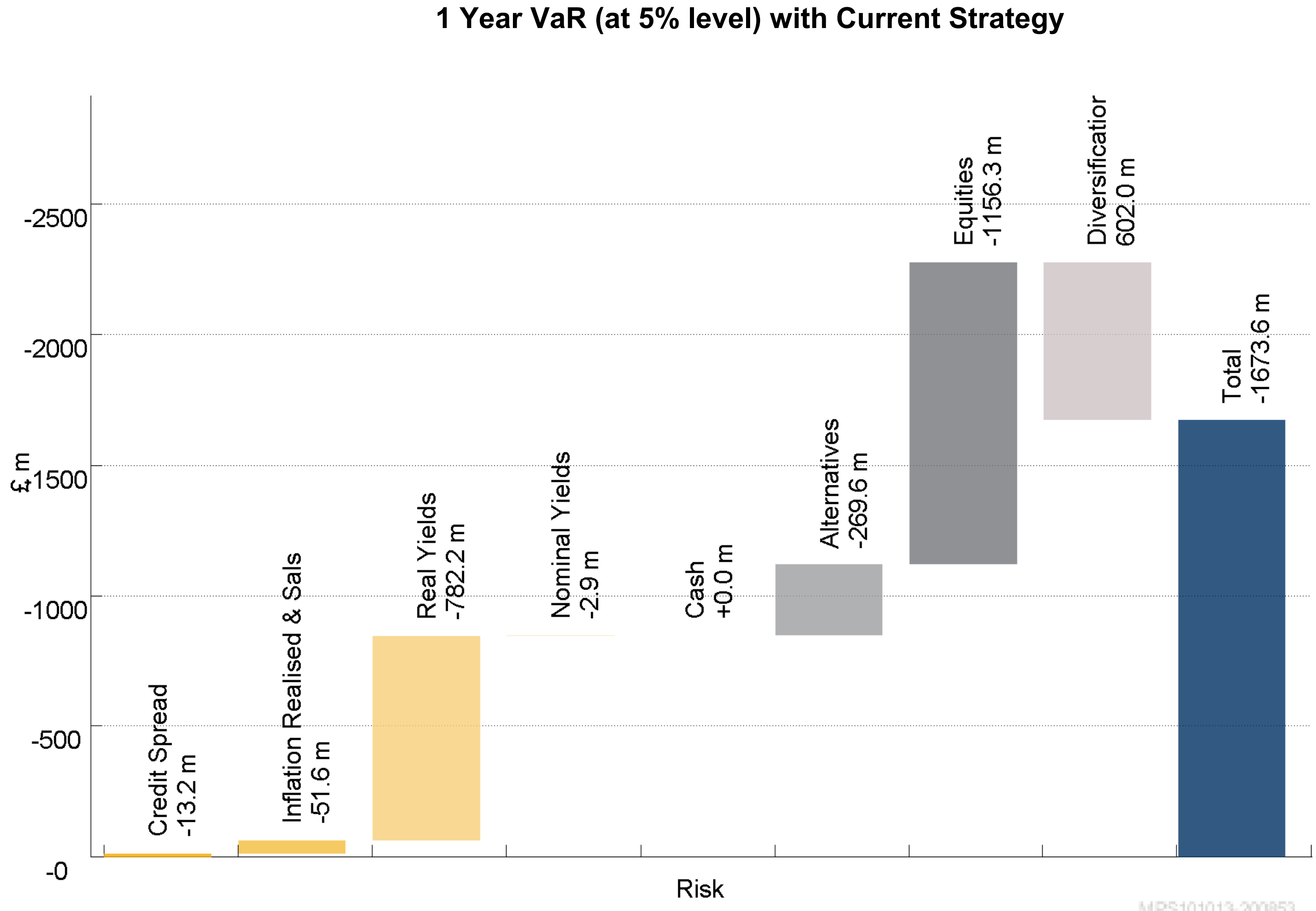
Risk analysis – Current Investment Strategy



Asset	Benchmark
Equities	55
Fixed Interest	20
Property	10
Alternatives	14
Cash	1
TOTAL	100

10yr expected relative return	4.0%
10yr expected standard deviation of relative return	14.1%

Risk analysis – Current Investment Strategy



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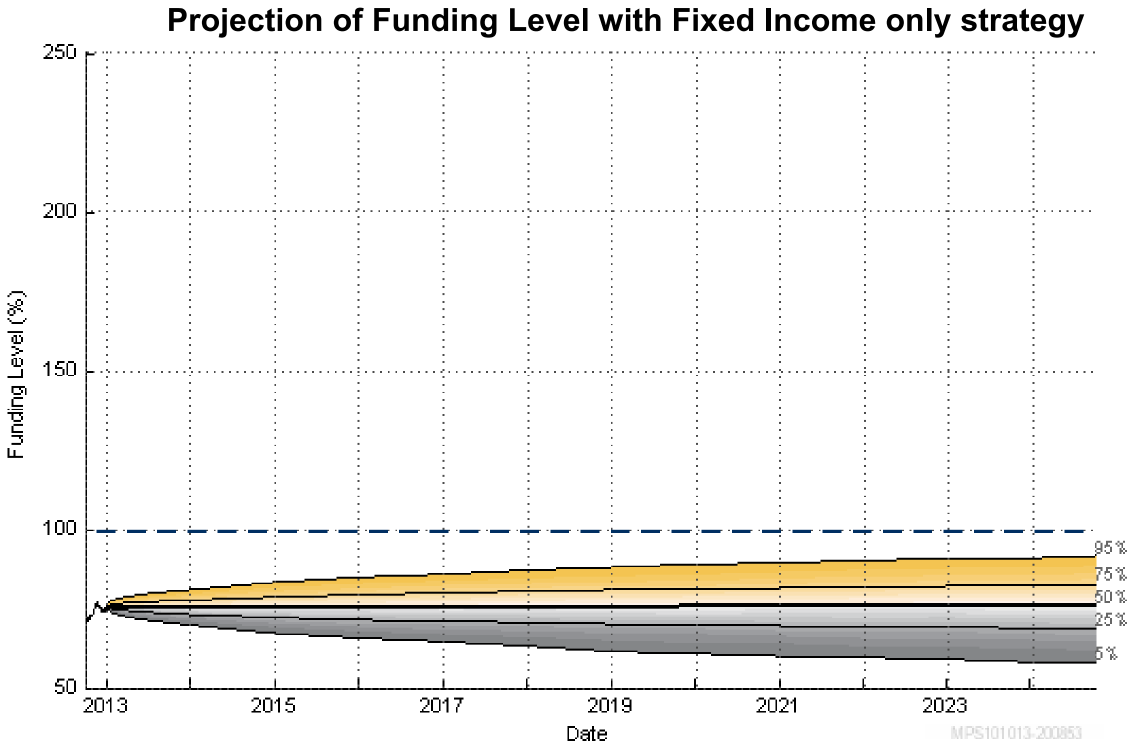
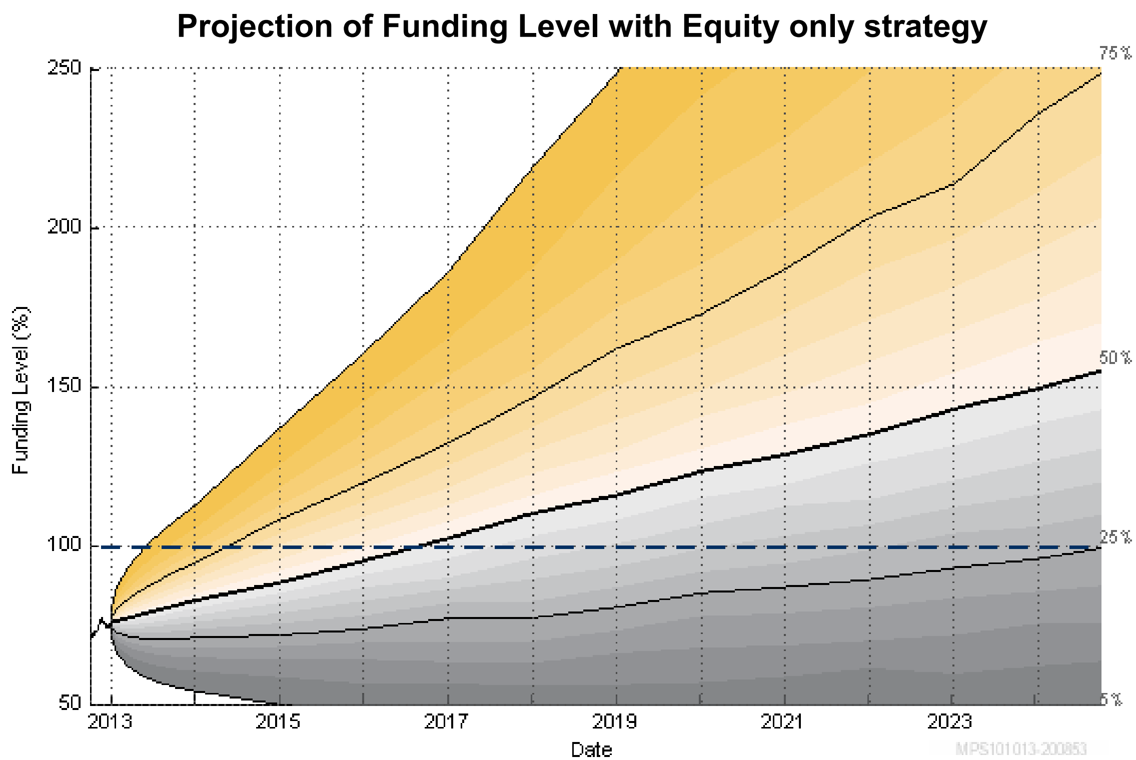
Extreme – 100% allocation to best matching gilt portfolio



Asset	Benchmark
Equities	0
Fixed Interest	100
Property	0
Alternatives	0
Cash	0
TOTAL	100

10yr expected relative return	-1.5%
10yr expected standard deviation of relative return	5.1%

Extreme – 100% allocation to equities



Asset	Benchmark
Equities	100
Fixed Interest	0
Property	0
Alternatives	0
Cash	0
TOTAL	100

10yr expected relative return	5.1%
10yr expected standard deviation of relative return	21.0%

Summary Metrics

	Current portfolio	100% matching	100% equity
10 year expected absolute return (median)	8.5%	2.7%	9.7%
10 year expected absolute standard deviation	13.5%	11.1%	20.5%
10 year expected return above ongoing liabilities (median)	4.0%	-1.5%	5.1%
10 year expected relative standard deviation	14.1%	5.1%	21.0%
1 year 95% Value at risk (VaR)	£1,674m	£201m	£2,325m
Probability fully funded by 30/06/2016	36%	0%	45%
Worst case (95th percentile) deficit contribution rate at 30/06/2016	£274m	£208m	£334m
Probability fully funded by 30/06/2023 (10 yrs)	72%	0%	72%
Worst case (95th percentile) deficit at 30/06/2023 (10 yrs)	£4,351m	£3,639m	£5,954m
Probability fully funded by 30/06/2035 (22 yrs)	90%	4%	85%
Worst case (95th percentile) deficit at 30/06/2023 (10 yrs)	£4,764m	NA	£8,813m

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  - **Diversification**
  - Focus on liability management
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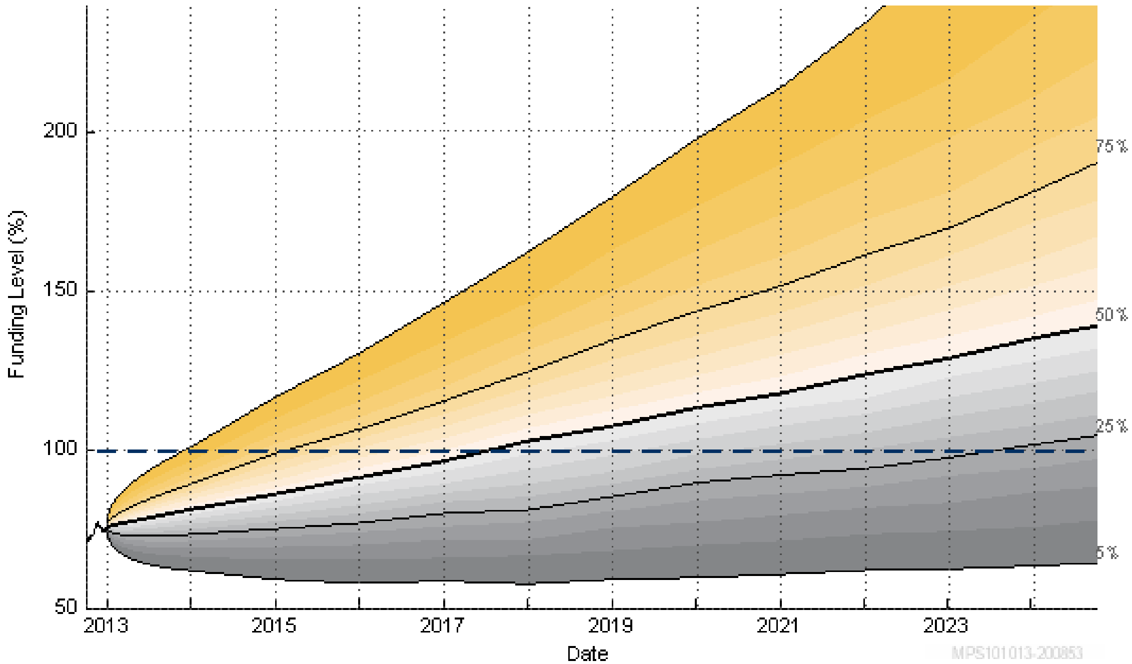
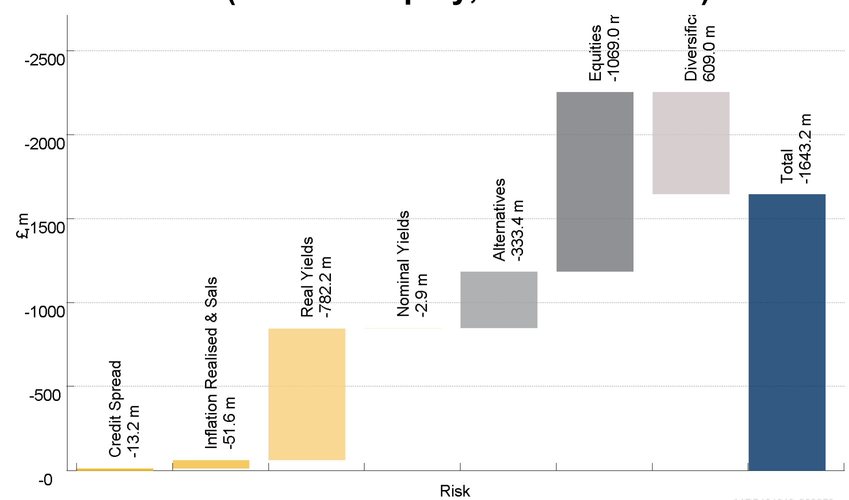
Increasing Alternatives – Allocation reduced from equities and cash

Projection of Funding Level with alternatives increased to 20% (5% from Equity, 1% from Cash)



Asset	Benchmark
Equities	50
Fixed Interest	20
Property	10
Alternatives	20
Private Equity	5
Hedge Funds	5
Thematics	5
Infrastructure	5
Cash	0
TOTAL	**100**

1 Year VaR (at 5% level) with alternatives increased to 20% (5% from Equity, 1% from Cash)



10yr expected relative return	3.9%
10yr expected standard deviation of relative return	13.9%

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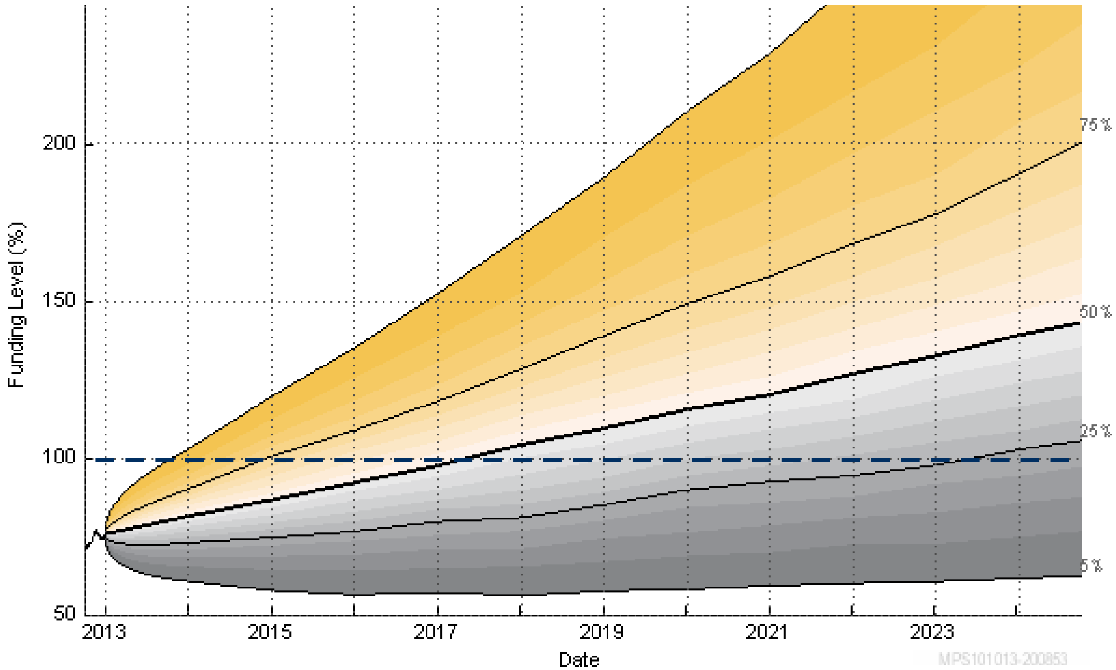
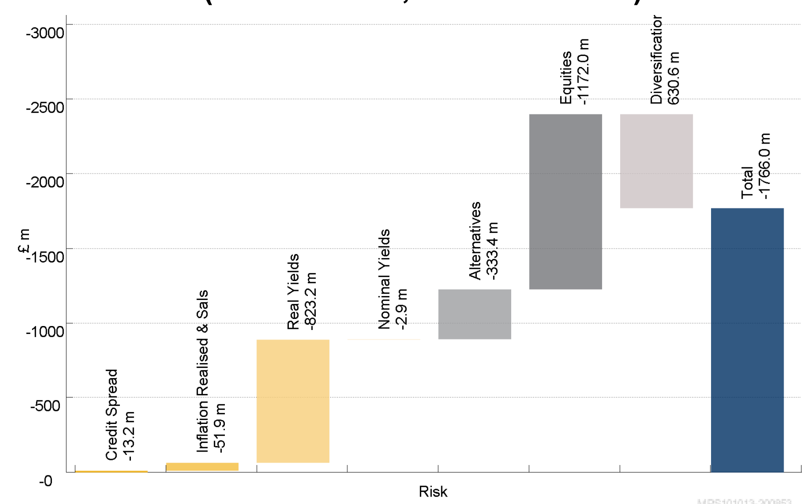
Increasing Alternatives – Allocation reduced from ILG and cash

Projection of Funding Level with alternatives increased to 20% (5% from ILG, 1% from Cash)



Asset	Benchmark
Equities	55
Fixed Interest	15
Property	10
Alternatives	20
Private Equity	5
Hedge Funds	5
Thematics	5
Infrastructure	5
Cash	0
TOTAL	**100**

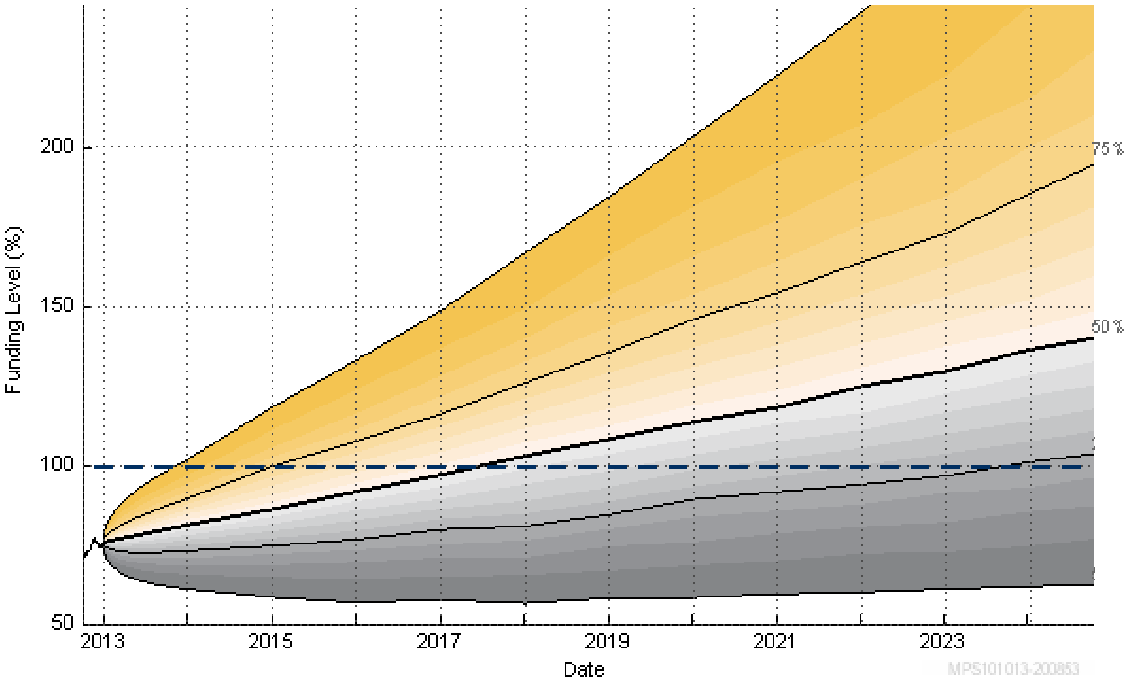
1 Year VaR (at 5% level) with alternatives increased to 20% (5% from ILG, 1% from Cash)



10yr expected relative return	4.3%
10yr expected standard deviation of relative return	15.0%

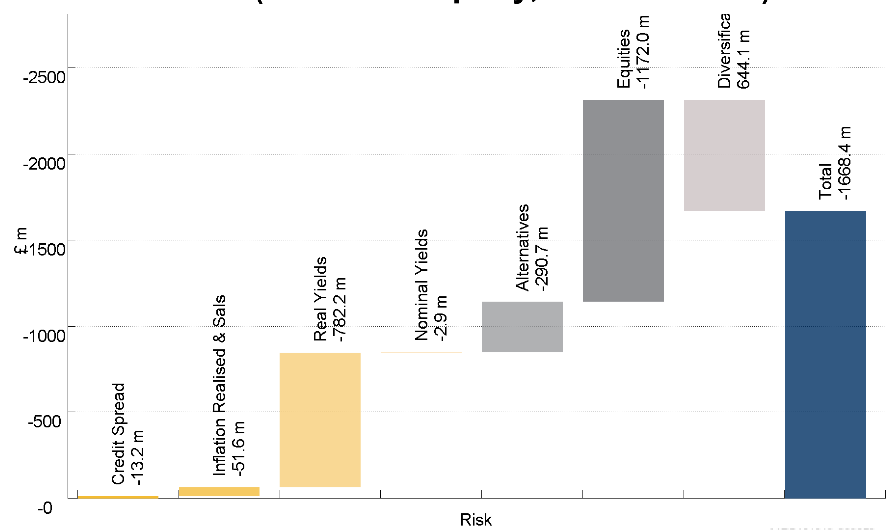
Increasing Alternatives – Allocation reduced from property and cash

Projection of Funding Level with alternatives increased to 20% (5% from Property, 1% from Cash)



Asset	Benchmark
Equities	55
Fixed Interest	20
Property	5
Alternatives	20
Private Equity	5
Hedge Funds	5
Thematics	5
Infrastructure	5
Cash	0
Total	100

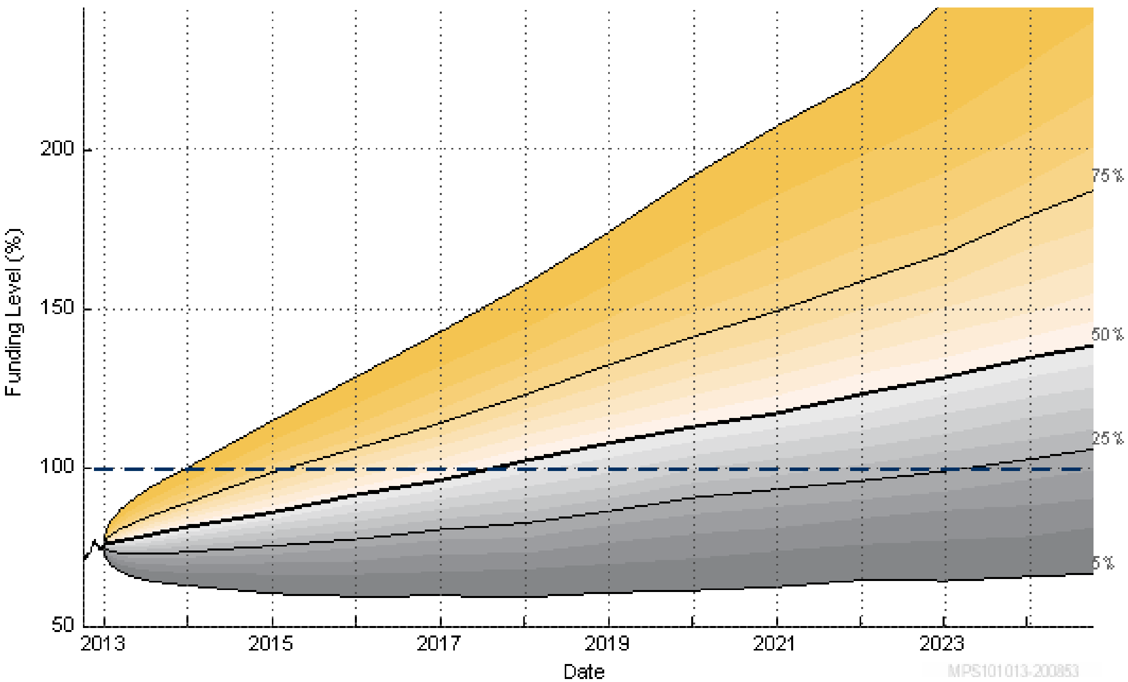
1 Year VaR (at 5% level) with alternatives increased to 20% (5% from Property, 1% from Cash)



10yr expected relative return	4.1%
10yr expected standard deviation of relative return	14.5%

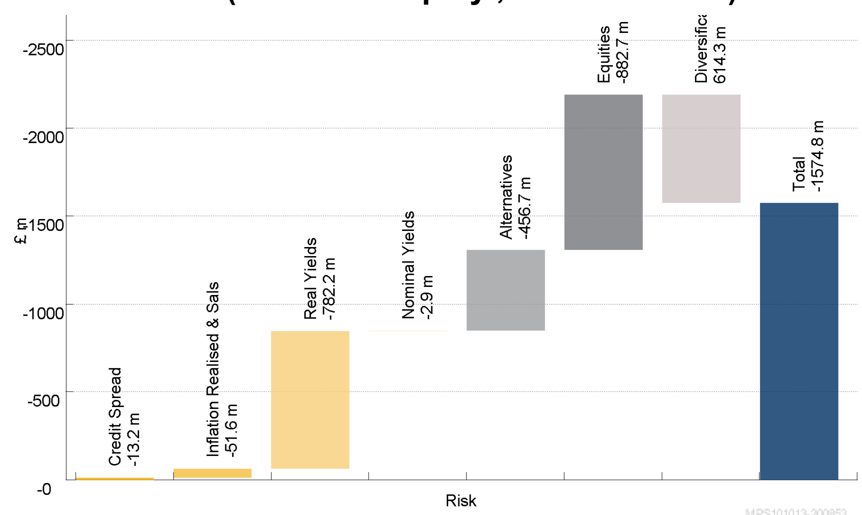
Increasing Alternatives – Alternatives increased to 30%, from equities and cash

Projection of Funding Level with alternatives increased to 30% (15% from Equity , 1% from Cash)



Asset	Benchmark
Equities	40
Fixed Interest	20
Property	10
Alternatives	30
Private Equity	*7.5*
Hedge Funds	*7.5*
Thematics	*7.5*
Infrastructure	*7.5*
Cash	0
TOTAL	**100**

1 Year VaR (at 5% level) with alternatives increased to 30% (15% from Equity , 1% from Cash)



10yr expected relative return 4.0%

10yr expected standard deviation of relative return 13.3%

Summary Metrics – increasing alternatives

	Current Portfolio	Cash and then Equities	Cash and then ILG	Cash and then Property	Alternatives 30%
10 year expected absolute return (median)	8.5%	8.6%	8.9%	8.7%	8.6%
10 year expected absolute standard deviation	13.5%	13.2%	14.2%	13.9%	12.5%
10 year expected return above ongoing liabilities (med)	4.0%	3.9%	4.3%	4.1%	4.0%
10 year expected relative standard deviation	14.1%	13.9%	15.0%	14.5%	13.3%
1 year 95% Value at risk (VaR)	£1,674m	£1,643m	£1,766m	£1,668m	£1570m
Prob. fully funded 30/06/2016	36%	36%	38%	37%	36%
Worst case (95th percentile) deficit contribution rate at 30/06/2016	£274m	£270m	£279m	£277m	£260m
Prob fully funded 30/06/2023 (10 yrs)	72%	73%	73%	73%	74%
Worst case (95th percentile) deficit at 30/06/2023	£4,351m	£4,184m	£4,374m	£4,364m	£3,930m
Prob fully funded 30/06/2035 (22 yrs)	90%	90%	90%	90%	92%
Worst case (95th percentile) deficit at 30/06/2035	£4,764m	£3,913m	£4,307m	£4,590m	£2,873m

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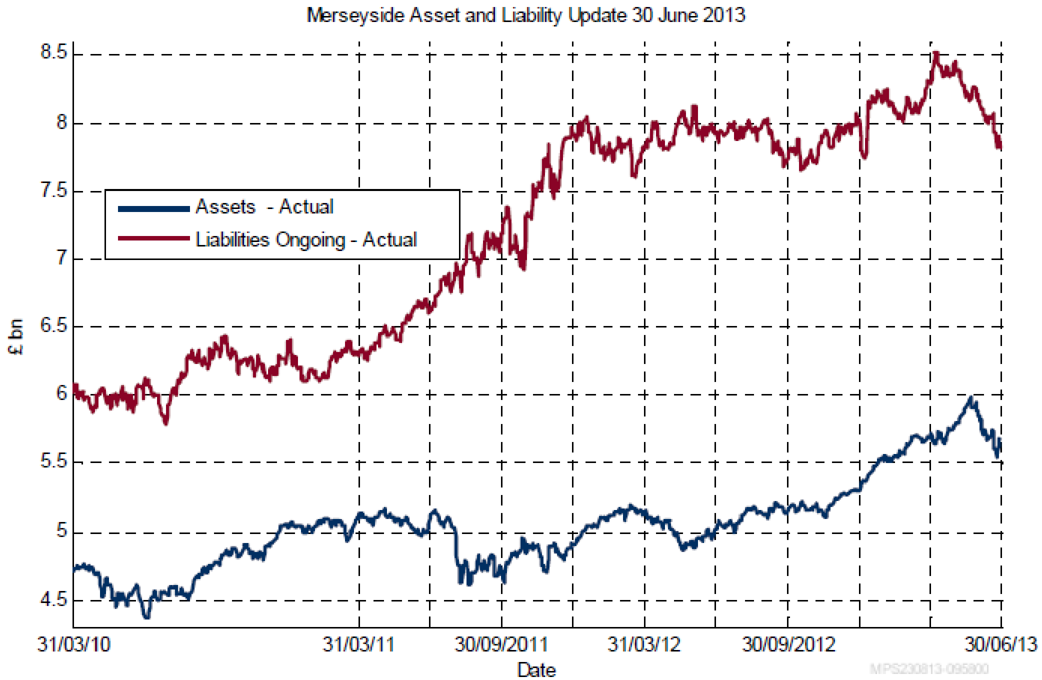
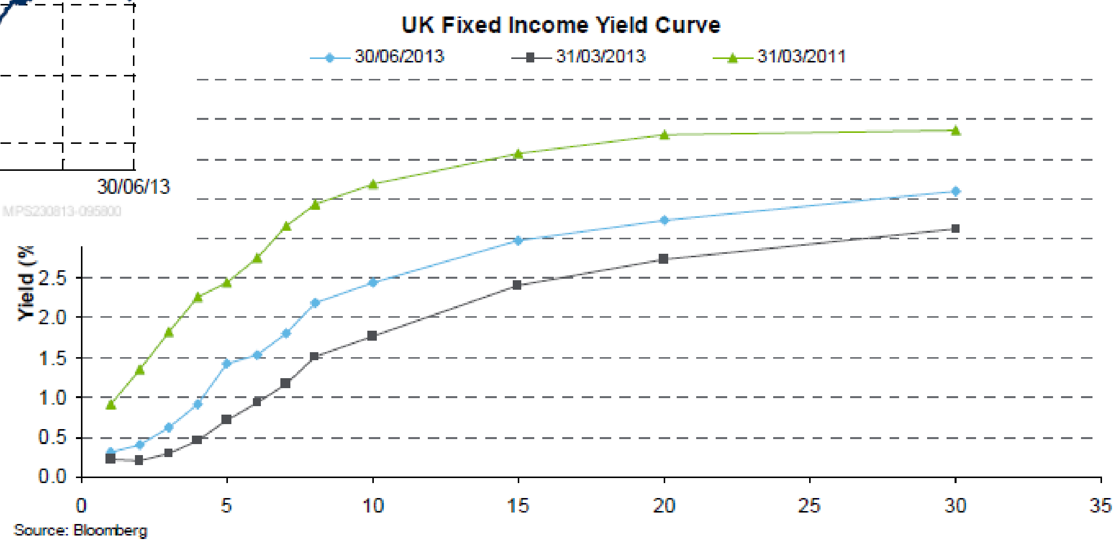
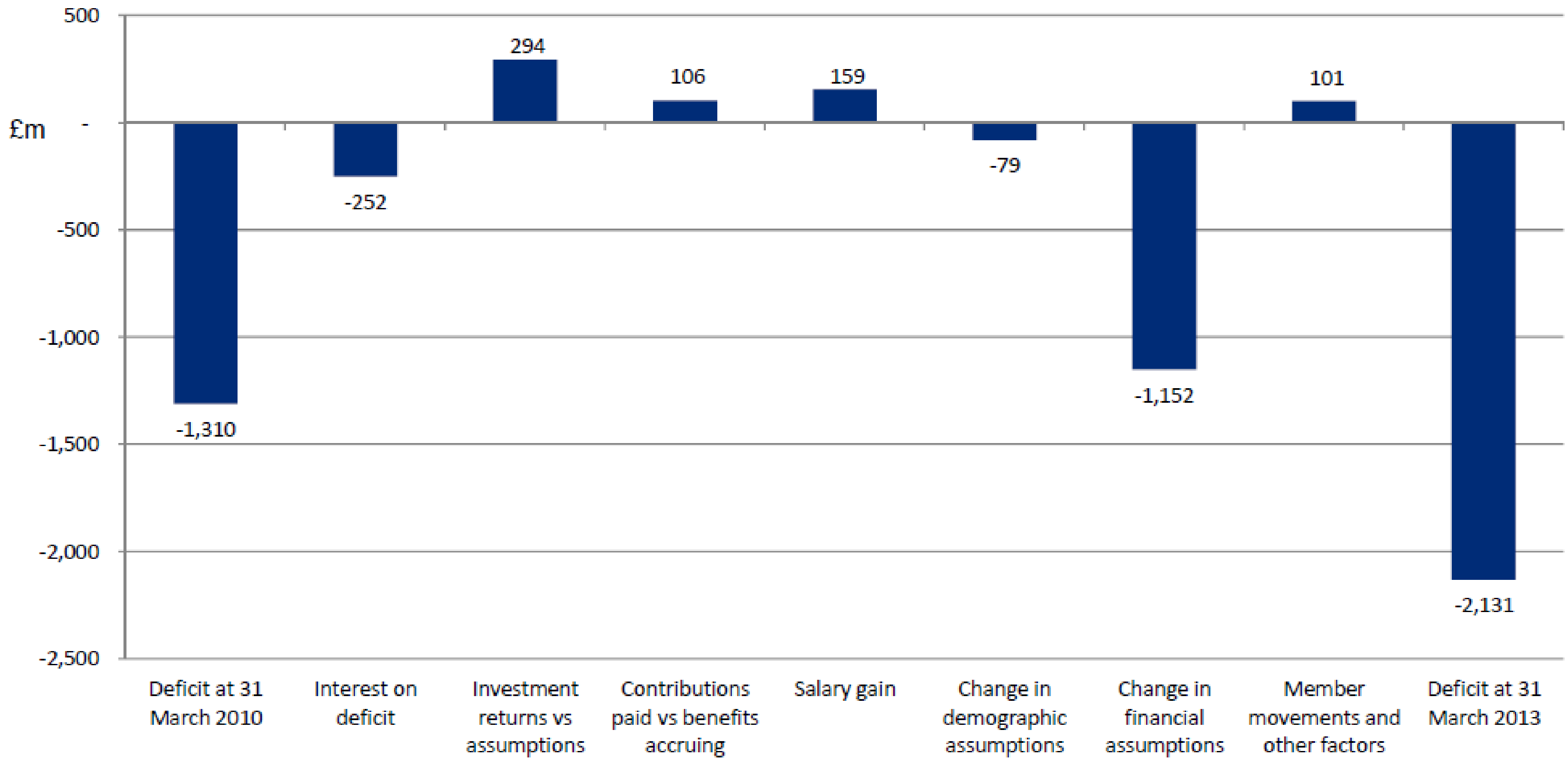
Focus on liability management





Analysis of change in baseline position for past service

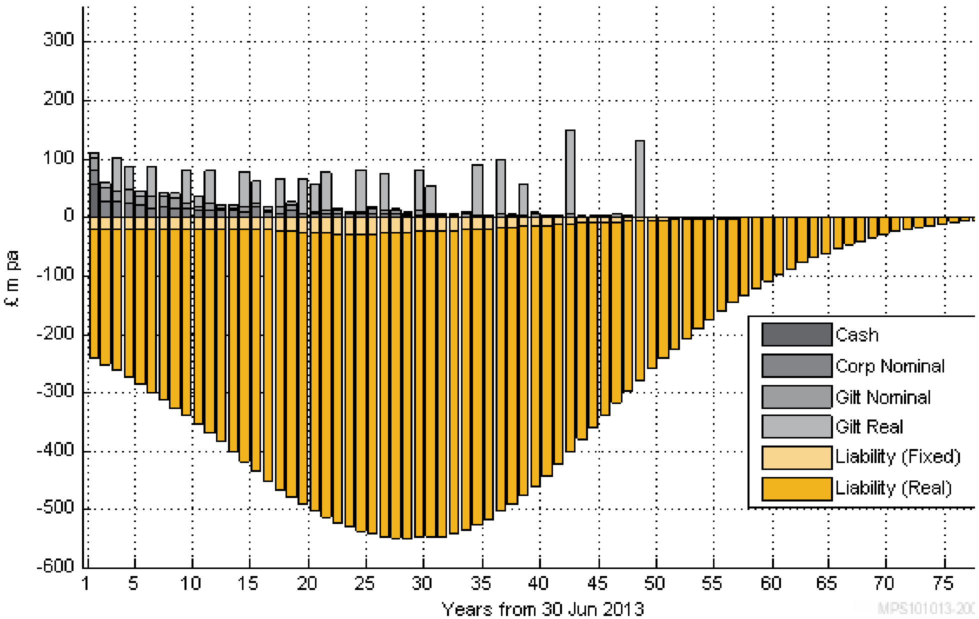


Source: Mercer

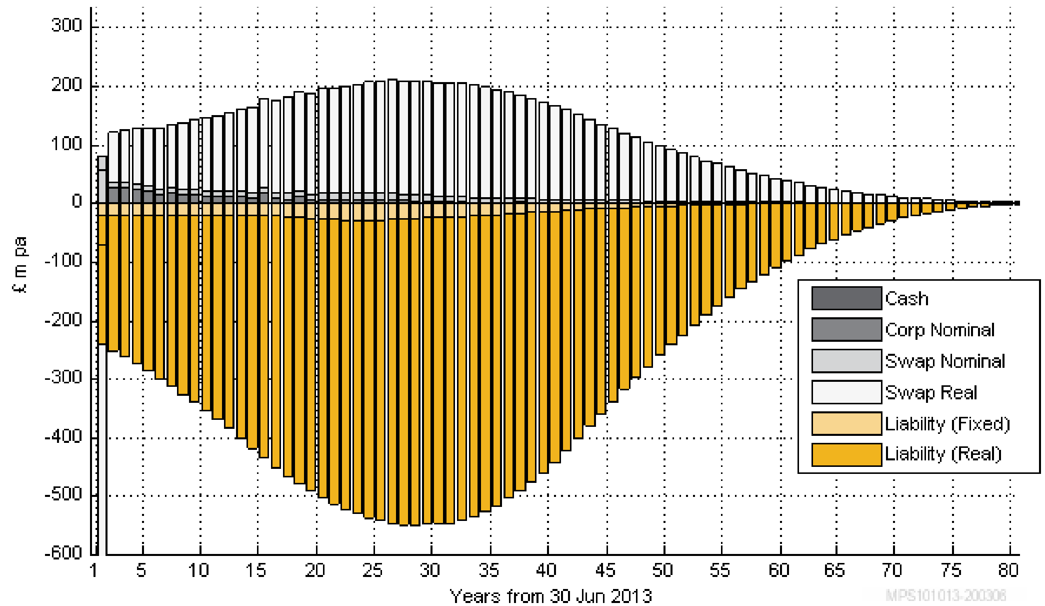
Matching Assets

- The Fund’s matching assets (i.e. index-linked gilts and bonds) change in value in a similar way to the liabilities, i.e:
  – Gilt yields fall = liabilities rise
  – Inflation rises = liabilities rise
- It is common amongst corporate pension funds to use derivatives to more efficiently match the movement of the liabilities and assets
  – This is know as Liability Driven Investment (LDI)

Cashflows from bonds within Current Strategy versus Liability Cashflows

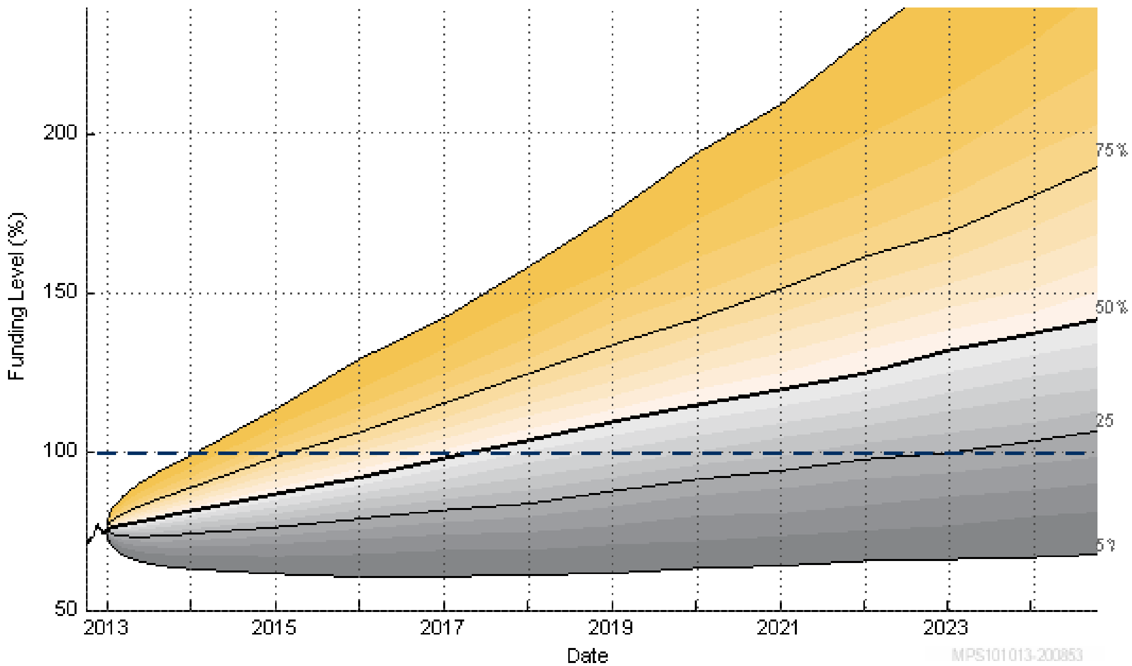


Cashflows when LDI used in strategy versus Liability Cashflows



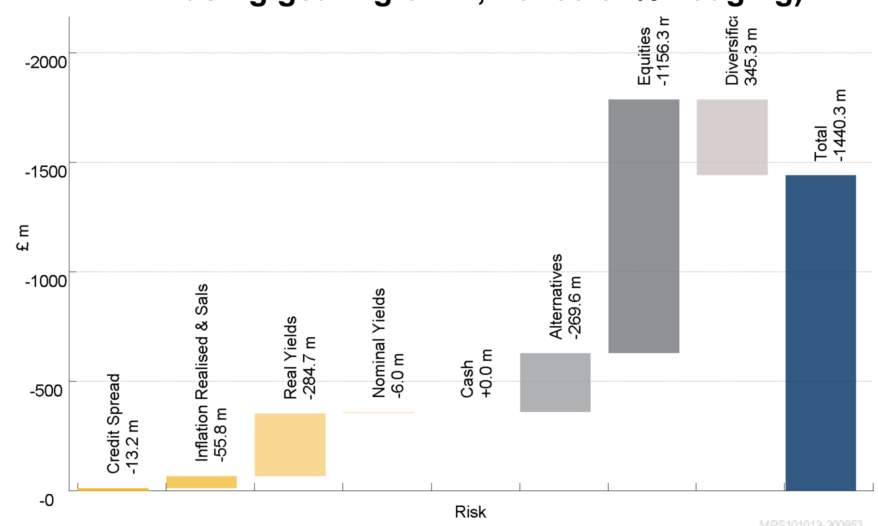
Risk analysis – Using derivatives to match changes in liability values

Projection of Funding Level with LDI Strategy (16% Bonds to LDI using gearing of 4x, hence 64% hedging)



Asset	Benchmark
Equities	55
Fixed Interest	4
LDI	16
Property	10
Alternatives	14
Private Equity	4
Hedge Funds	5
Thematics	3
Infrastructure	2
Cash	1
TOTAL	**100**

1 Year VaR (at 5% level) with LDI Strategy (16% Bonds to LDI using gearing of 4x, hence 64% hedging)



10yr expected relative return	4.2%
10yr expected standard deviation of relative return	13.1%

Summary Metrics – LDI

	Current portfolio	Existing Gilt and ILG holdings to LDI
10 year expected absolute return (median)	8.5%	8.9%
10 year expected absolute standard deviation	13.5%	14.2%
10 year expected return above ongoing liabilities (median)	4.0%	4.2%
10 year expected relative standard deviation	14.1%	13.1%
1 year 95% Value at risk (VaR)	£1,674m	£1,440m
Probability fully funded by 30/06/2016	36%	35%
Worst case (95th percentile) deficit contribution rate at 30/06/2016	£274m	£246m
Probability fully funded by 30/06/2023 (10 yrs)	72%	75%
Worst case (95th percentile) deficit at 30/06/2016	£4,351m	£3,606m
Probability fully funded by 30/06/2035 (22 yrs)	90%	91%
Worst case (95th percentile) deficit at 30/06/2016	£4,764m	£3,310m

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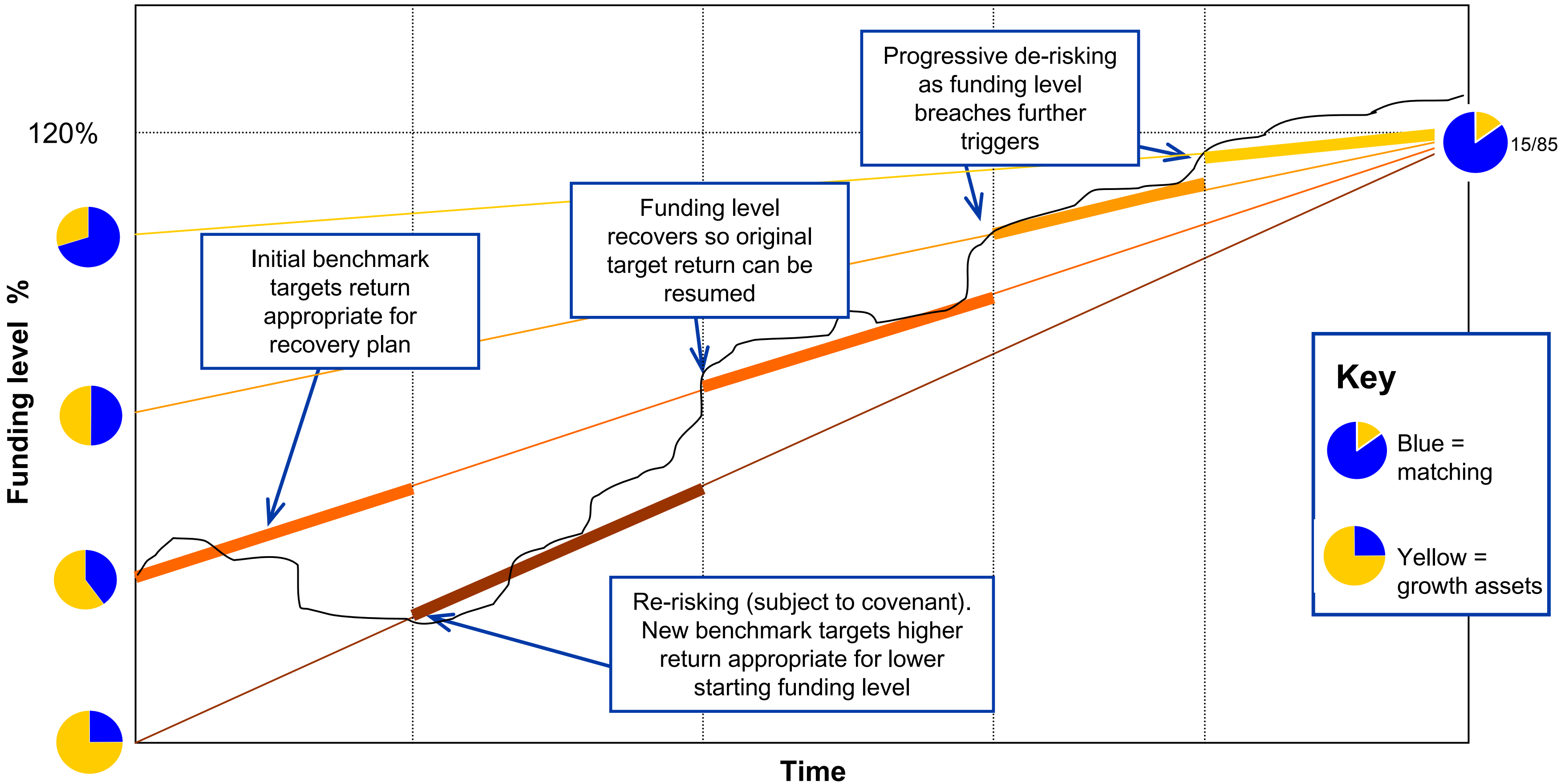
Flight plan – responding to actual experience

- Consider a plan to lock in gains as funding level improves
  - Bear in mind long term objective and link between investment strategy and discount rate
  - Also consider process for switching assets



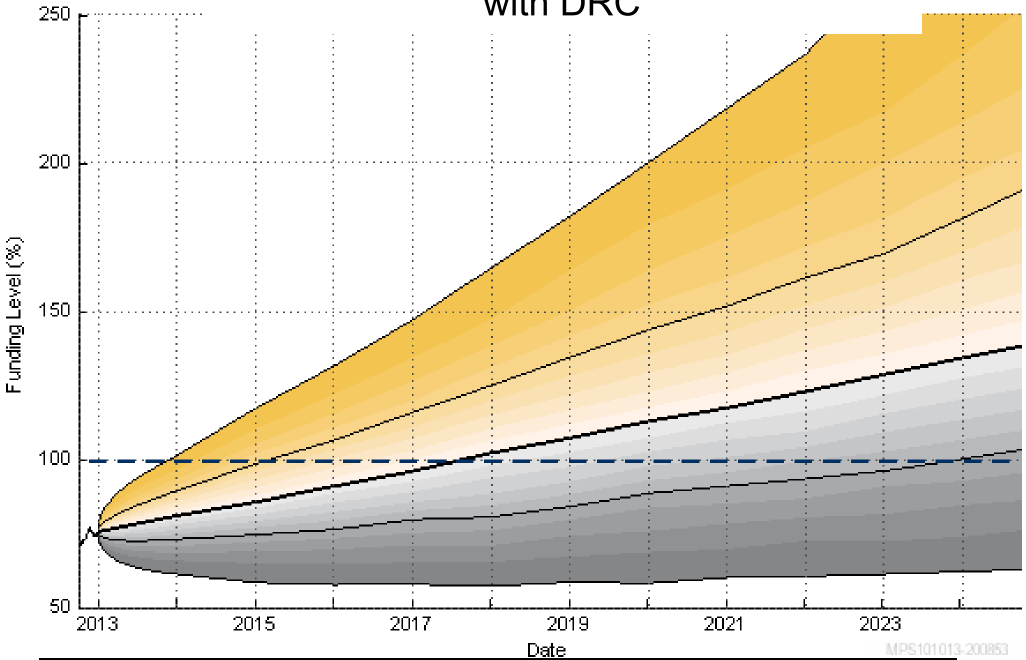
Next steps

- Discuss and decide future investment strategy
- Move from current investment strategy to future investment strategy
  - Possibly using medium term asset allocation framework
- Is more training required on Liability Driven Investment (LDI) and Flight planning?

Appendix

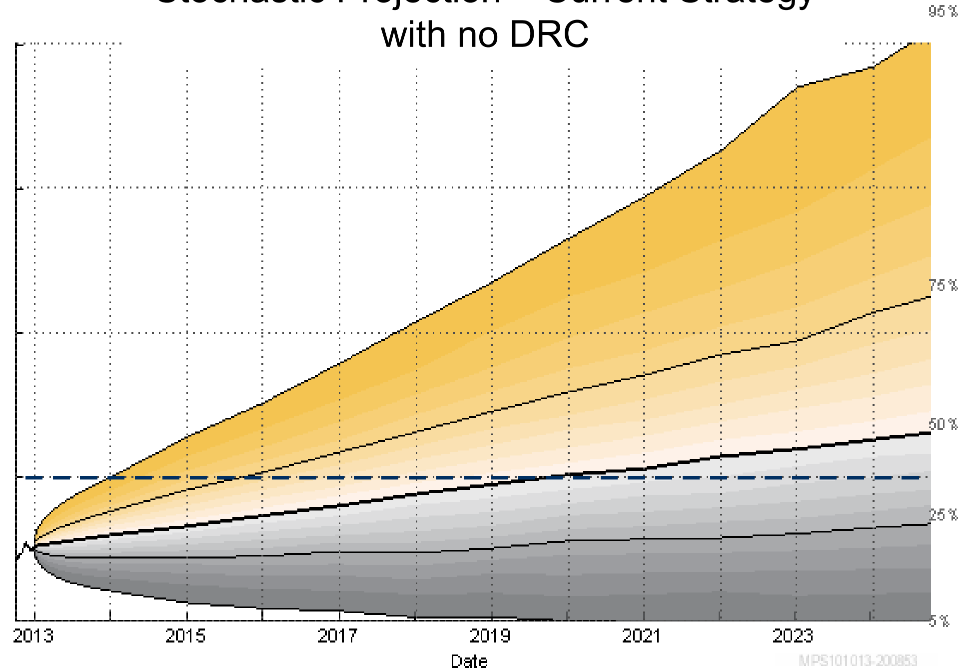
Funding level projections – current and no deficit repair contributions

Stochastic Projection – Current Strategy with DRC



	2016	2023	2035
Probability of funded	36%	72%	90%
95th Deficit	£3,719m	£4,351m	£4,764m

Stochastic Projection – Current Strategy with no DRC



	2016	2023	2035
Probability of funded	28%	58%	75%
95th Deficit	£4,039m	£5,739m	£11,931m

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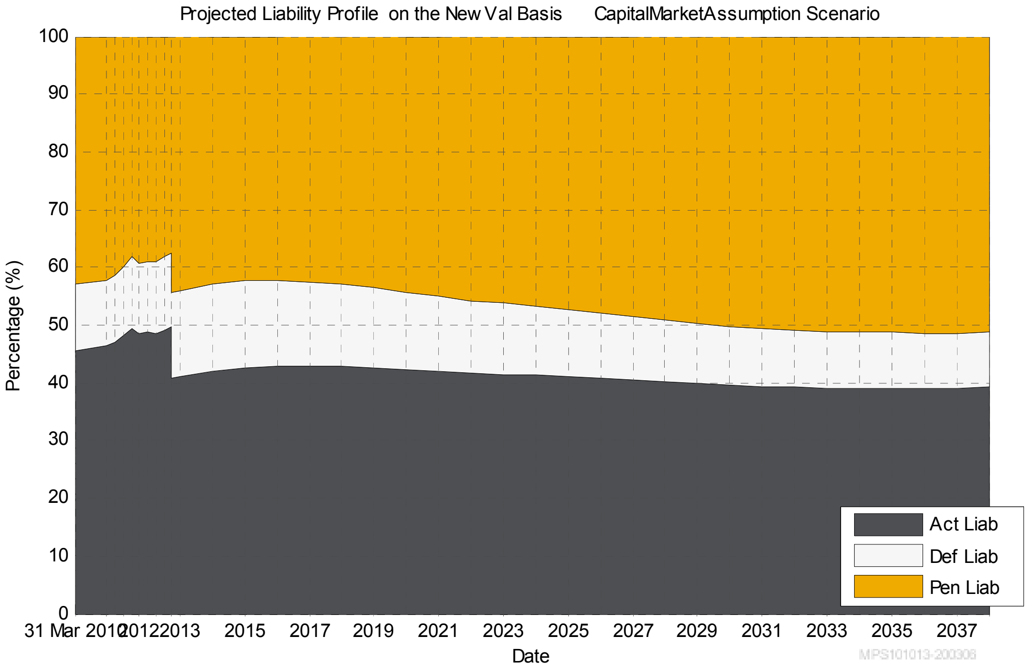
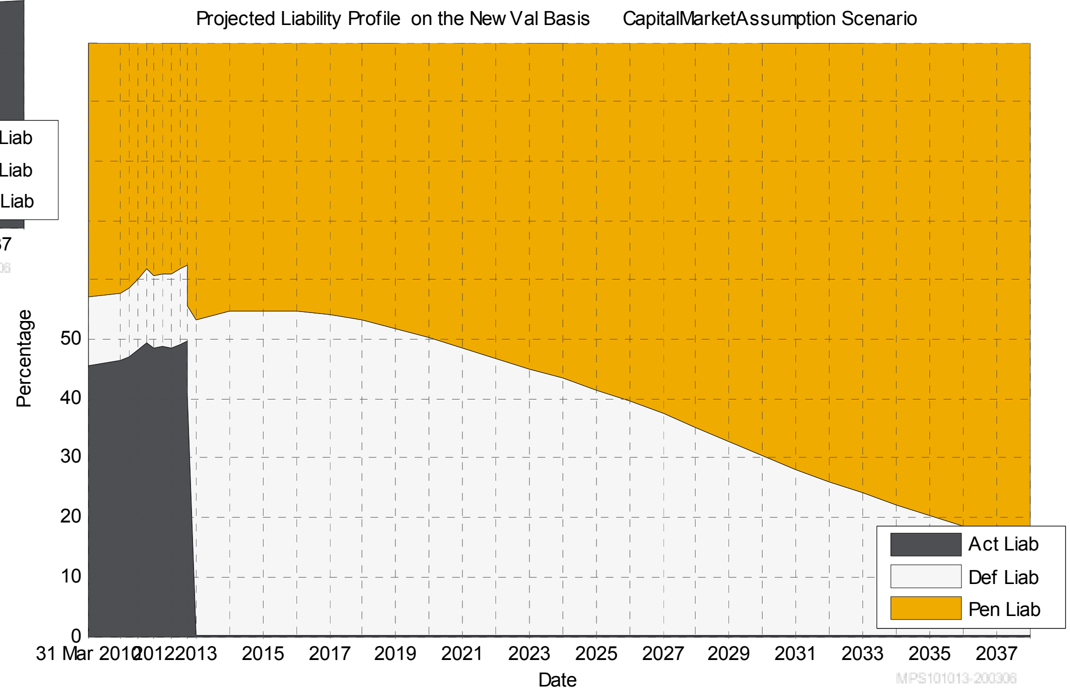
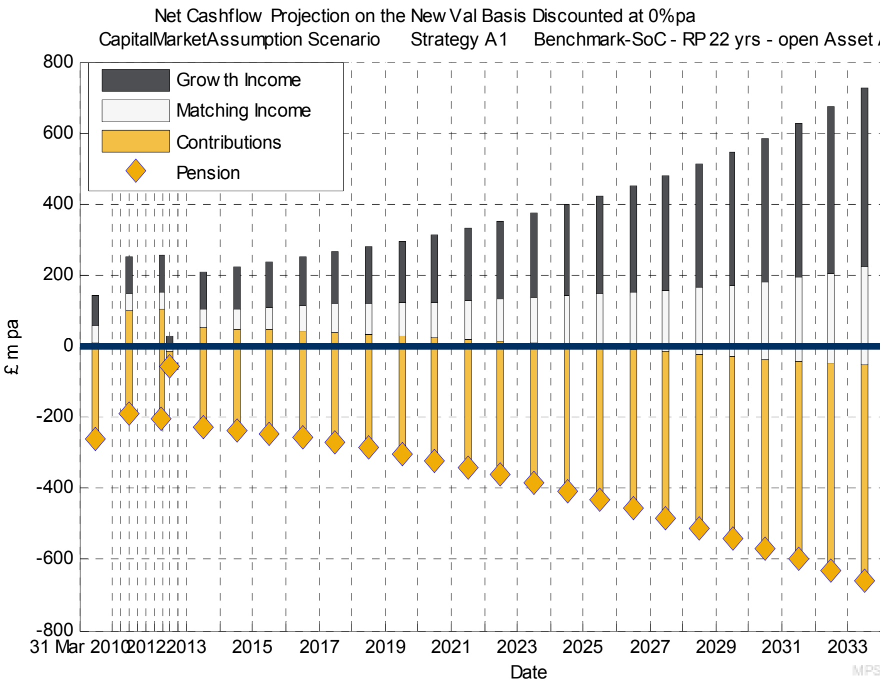
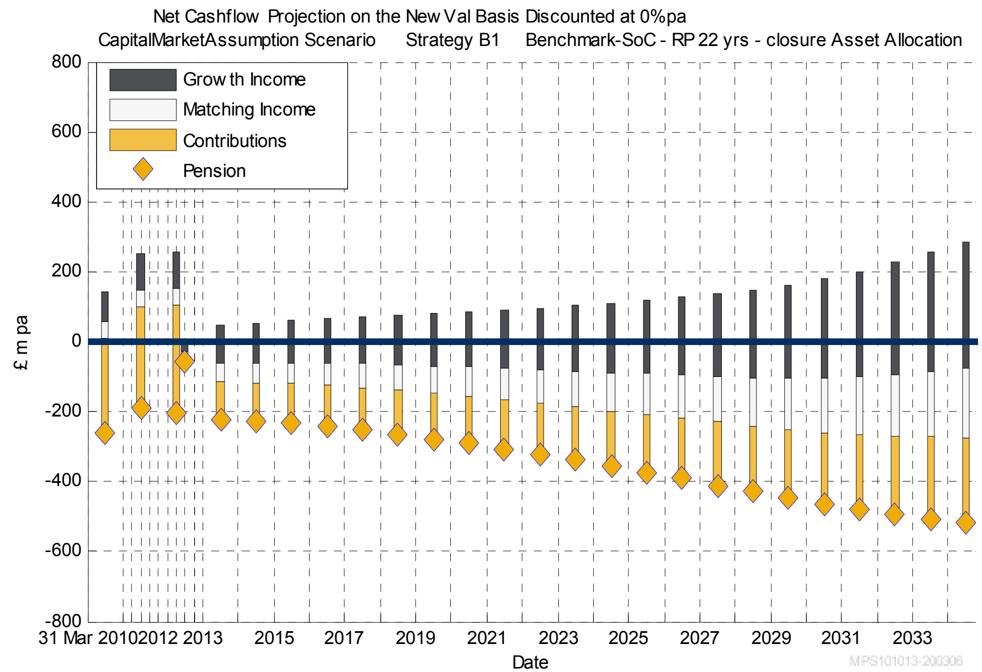
Your projected liability profile current or closed to future accrual



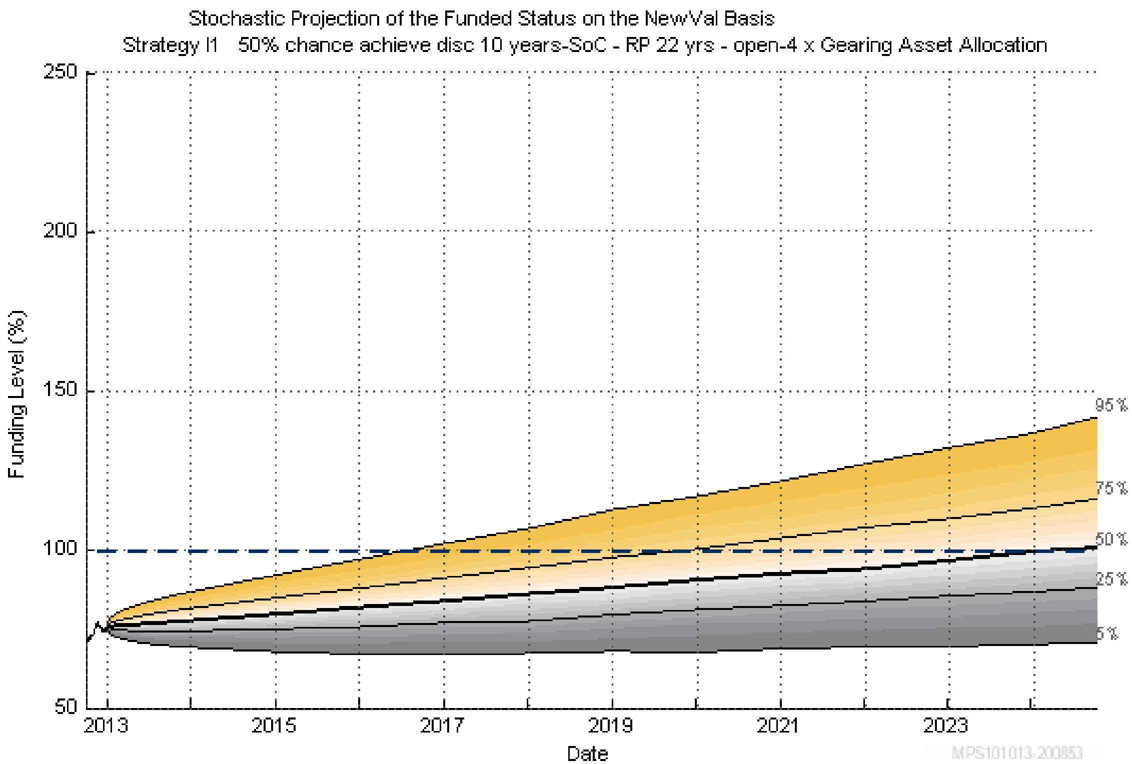


Cashflow projections – current and closed to future accrual





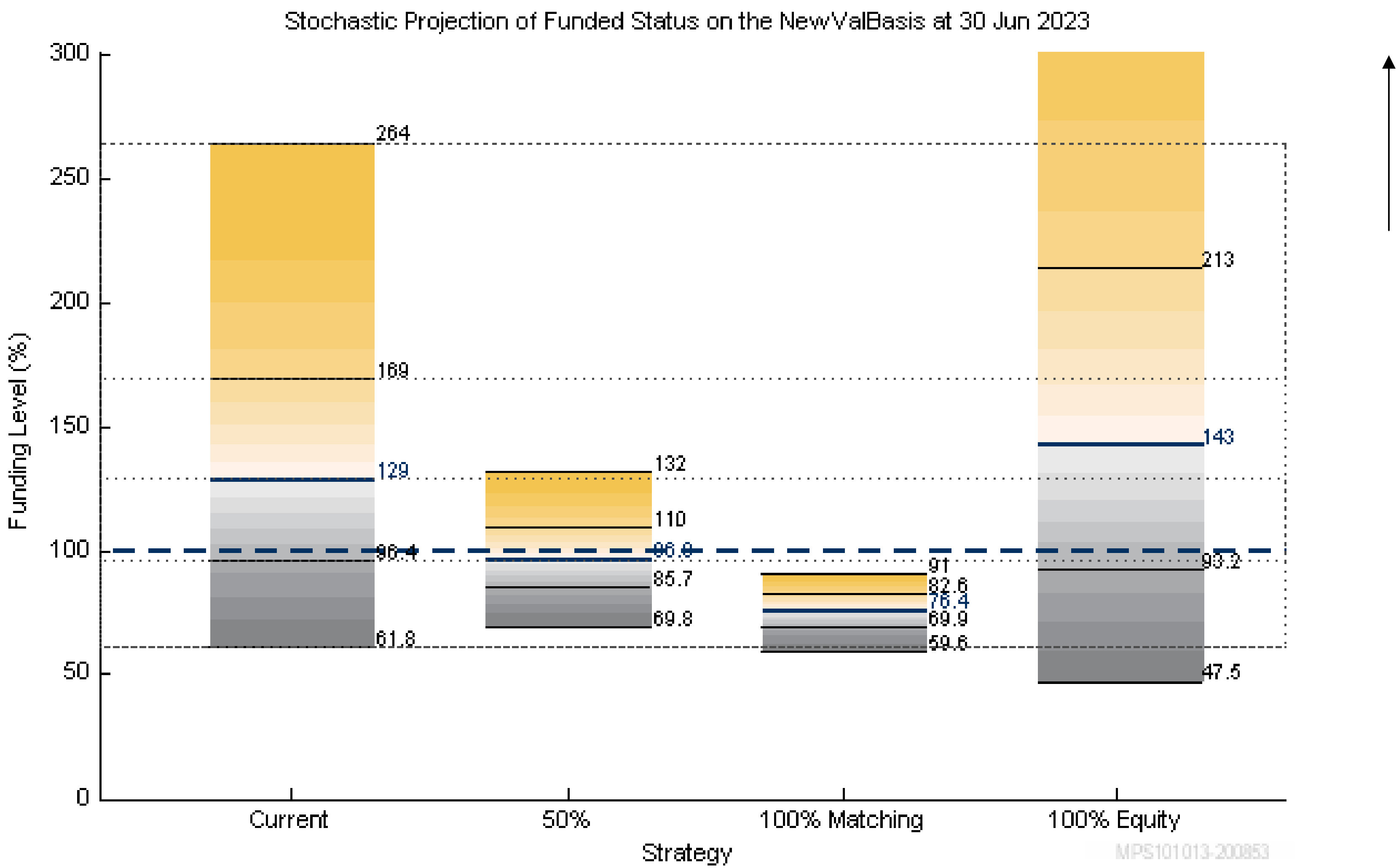
Extreme – 50% chance of being fully funded in 10 years



Asset	Benchmark
Equities	22
Fixed Interests	65
Property	4
Alternatives	6
Cash	3
Total	100

10yr expected relative return	1.0%
10yr expected standard deviation of relative return	5.9%

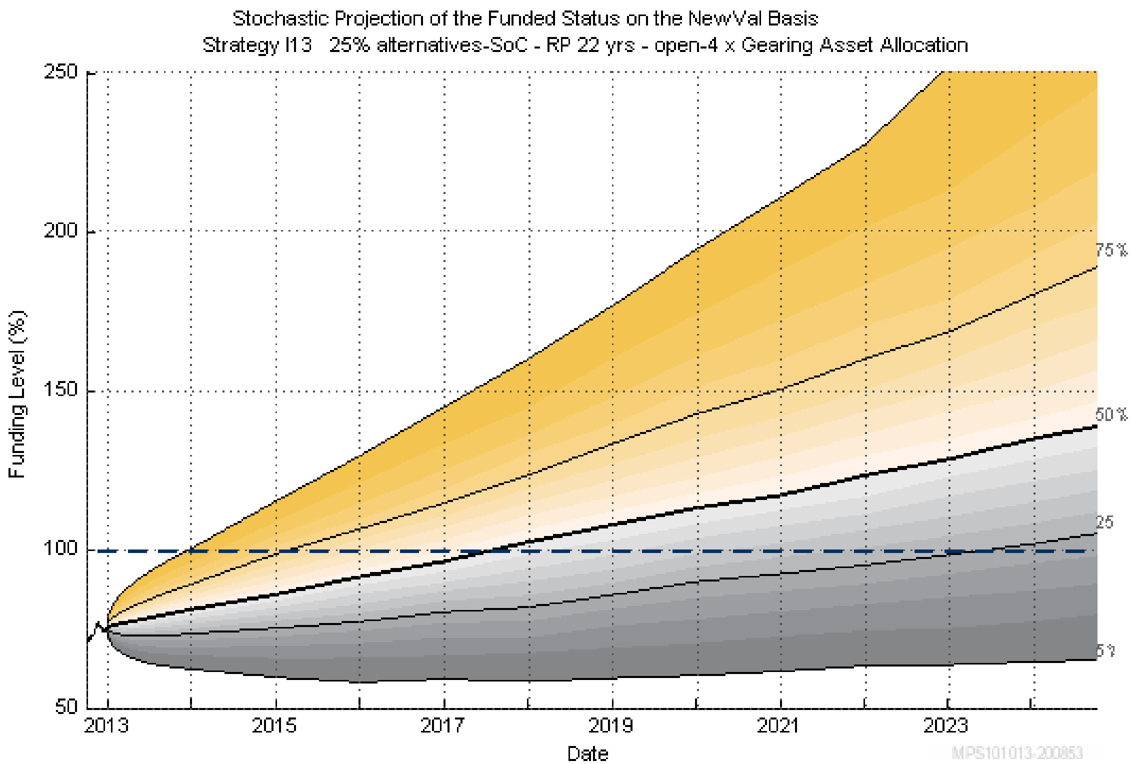
Projected funding level comparison in 10 years



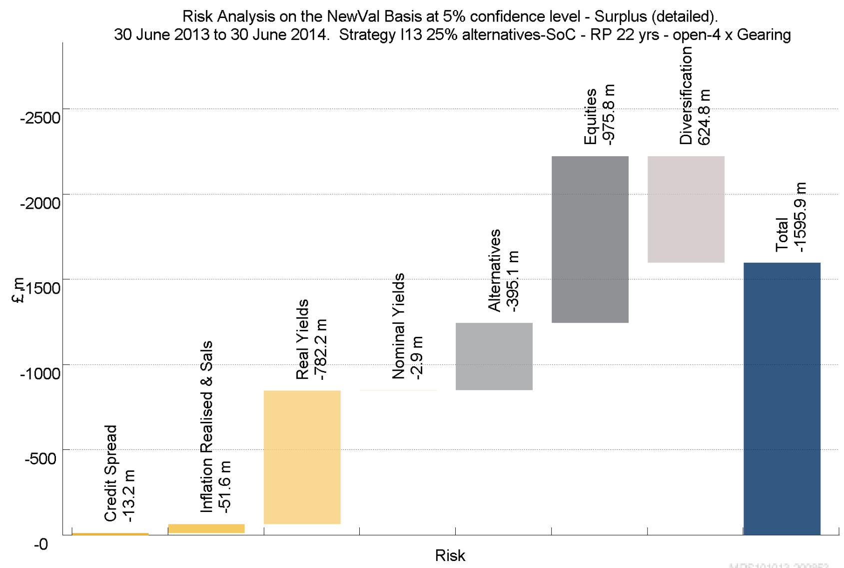
Extremes - Summary Metrics

	Current portfolio	100% matching	100% equity	50% chance of fully funded in 10 yrs
10 year expected absolute return (median)	8.5%	2.7%	9.7%	5.4%
10 year expected absolute standard deviation	13.5%	11.1%	20.5%	6.6%
10 year expected return above ongoing liabilities (median)	4.0%	-1.5%	5.1%	1.0%
10 year expected relative standard deviation	14.1%	5.1%	21.0%	5.9%
1 year 95% Value at risk (VaR)	£1,674m	£201m	£2,325m	£841m
Probability fully funded by 30/06/2016	36%	0%	45%	3%
Worst case (95th percentile) deficit contribution rate at 30/06/2016	£274m	£208m	£334m	£222m
Probability fully funded by 30/06/2023 (10 yrs)	72%	0%	72%	43%
Worst case (95th percentile) deficit at 30/06/2023 (10 yrs)	£4,351m	£3,639m	£5,954m	£3,540m
Probability fully funded by 30/06/2035 (22 yrs)	90%	4%	85%	80%
Worst case (95th percentile) deficit at 30/06/2023 (10 yrs)	£4,764m	NA	£8,813m	£4,654m

Increasing Alternatives – Alternatives increased to 25%, from equities and cash



Asset	Benchmark
Equities	45
Fixed Interest	20
Property	10
Alternatives	25
Private Equity	*6.25*
Hedge Funds	*6.25*
Thematics	*6.25*
Infrastructure	*6.25*
Cash	0
TOTAL	**100**



10yr expected relative return	3.9%
10yr expected standard deviation of relative return	13.6%

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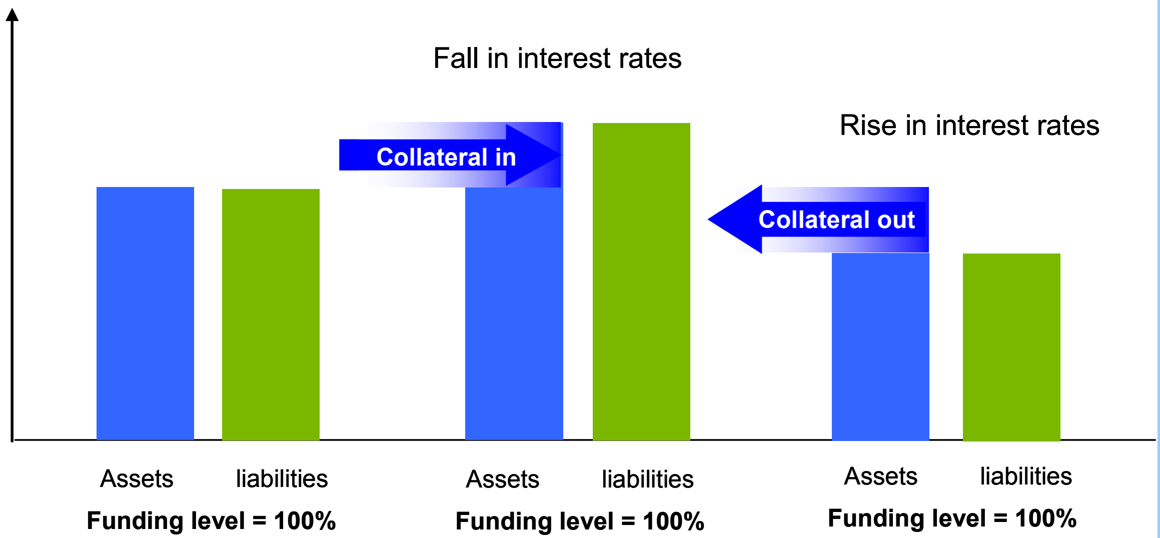
Summary Metrics – increasing alternatives

	Current Portfolio	Cash and then Equities	Cash and then ILG	Cash and then Property	Alternatives 25%	Alternatives 30%
10 year expected absolute return (median)	8.5%	8.6%	8.9%	8.7%	8.6%	8.6%
10 year expected absolute standard deviation	13.5%	13.2%	14.2%	13.9%	12.9%	12.5%
10 year expected return above ongoing liabilities (med)	4.0%	3.9%	4.3%	4.1%	3.9%	4.0%
10 year expected relative standard deviation	14.1%	13.9%	15.0%	14.5%	13.6%	13.3%
1 year 95% Value at risk (VaR)	£1,674m	£1,643m	£1,766m	£1,668m	£1,596m	£1570m
Prob. fully funded 30/06/2016	36%	36%	38%	37%	36%	36%
Worst case (95th percentile) deficit contribution rate at 30/06/2016	£274m	£270m	£279m	£277m	£265m	£260m
Prob fully funded 30/06/2023 (10 yrs)	72%	73%	73%	73%	74%	74%
Worst case (95th percentile) deficit at 30/06/2023	£4,351m	£4,184m	£4,374m	£4,364m	£4,019m	£3,930m
Prob fully funded 30/06/2035 (22 yrs)	90%	90%	90%	90%	91%	92%
Worst case (95th percentile) deficit at 30/06/2035	£4,764m	£3,913m	£4,307m	£4,590m	£3,273m	£2,873m

Reducing the volatility of the funding level

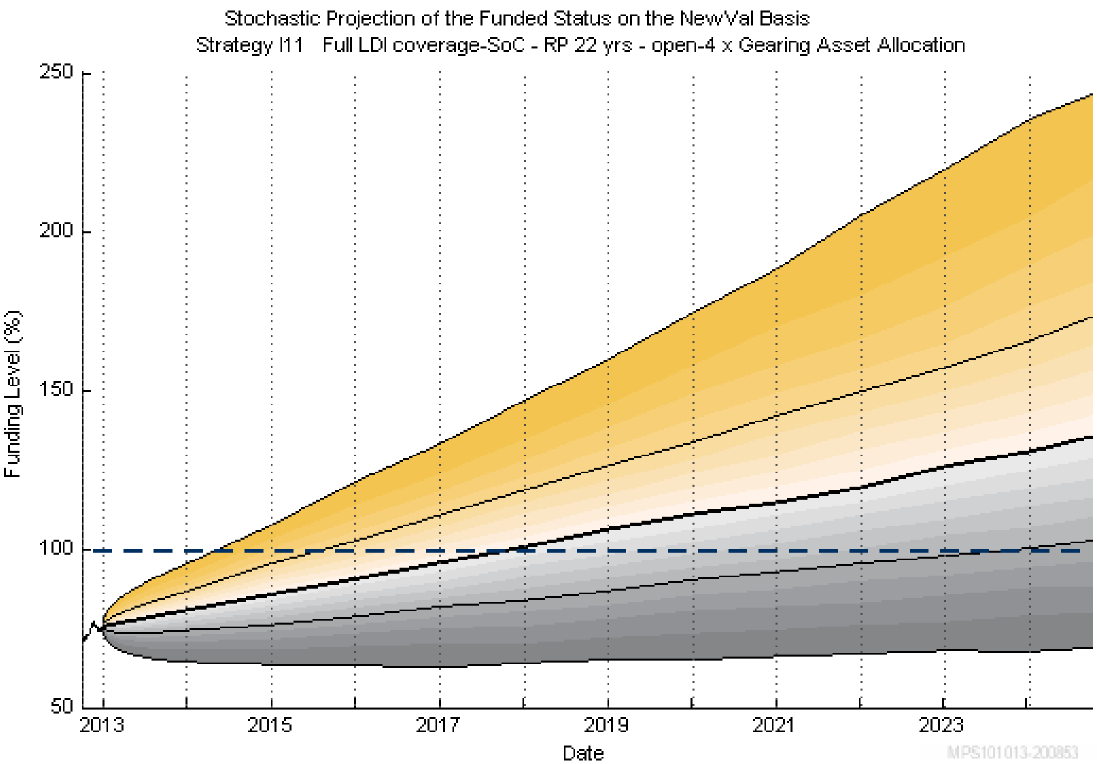
- **Aim:** Protect the Funding Level against movements in interest rates and inflation
- **How:** Collateral is paid into the Scheme account when interest rates fall. Collateral is paid out of the Scheme account when interest rates rise.
- It is similar for inflation. Collateral is paid into the Scheme account when inflation rises.



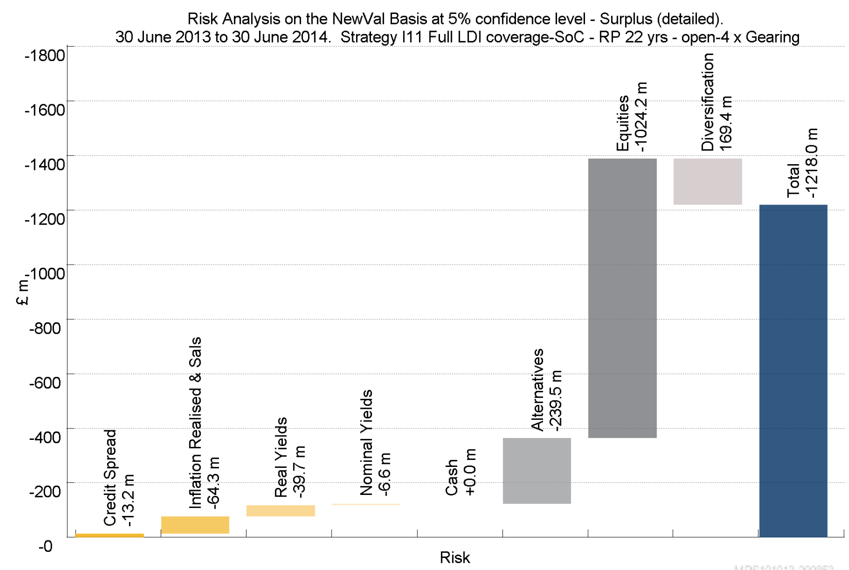
The payment or receipt of collateral is not a bad thing:

- Payment is received when the value of your liabilities rises (as compensation)
- Payments are made when the value of your liabilities falls

Risk analysis – Full LDI coverage



Asset	Benchmark
Equities	48.7
Fixed Interest	4
LDI	25
Property	8.9
Alternatives	12.4
Private Equity	3.5
Hedge Funds	4.4
Thematics	2.7
Infrastructure	1.8
Cash	1
TOTAL	100



10yr expected relative return 3.7%

10yr expected standard deviation of relative return 11.6%

Summary Metrics – LDI

	Current portfolio	Existing Gilt and ILG holdings to LDI	Full LDI Coverage
10 year expected absolute return (median)	8.5%	8.9%	8.4%
10 year expected absolute standard deviation	13.5%	14.2%	13.7%
10 year expected return above ongoing liabilities (median)	4.0%	4.2%	3.7%
10 year expected relative standard deviation	14.1%	13.1%	11.6%
1 year 95% Value at risk (VaR)	£1,674m	£1,440m	£1,218m
Probability fully funded by 30/06/2016	36%	35%	30%
Worst case (95th percentile) deficit contribution rate at 30/06/2016	£274m	£246m	£225m
Probability fully funded by 30/06/2023 (10 yrs)	72%	75%	74%
Worst case (95th percentile) deficit at 30/06/2016	£4,351m	£3,606m	£3,246m
Probability fully funded by 30/06/2035 (22 yrs)	90%	91%	89%
Worst case (95th percentile) deficit at 30/06/2016	£4,764m	£3,310m	£3,041m