

ALM Results LGERS

Current policies & Optimization

North Carolina Retirement System

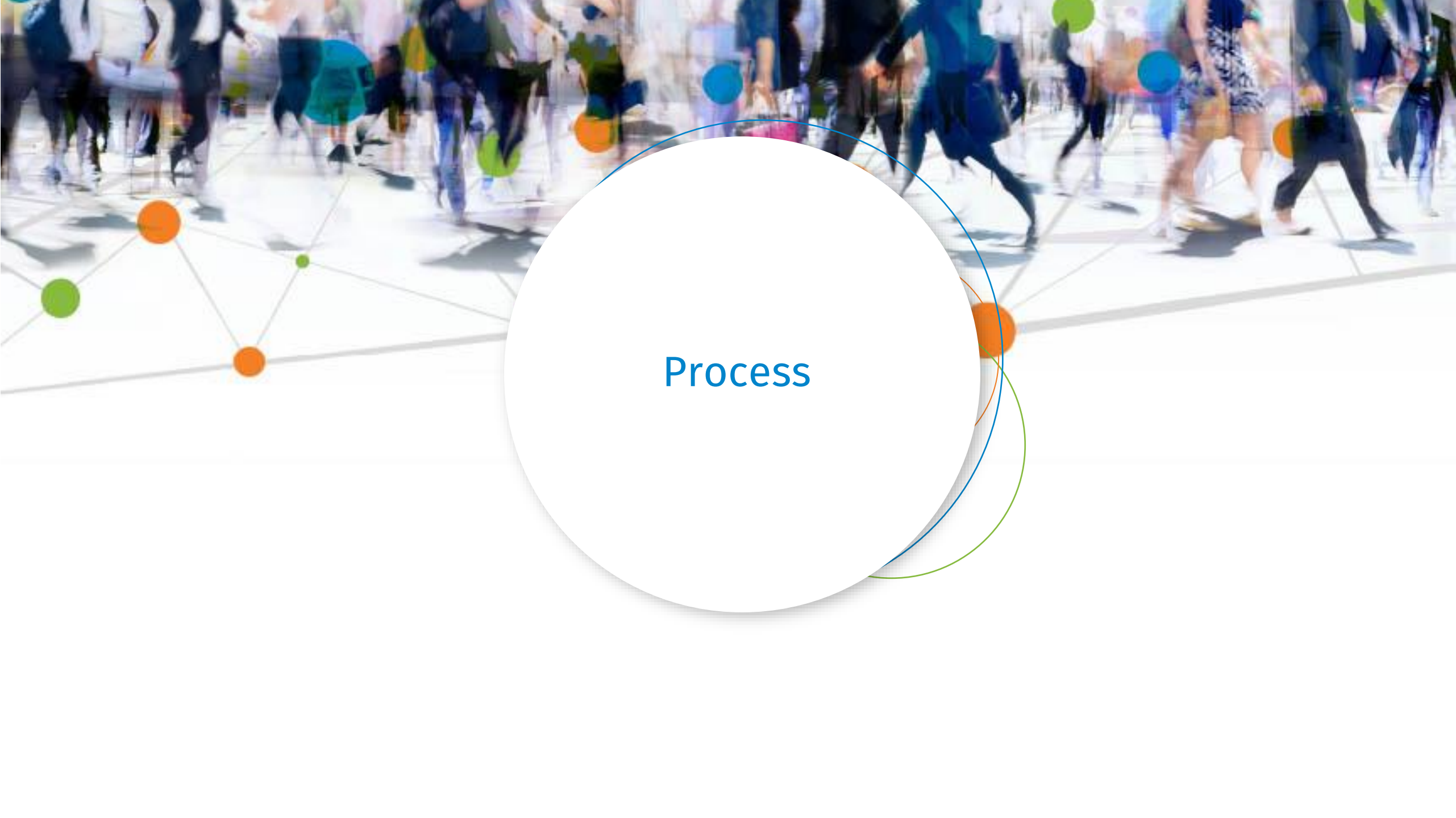
Board Meeting | December 17, 2025





Agenda

- Process
- Key findings
- Going concern outlook
- Strategic Asset Allocation
 - Optimization results
 - Peer groups
 - Model Portfolios
 - Reference Portfolios
- Next steps



Process



ALM process

Overview

Assumptions &
objectives

Evaluation of outlook
Going Concern

Asset allocation
analyses

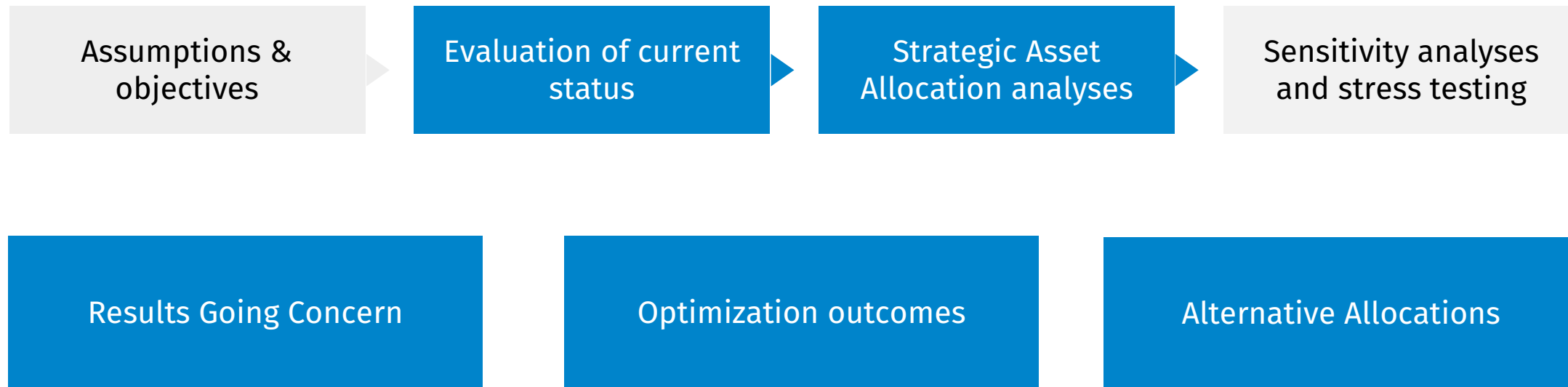
Sensitivity analyses
and stress testing

Main objective of the ALM study is to define a new Strategic Asset Allocation



ALM process

Today



Today

- Presenting first results
- Discussing results & risk appetite



Key findings



Key findings

Summary

- The fund shows healthy growth to being fully funded in the long-term, helped by investment returns and deficit amortizations.
- Downside risks are moderate but can result in low funding ratios (around 72%) and high employer contributions (around 22% of payroll).
 - Investment risk (especially equity risk) is by far the largest risk driver.
- For retired members, inflation reduces their purchasing power (-20% in 10-years time). While discretionary Cost Of Living Adjustments (COLA) can be granted, this only partially offset inflation risks.
- Through optimization runs we learn that the Strategic Asset Allocation (SAA) can be adjusted to improve the central expectation (higher funding ratio, lower contributions, higher COLA) and/or reduce risk.
 - We find that Private Equity, Real Estate, Investment Grade (IG) Fixed Income, Natural Resources and Infrastructure are attractive asset classes.
 - Relatively high interest rates make IG fixed income attractive, while public equity is less attractive compared to private investments. Credit shows mixed results, depending on the horizon we look at.
- Based on these results, constraints on illiquidity, and qualitative considerations, NCRS presents 2 Model Portfolios:
 - **Model Portfolio 1 (MP1)** contains more Private Equity, Infrastructure, Energy, and Credit, and Multi Strategy.
 - Less Public Equity, Cash, and Real Estate – compared to the SAA. **Focus is on Return increase.**
 - **Model Portfolio 2 (MP2)** contains more Private Equity, Infrastructure, Commodities, Credit, IG Fixed Income, and Multi Strat.
 - Less Public Equity, TIPS, and Real Estate. **Focus is on downside Risk reduction.**



Assumptions



Assumptions

Overview - LGERS

- Modelled both assets and liabilities:
 - Taking into account the recent Experience Study carried out by Gallagher.
 - Liabilities are sensitive to wage inflation and CPI (through conditional COLA).
- Initial positions at 31 December 2024:
 - Actuarial Value of Assets: USD 36.0 bn
 - Actuarial Accrued Liabilities: USD 42.6 bn
 - Funding ratio: 84.5%
- Contributions:
 - Actuarial Determined Employer Contributions (ADEC) based on Normal Cost and Accrued Liability rate (minimum 6%).
 - Employer Contribution Rate Stabilization Policy (ECRSP) policy ends in 2027. Conservatively, no new policy is assumed.
- Projections using end of June 2025 Ortec Finance Scenarios (OFS):
 - See appendix for Capital Market Assumptions.



Going Concern Outlook



Going Concern

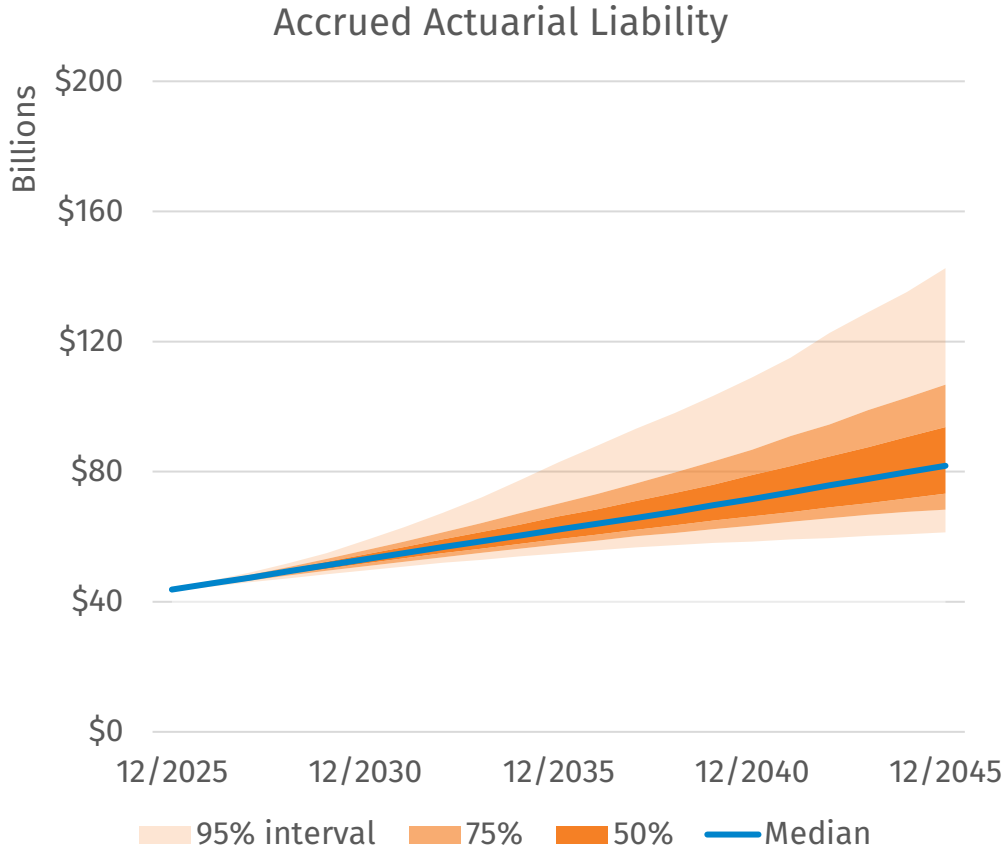
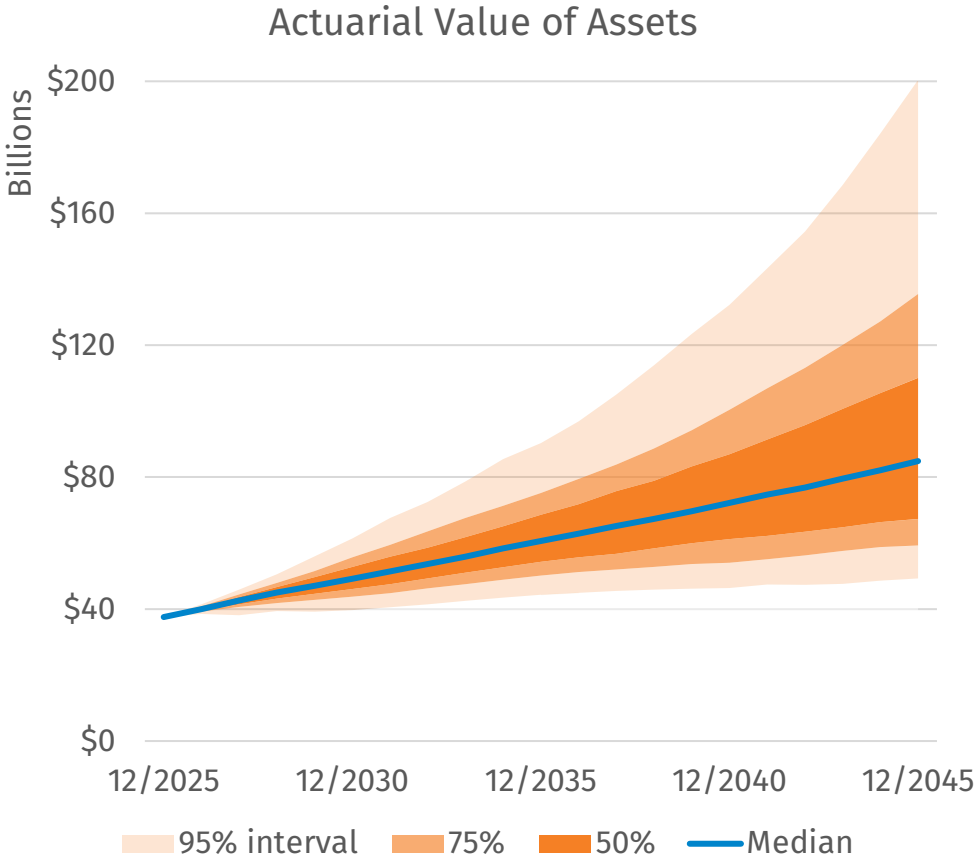
Introduction

- This section presents the expected development and potential risks of the fund under the current policies for key metrics:
 - Assets & liabilities
 - Funding ratio
 - Employer contribution
 - COLA
- We zoom in on downside funding ratio risk using Risk Factor Decomposition tooling.
- For a full overview of assessed risk metrics, please see the ALM table in the next section.



Going Concern

Assets & liabilities





Going Concern

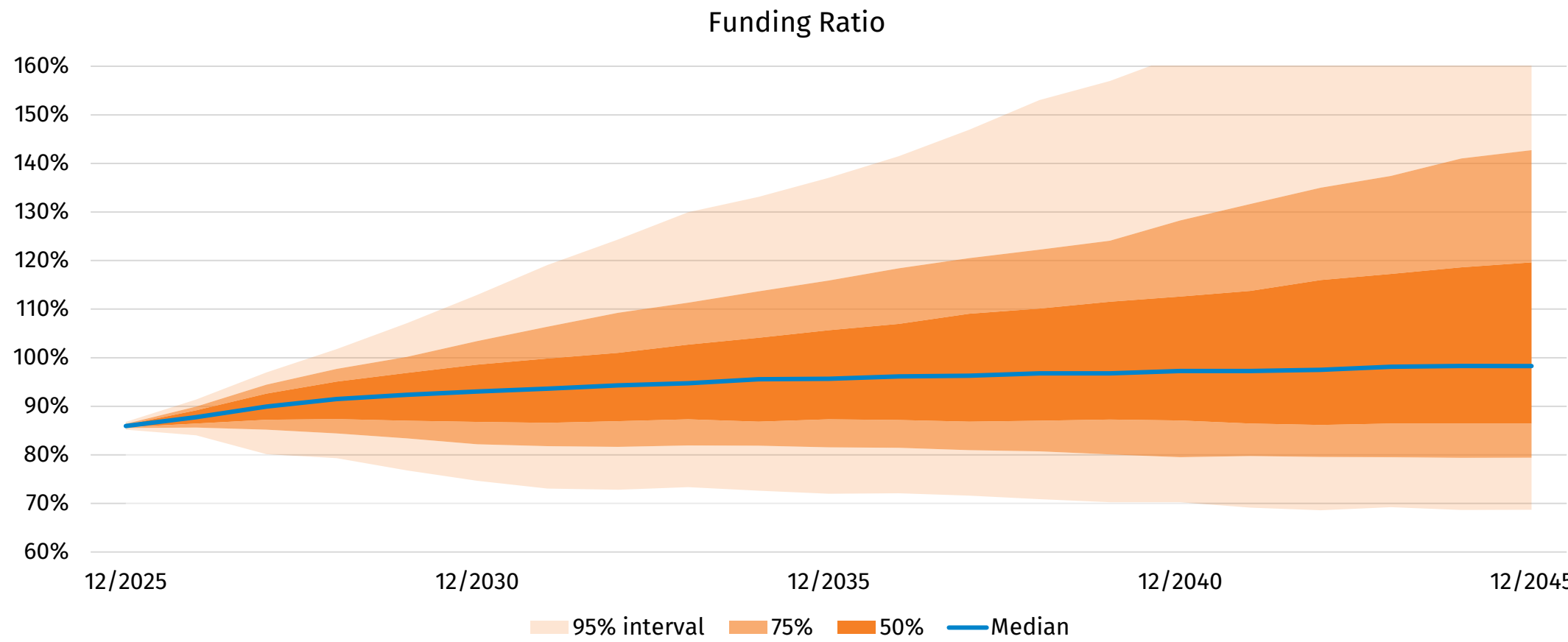
Assets & liabilities commentary

- **Assets** increase over time, driven by investment returns.
 - In the central expectation (median), the actuarial value of assets increases to USD 61 bn and USD 85 bn respectively in year 2035 and year 2045.
 - The increase is somewhat muted due to negative net cash flows (the benefit payments exceed the contribution payments)
 - Net cash flow as percentage of assets stabilizes around -3.0% per year on average
- Low assets values are primarily driven by low investment returns.
- On average, the asset value increases at a higher pace than the value of the liabilities.
 - However, downside risk is larger as well.
- **Liabilities** are expected to increase over time at a relatively stable rate being driven by:
 - Wage inflation increase to active members.
 - New members entering the scheme and accruing benefits. Although this is offset by inactives no longer receiving benefits.
 - Increased benefits on respect of COLA benefits.
- The median liability value increases to USD 64 bn and USD 82 bn respectively in year 2035 and year 2045.
- In scenarios with high liability values, these are driven by scenarios with high inflations (wage growth and high COLA) and vice versa for low liability values.



Going Concern

Funding ratio





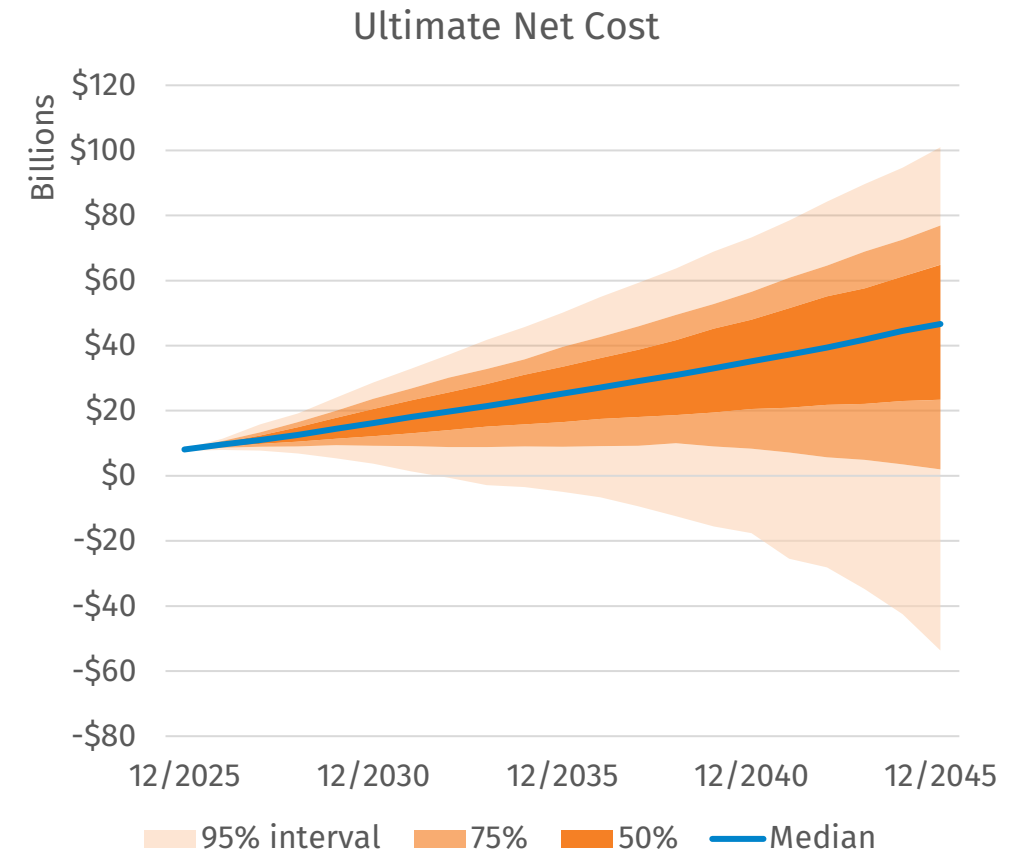
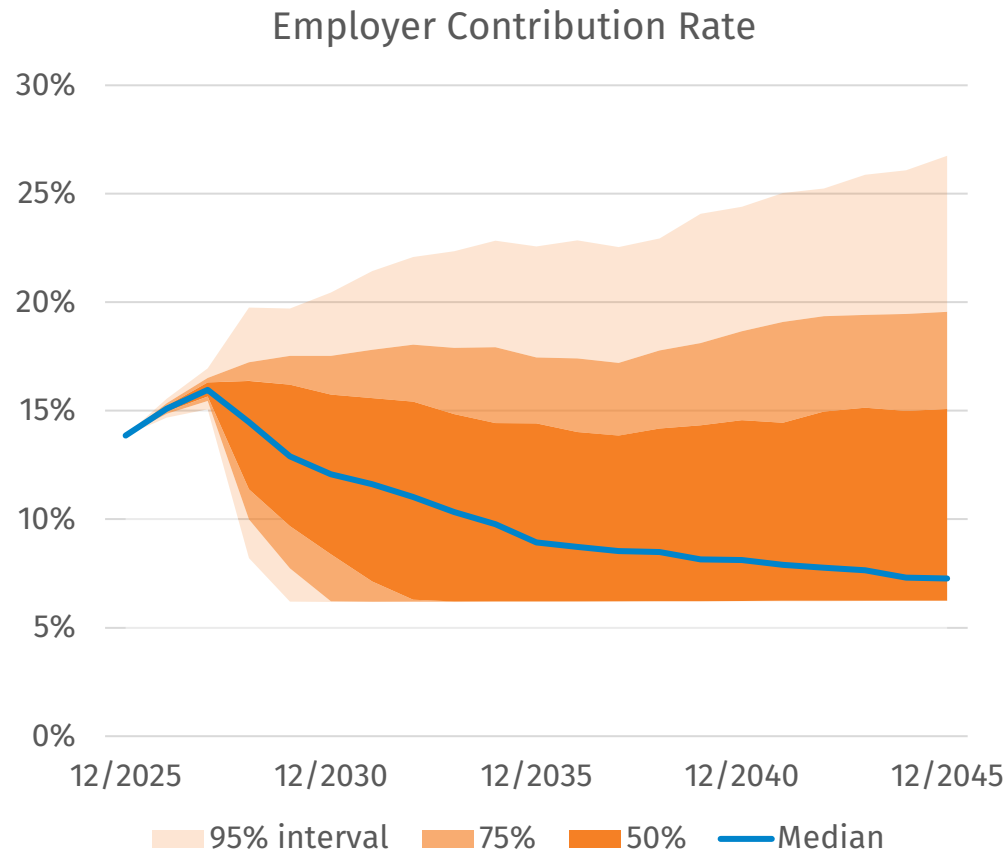
Going Concern

Funding Ratio commentary

- The funding ratio increases over time, to a level of close to 96% in 2035 and 98% in 2045 in the central expectation.
- In the first few years, the funding ratio increases at a higher pace. This is driven by 2 factors:
 - In the first few years, employer contribution levels are relatively high (deficit amortizations).
 - The strong investment performance H1 2025 boosts the Actuarial Value of Assets in the coming years.
- In worst case scenarios, the funding level drops to levels around 72% by 2035 (5% CVaR)
 - These scenarios are primarily driven by low investment returns.
 - Scenarios of high inflation cause an increase in liabilities and hence a lower funding ratio.
- In later years, there is also considerable upside potential: in certain scenarios the funding ratio skyrockets driven by high investment returns.
 - In practice some of this surplus would be used for employer contribution holidays (not modelled).

Going Concern

Employer Contribution & Ultimate Net Cost





Going Concern

Employer Contribution commentary

- As the fund approaches a funding surplus (funding ratio over 100%) over time, we expect the fund to become less dependent on the Employers Contributions.
- Drivers of the Employer Contribution Rate:
 - Short term - For the first few years, employer contributions are a given, driven by the ECRSP.
 - Long term - deficit contributions become lower, resulting in significantly reduced employer contribution rates.
- In the long-term, **around 75% of the scenarios show an Employer Contribution Rate of less than 15%**. Around 25% of the scenarios shows an Employee Contribution Rate of 6% of which the Employer Contribution Rate is not allowed to reduce below this amount.
 - This directly correlates to improvements in funding ratio and the resulting reduction in deficit contributions.
- However, there are also considerable risks. In the long term, **12.5% of the scenarios (1 in 8) show an Employer Contribution Rate of over 19%**.
 - In worst case scenarios, this rate exceeds 25% of the payroll.
- The **Ultimate Net Cost (UNC)** is defined as *Cumulative contribution up to year t + the unfunded liability of year t*
 - A negative UNC signals a surplus. A positive UNC signals high past contributions and/or a high deficit



Going Concern

Modeling of Discretionary Cost of Living Adjustments (COLA)

- Discretionary Cost of Living Adjustments for retired members benefits may occur.
 - To account for potential future COLA decisions, we aim to model a possible *decision-making process*.
 - To this end, we need a rule-based (if-then) system. By definition, this will be a simplification of the real process.
 - Increases modelled are permanent benefit improvements. In reality, one-time payments are also possible.
- Modelled discretionary COLA:
 - The indexation *budget* is defined by the excess return over 6.5% (the discount rate) over a 5-year period.
 - If funding ratio <80% → 0% COLA.
 - If funding ratio >80% → 25% of the budget is used for COLA.
 - If funding ratio >95% → 50% of the budget is used for COLA.
 - If funding ratio >125% the full budget is used for COLA.
 - COLA is capped by the minimum of 5% and CPI; and floored by 0%.

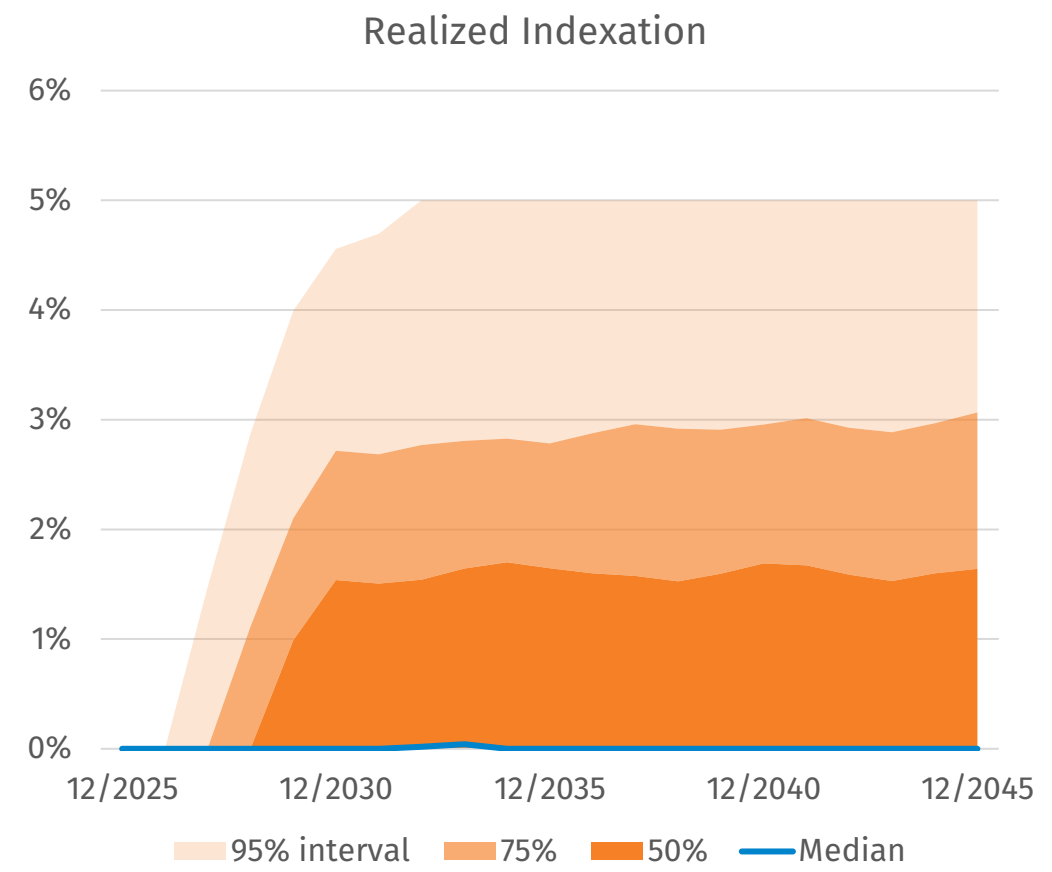
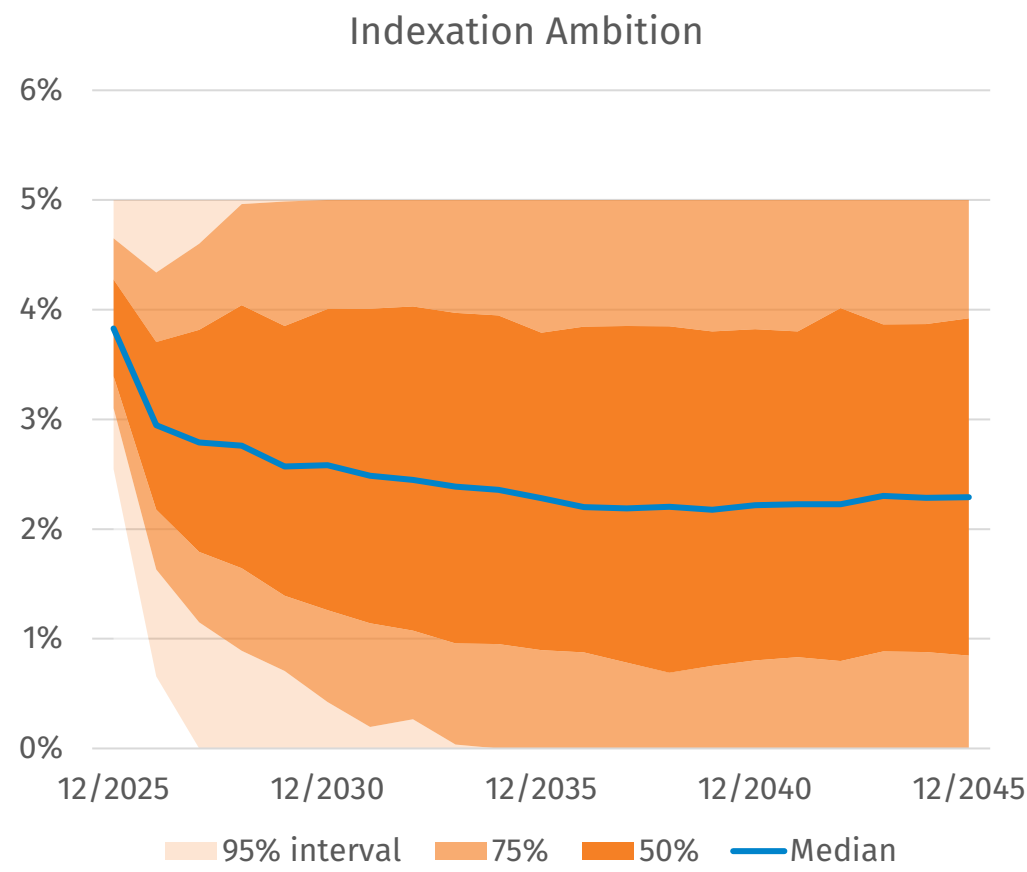
Example: assume an excess return of 3%, funding ratio just over 125%, and CPI of 6%

- The indexation budget as a percentage of total liabilities is $3\% \times 125\% \times 100\% = 3.75\%$
- However, COLA only affects retirees. Assuming their liabilities make up half of total liabilities, indexation can be 6% (CPI)
- The actual COLA granted is 5% due to the cap.



Going Concern

Cost of living adjustments





Going Concern

Cost of living adjustments commentary

Indexation Ambition

- On the left we show indexation ambition, which is defined as CPI, capped by 5% and floored by 0%
 - Without these caps and floors, inflation scenarios reach levels of roughly +8% and -2% (and extreme outliers going even beyond that, especially on the upside)
 - The cap of 5% limits inflation protection in high-inflation scenarios. On the other hand, the 0% floor means that benefits will not be reduced (negative COLA) in case of deflation. This improves purchasing power
- Inflation starts at an elevated level of around by the end of 2025. Over time it normalizes to around 2.25% on average.
- Half of the ambition (inflation) scenarios ranges between 1% and 4%.

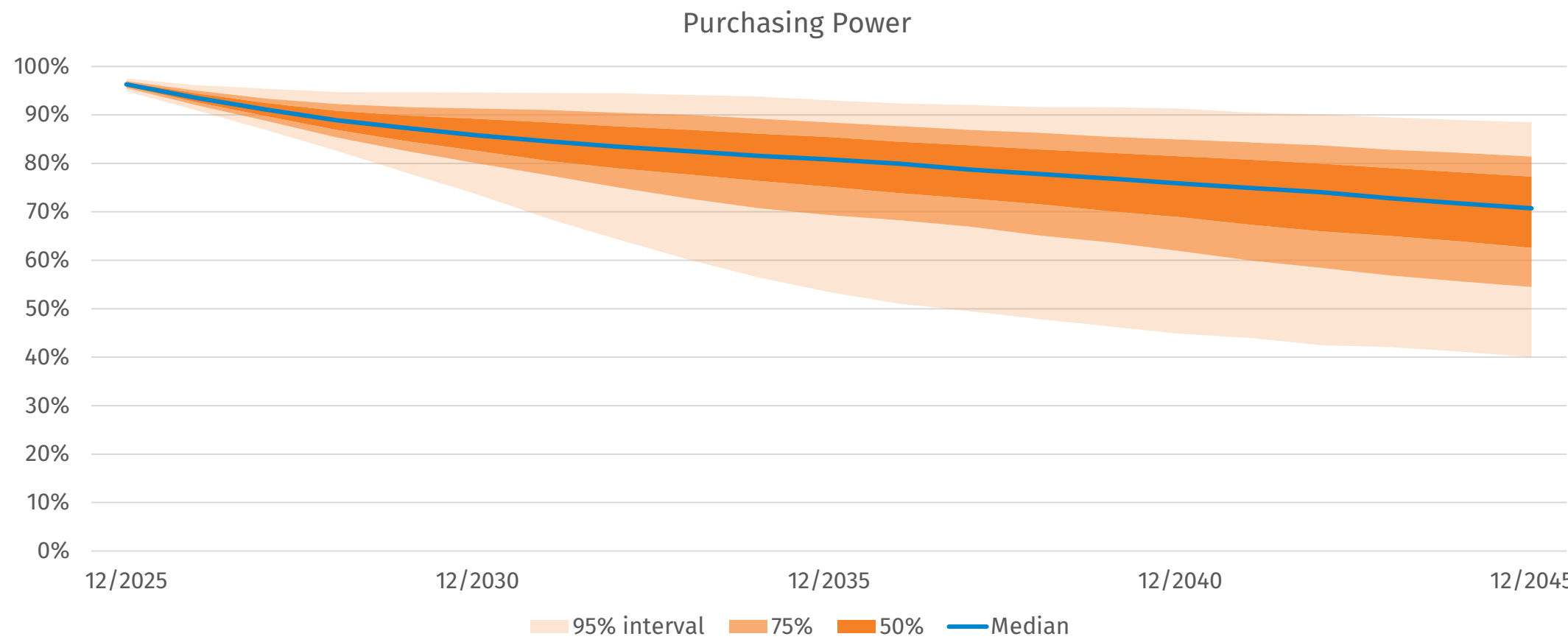
Realized Indexation

- Once the fund has shown outperformance (to the 6.5% target) over a 5-year trailing average, the available budget is used for cost-of-living adjustments if the funding ratio permits.
- In any given year, the probability of COLA is less than 50%.
- However, over time, **it is expected (median) that 17%, resp. 28% of the ambition is granted for the first 10 and first 20 years.**
 - In the 25% worst scenarios, this reduces to resp 4% and 15% or less.
 - In the 25% best scenarios, this increases to 34% and 42% or more.
- Next, we assess how this impacts retiree purchasing power.



Going Concern

Retiree Purchasing Power





Going Concern

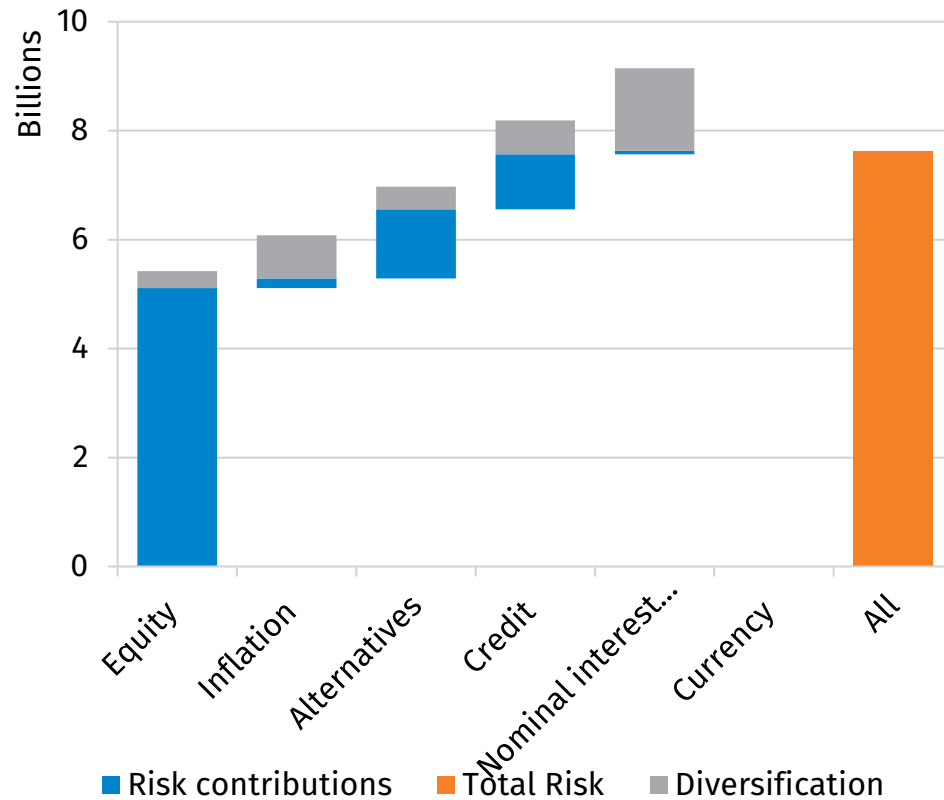
Retiree Purchasing Power commentary

- Shown is the development of the purchasing power retirees, starting at 100% at December 2024.
- Purchasing Power is calculated by taking the cumulative COLA granted and dividing this by cumulative inflation:
 - $(1 + \text{Cumulative indexation}) / (1 + \text{cumulative CPI})$
- Example: in the first year, inflation is around 3.5% but no indexation is granted.
 - $\text{Purchasing Power} = 1.000 / 1.035 = 96.6\%$
- Low purchasing power results are primarily driven by **high inflation scenarios, with lower-than-average investment returns**.
 - **Worst-case investment returns** lead to the worst-case funding ratios; but **purchasing power is only somewhat subdued**. This is possible, because inflation is typically moderate in these scenarios.
- We find that **high purchasing power** results are typically driven by either **high-return scenarios with moderate inflation**, or **low inflation scenarios with moderate investment returns**.

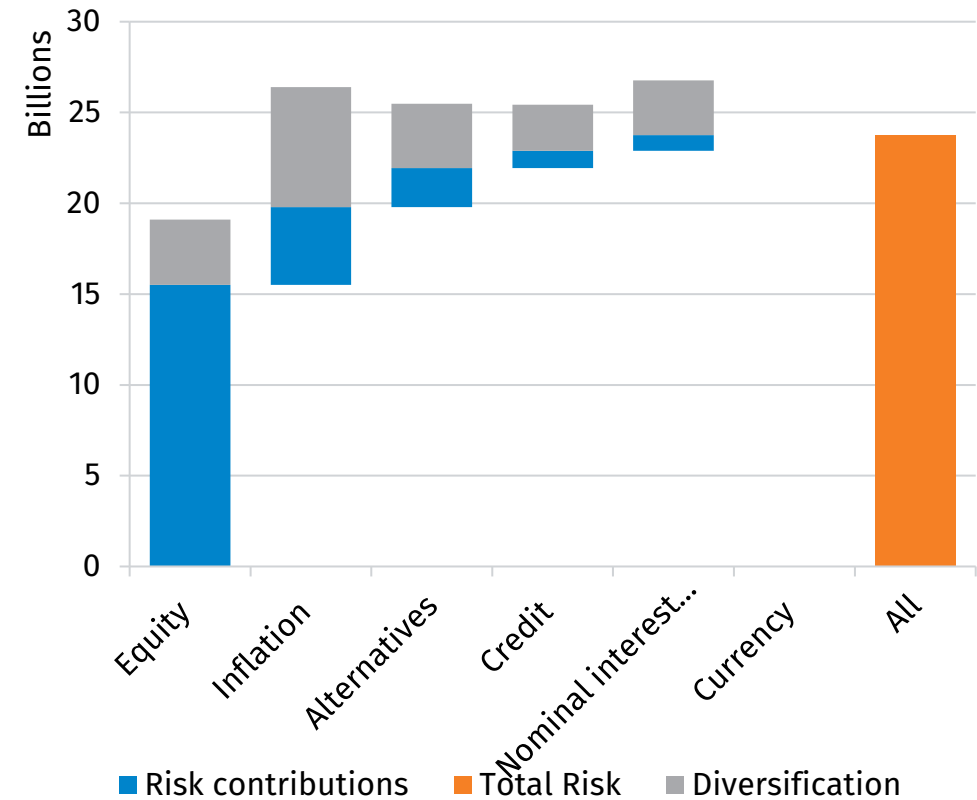
Going Concern

Risk decomposition

Surplus Risk Decomposition (5% CVaR) year 1



Surplus Risk Decomposition (5% CVaR) year 10





Going Concern

Risk decomposition

- On the previous slide we show the exposure to different risk factors (gross and marginal) of surplus (A-L), analyzed at a 1-year and a 10-year point (with risks cumulative up to that point)
- This is calculated by looking at the 5% lowest surplus (deficit) scenarios, both for the total portfolio, as well as risk factors in isolation (gross risk)
 - By looking at the difference between the total balance sheet risk and that of individual components, we can calculate the net risk and diversification of risks per risk source
- In the 5% worst case scenarios deficits are on average USD 8bn at 1-year, and USD 24bn at 10-years. As a point of reference, average asset value is USD 44bn resp. 64bn in those years.
 - These losses are for the largest part driven by equity returns.
- Inflation is the second highest risks. In isolation, this can result in a deficit of about USD 1 bn 1-year, and USD 11 bn over 10-years. However, typically when the worst equity returns occur, inflation-driven losses are smaller (diversification).
- Currency risk is present in the Equity ACWI portfolio. However, as this asset is modelled in USD only, this risks does not show up in our analysis. Typically, we find that most of the currency risk diversifies well against other risks.



Strategic Asset Allocation Analyses



Strategic Asset Allocation

Process

- Goal is to identify a Strategic Asset Allocation that ensures long-term continuity while minimizing risk, within the bounds of practical limitations
 - Continuity and risk are measured by the investment return, funding ratio, employer contributions, and COLA
- NCRS presents two Model Portfolios for the Board's consideration. These portfolios are informed by:
 - Optimization runs
 - Peer portfolios analysis
 - Qualitative considerations
- To check the robustness of the Model Portfolios we look at ALM metrics and Risk Decomposition (and stress scenarios at a later date)
- For each Model Portfolio a Reference Portfolio is defined, containing 2 asset classes: Equity ACWI / US Treasuries (5+)
 - Based on investment volatility
 - This functions as a benchmark, based on liquid public assets

Strategic Asset Allocation

Optimization approach

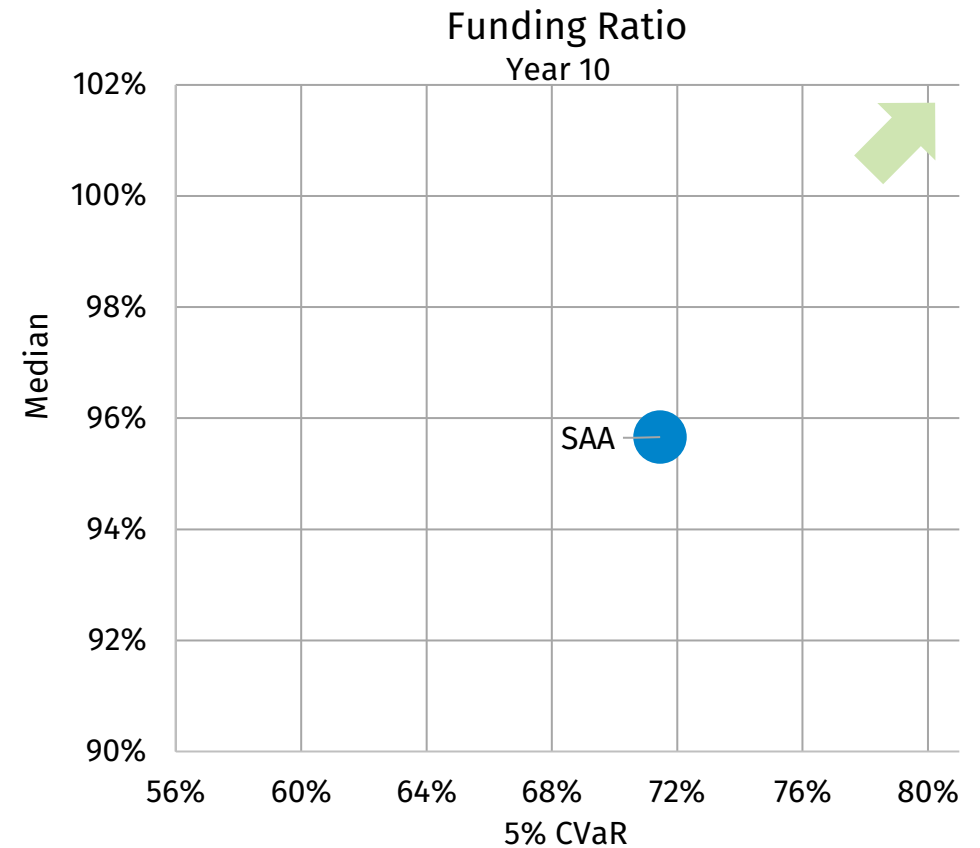
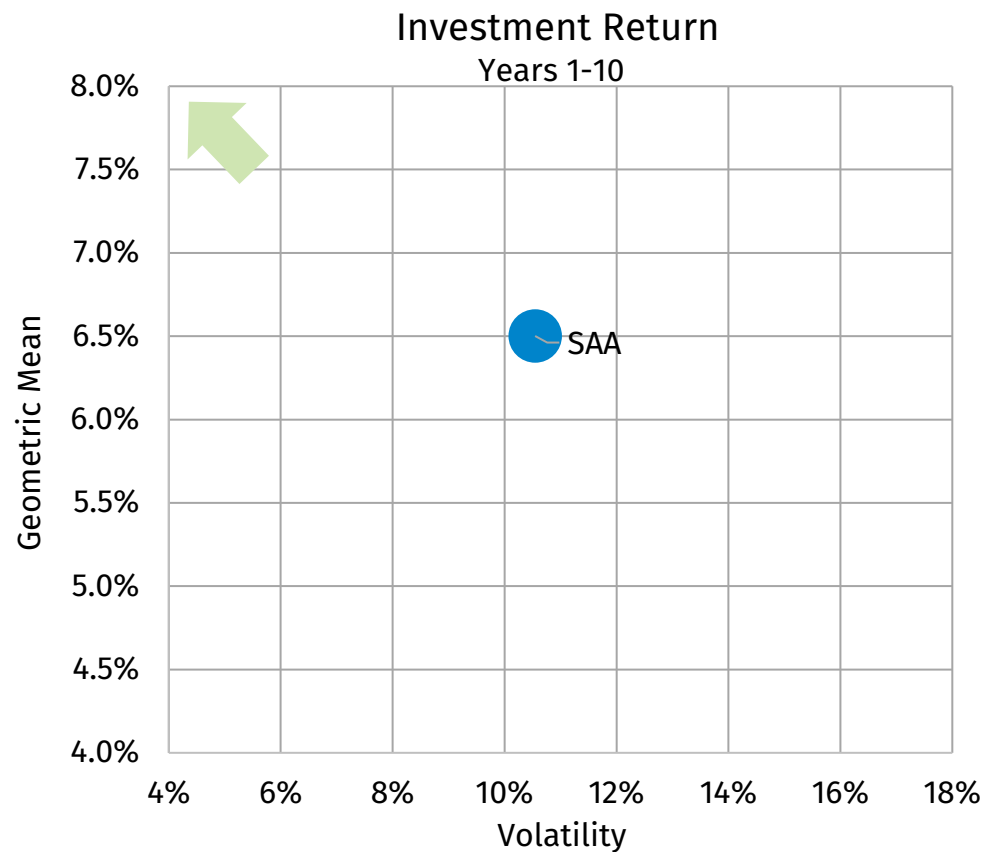
- We are optimizing funding ratio return vs risk.
 - Risk is defined as 5% conditional value at risk (CVaR).
 - Generating 10 Optimal Portfolios (OP).
- Allocations are restricted to achieve realistic portfolios.
- Allocations are restricted 40% illiquidity scoring in total.
 - Each asset class has an illiquidity score which is multiplied with the asset weight.
- Focus is on 10-year. As robustness check, we also optimized over a 20-year period (appendix).
- Optimizers provide useful insights. However, any outcome of an optimization model (and financial models in general) needs to be interpreted carefully.

Optimizer Constraints			
Asset Class	Min	Max	Illiquid %
Public Equity	20.00%	80.00%	
Global Equity	0.00%	100.00%	0%
Private Equity	0.00%	30.00%	
Buyout	30.00%	85.00%	100%
Venture	0.00%	35.00%	100%
Distressed	0.00%	10.00%	100%
Real Estate	0.00%	20.00%	
Value Added	20.00%	40.00%	100%
Opportunistic	30.00%	75.00%	100%
Core Real Estate US	0.00%	50.00%	80%
Credit	0.00%	20.00%	
Performing Corporate	0.00%	100.00%	
High-Yield	0.00%	75.00%	0%
Leveraged Loans US	0.00%	75.00%	0%
Direct Lending	0.00%	50.00%	100%
Distressed	0.00%	35.00%	100%
Asset Based Financing	0.00%	75.00%	50%
IG Fixed Income	20.00%	40.00%	
US Treasuries 5+	10.00%	50.00%	0%
IG Corporate Credits US 5+	10.00%	50.00%	0%
Mortgages US	10.00%	50.00%	0%
IG Cash	0.00%	10.00%	0%
Pension Cash	0.00%	10.00%	
Pension Cash	0.00%	100.00%	0%
Real Assets	0.00%	20.00%	
US TIPS	0.00%	10.00%	0%
Private Natural Resources	0.00%	75.00%	
Commodities (Bloomberg)	0.00%	25.00%	0%
Gold	0.00%	10.00%	0%
Timberland	0.00%	10.00%	100%
Farmland	0.00%	25.00%	100%
Agriculture	0.00%	10.00%	100%
Energy	0.00%	100.00%	100%
Infrastructure	0.00%	75.00%	100%
Multi Strategy	0.00%	15.00%	50%

Strategic Asset Allocation

Investment return & funding ratio

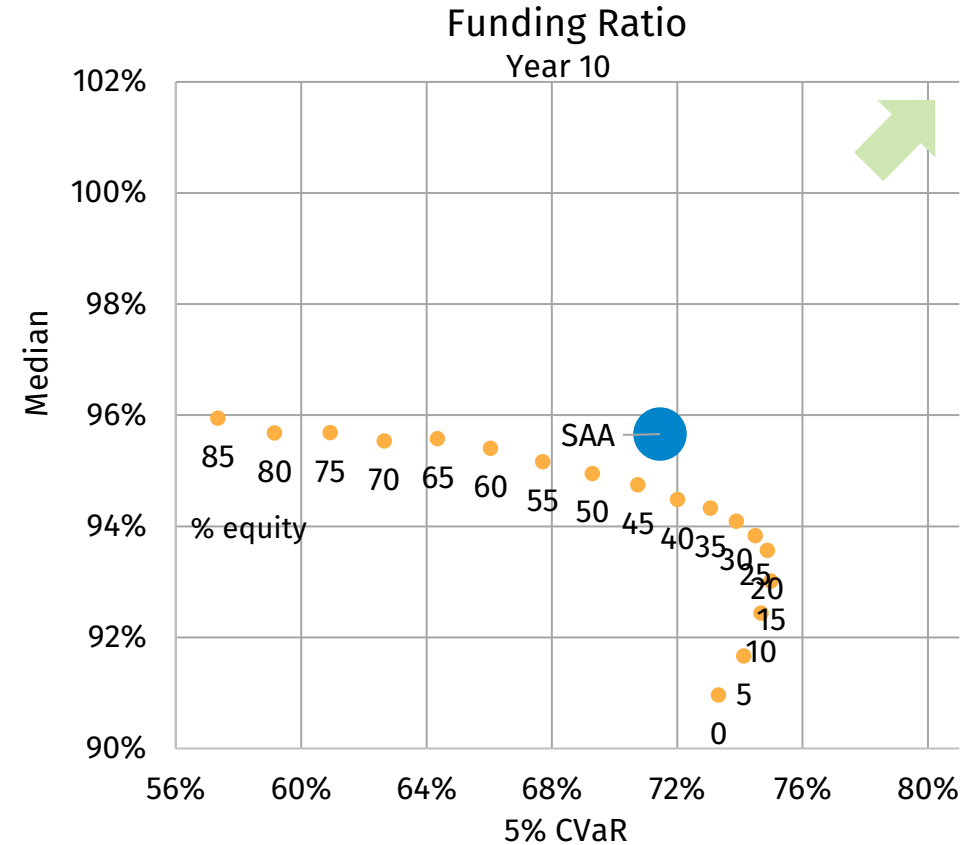
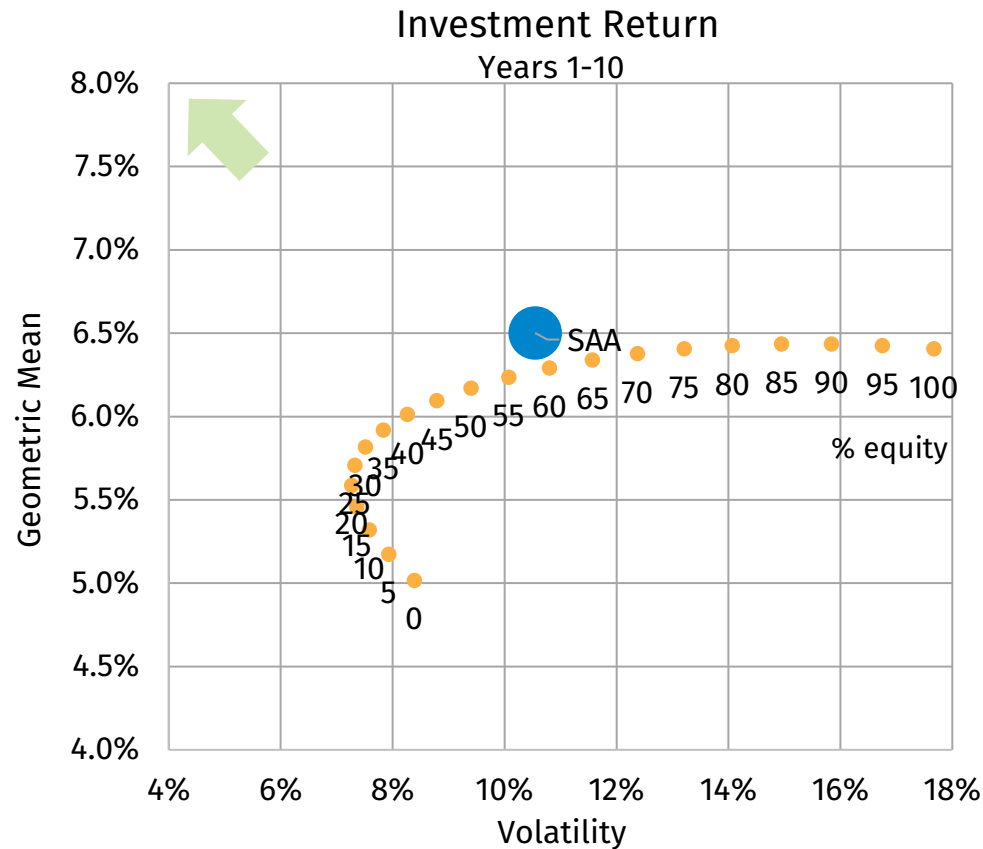
Focusing on the SAA alone



Strategic Asset Allocation

Investment return & funding ratio

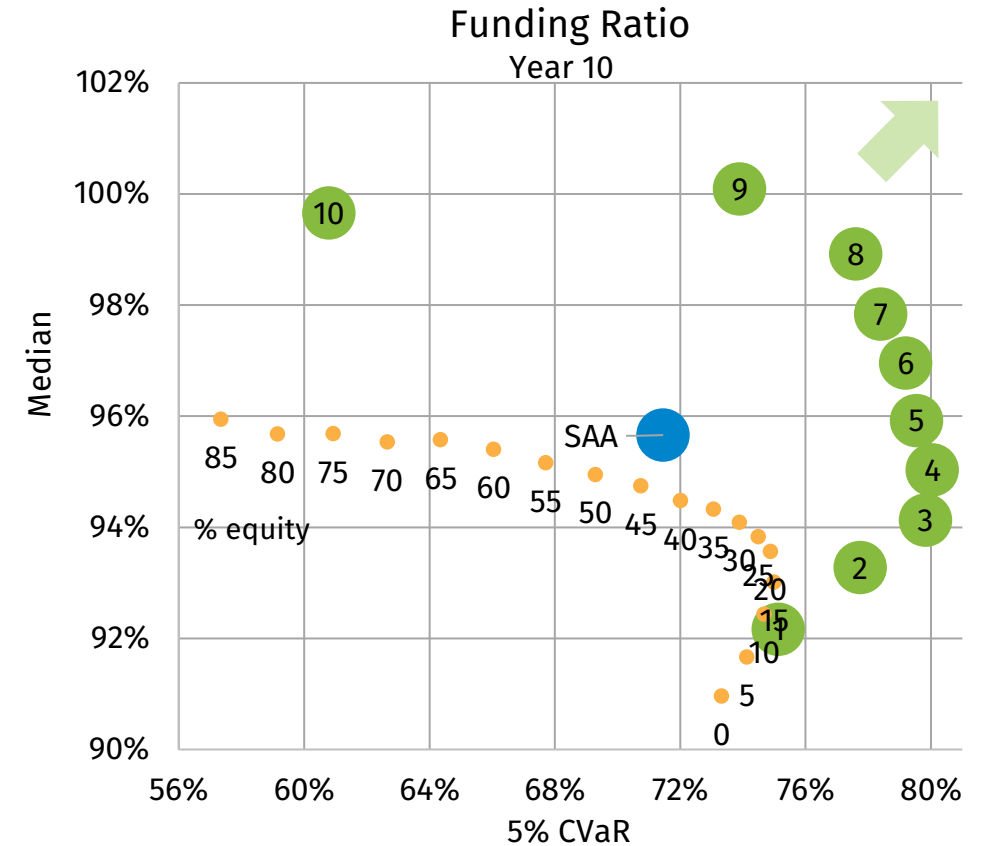
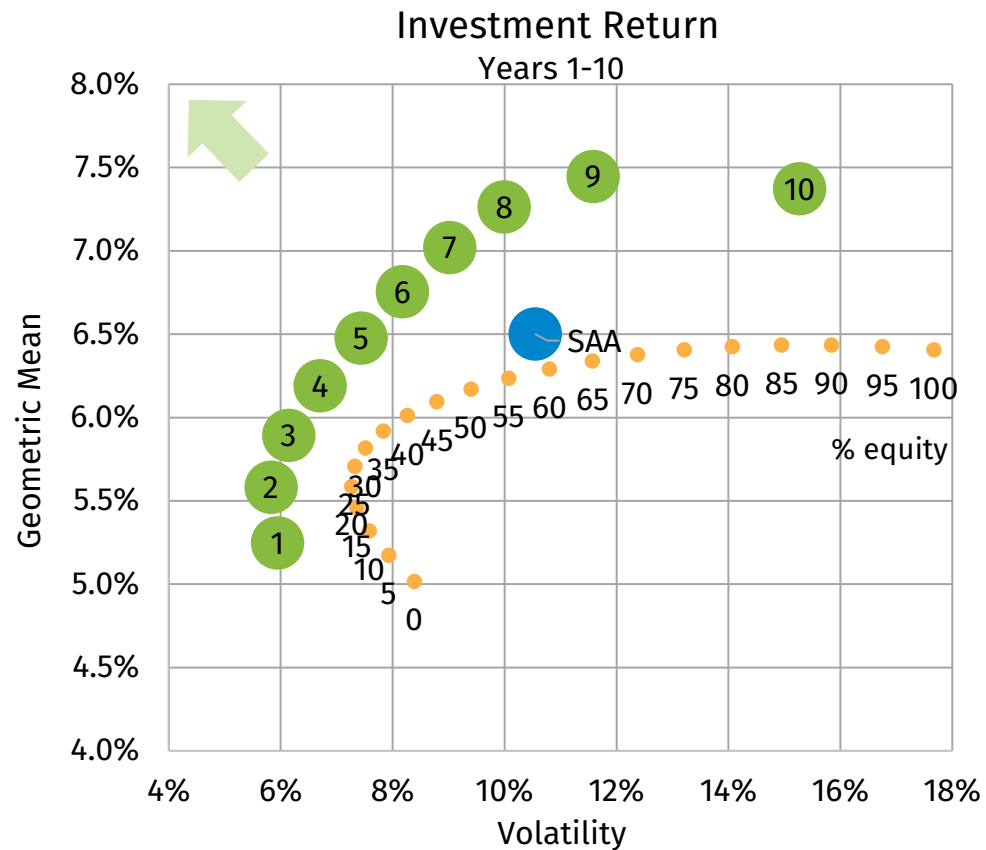
Incorporating reference portfolios where the number represents the proportion held in US equity, and the remaining in US treasuries



Strategic Asset Allocation

Investment return & funding ratio

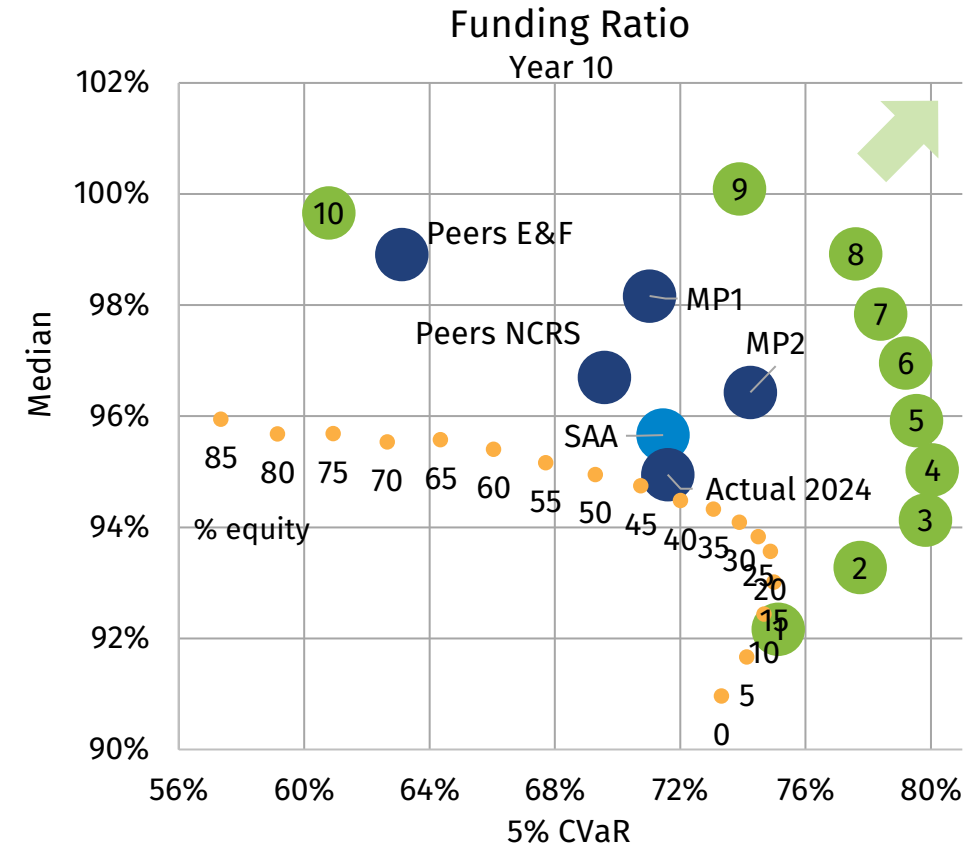
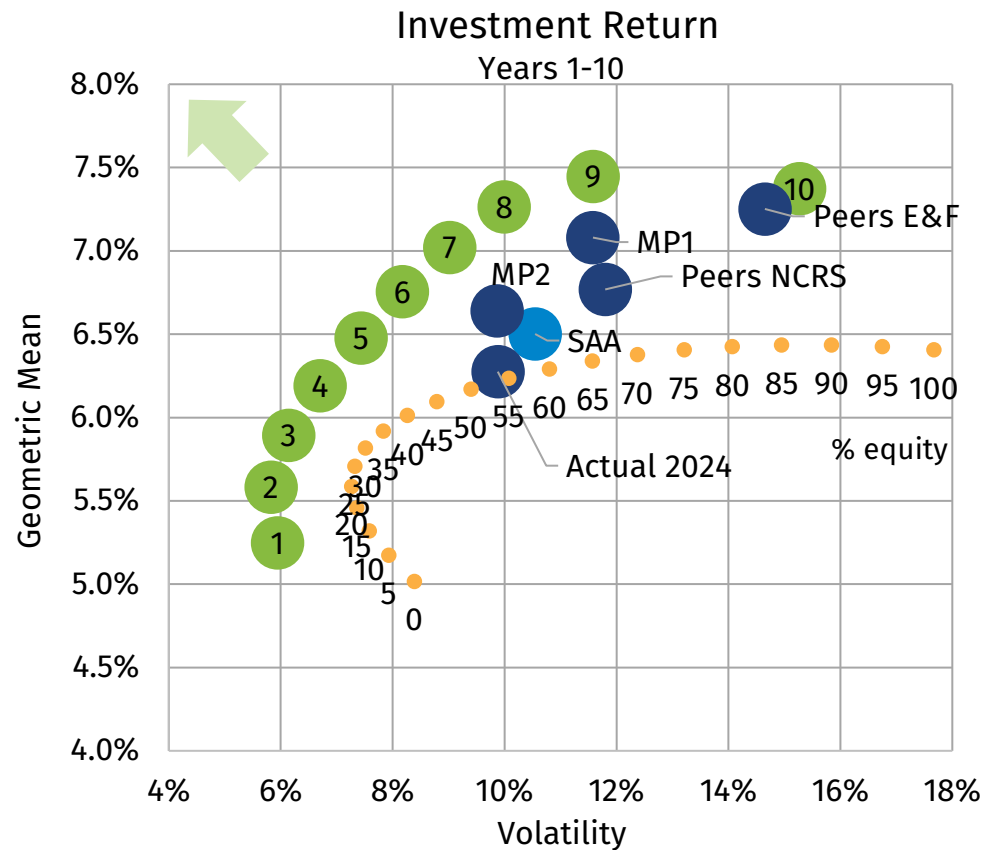
The optimized portfolios create the efficient frontier within the portfolio space



Strategic Asset Allocation

Investment return & funding ratio

Finally, NCRS target portfolios and peer portfolios can be modelled against the current SAA and the optimized portfolios





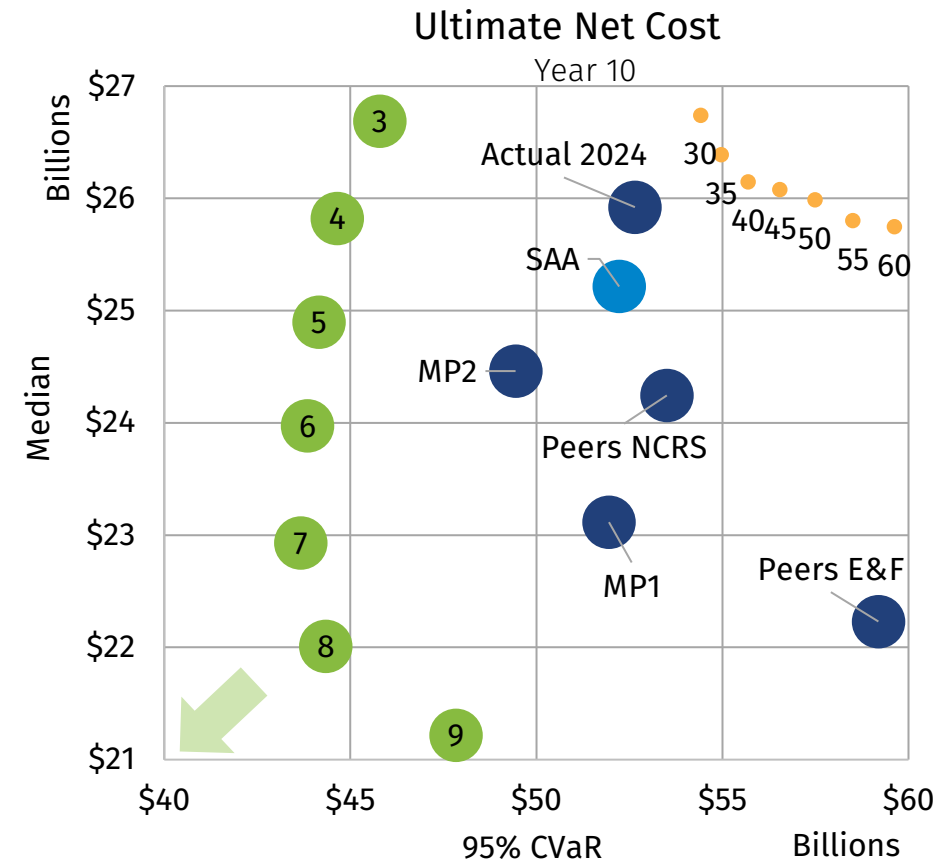
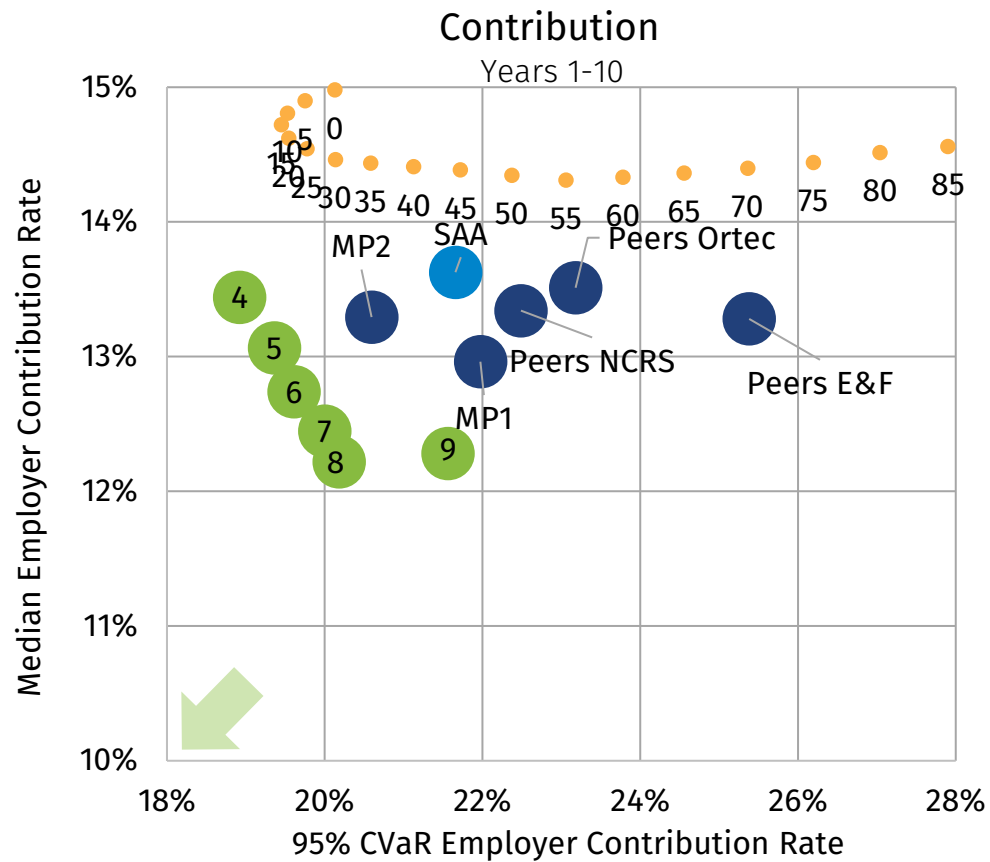
Strategic Asset Allocation

Investment return & funding ratio commentary

- As a starting point, we find that the SAA generates an average investment return of 6.5% and volatility of 10.5%.
 - In terms of investment risk, the SAA is comparable to a 60/40 Equity/Treasury mix (Reference Portfolio).
- The efficient frontier shows that the same return as SAA can be achieved at an investment return volatility of 7.5% (OP5) and that for the same level of risk a geometric return of 7.3% can be generated (OP8).
 - In Funding Ratio terms, the OP5-OP8 range also shows significant improvements. OP9 may be interesting too, however, this portfolio sits rather close to the 40% illiquidity constraint.
- The peer portfolios show a similar or worse risk/return efficiency as the SAA, albeit at higher return levels (esp. E&F).
- Based on the optimization results, results from peer portfolios, and qualitative considers, NCRS created MP1 and MP2.
 - MP1 focusses on return – improving the central expectation (Reference Portfolio 65% equity).
 - MP2 focusses on risk – reducing downside risks (Reference Portfolio 55% equity).
- On the next slides, we zoom in on the most relevant part of the efficient frontier (OP4-OP9).

Strategic Asset Allocation

Employer Contributions



Strategic Asset Allocation

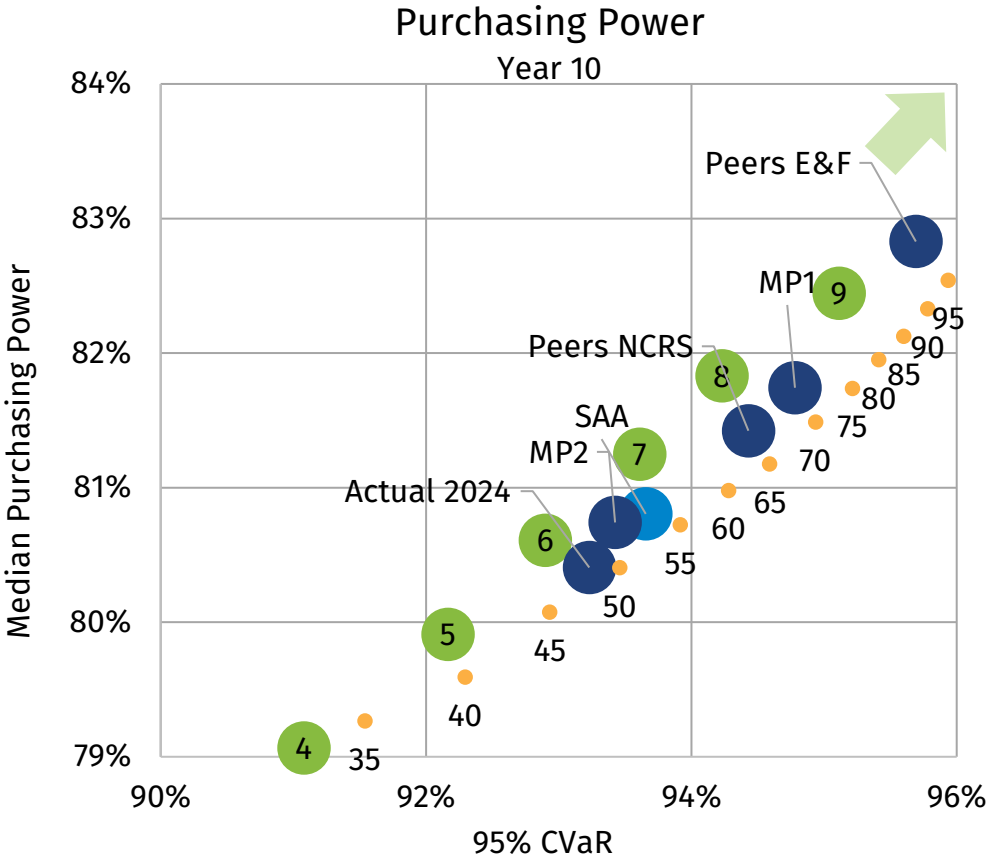
Employer Contributions commentary

- Part of the 'efficiency gains' of the Optimized Portfolios end up in lower employer contributions (other parts being visible in higher Funding Ratio and COLA).
 - Note that OP9 ceased to be efficient: risk is getting the upper hand
- MP1 and MP2 reduce the expected contributions by about 0.7% and 0.3% of payroll respectively (with MP2 also showing lower contributions in worst-case scenarios).
 - Combined with higher the higher funding ratios these portfolios achieve this results in a lower Ultimate Net Cost
- Peer Portfolios, are inefficient in the context of LGERS' balance sheet and policies, and the resulting contributions



Strategic Asset Allocation

Cost of living adjustments





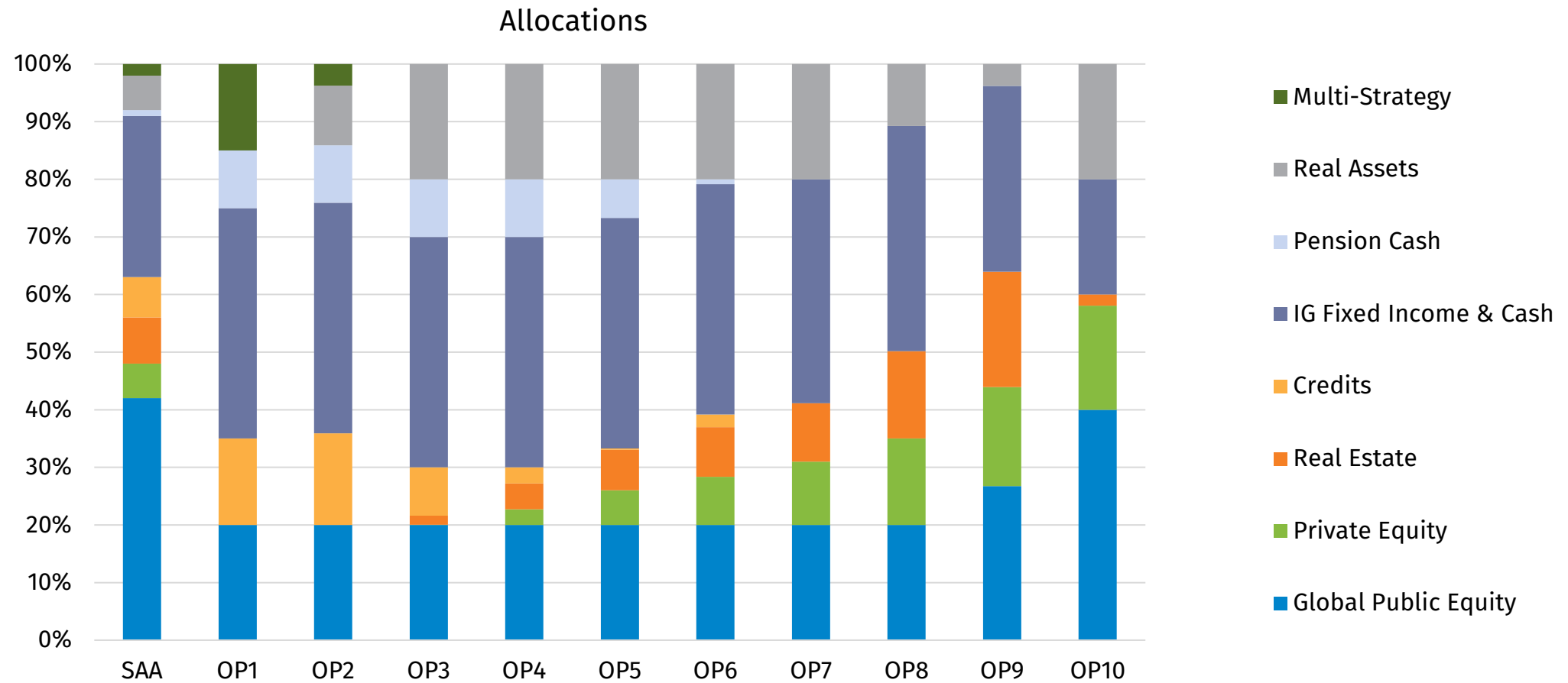
Strategic Asset Allocation

Cost of living adjustments commentary

- There is a linear relation between investment returns and the amount of COLA that can be granted.
 - This is true not only for the central expectation, but also for the worst-case COLA results. Higher investment risk, in the long term leads to more/higher cost-of living-adjustments even in worst case scenarios and thereby less purchasing power risk.
- However, note that the room for improvement by means of investment strategy is limited. Even with the rather aggressive asset mix of peer group Endowments & Foundations, this only improves purchasing power by 2% over a 10-year horizon, compared to the SAA.

Strategic Asset Allocation

Allocations – high level



Strategic Asset Allocation

Allocations – detailed

Optimized Allocations	SAA	MP1	MP2	Peers NCRS	Peers E&F	Actual 2024	OP4	OP5	OP6	OP7	OP8	OP9
Global Public Equity	42.0%	32.0%	30.0%	43.0%	27.9%	41.2%	20.0%	20.0%	20.0%	20.0%	20.0%	26.8%
Private Equity	6.0%	12.0%	7.0%	13.0%	33.6%	4.8%	2.7%	6.0%	8.4%	11.0%	15.0%	17.2%
Private Equity Buy-Out US	2.7%	8.0%	5.0%	5.9%	19.5%	2.2%	1.8%	3.9%	5.4%	6.6%	8.5%	9.5%
Private Equity Venture Capital US	1.5%	4.0%	2.0%	3.2%	14.1%	1.2%	0.9%	2.1%	2.9%	3.8%	5.3%	6.0%
Distressed Debt	1.8%	0.0%	0.0%	3.9%	0.0%	1.4%	0.0%	0.0%	0.0%	0.5%	1.3%	1.7%
Real Estate	8.0%	7.0%	7.0%	9.0%	5.7%	6.6%	4.5%	7.1%	8.6%	10.2%	15.1%	20.0%
Value Added Real Estate US	1.1%	2.0%	1.0%	1.2%	0.0%	0.8%	1.1%	1.8%	2.2%	2.5%	3.8%	5.0%
Opportunistic Real Estate US	2.0%	5.0%	3.0%	2.2%	5.7%	0.8%	3.4%	5.3%	6.5%	7.6%	11.4%	15.0%
Core Real Estate US	5.0%	0.0%	3.0%	5.6%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Credits	7.0%	9.0%	9.0%	7.5%	1.2%	6.3%	2.8%	0.2%	2.2%	0.0%	0.0%	0.0%
Performing Corporate	5.3%	3.0%	3.0%	5.6%	1.2%	4.8%	0.9%	0.1%	0.6%	0.0%	0.0%	0.0%
High-Yield (dur 3.9)	2.1%	1.0%	1.0%	2.2%	1.2%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Leveraged Loans US	2.1%	1.0%	1.0%	2.2%	0.0%	1.9%	0.6%	0.0%	0.4%	0.0%	0.0%	0.0%
Direct Lending US	1.1%	1.0%	1.0%	1.1%	0.0%	1.0%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%
Distressed Debt (dur 3.3)	1.8%	3.0%	3.0%	1.9%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Asset Based Financing (dur 6.6)	0.0%	3.0%	3.0%	0.0%	0.0%	0.0%	1.9%	0.2%	1.7%	0.0%	0.0%	0.0%
IG Fixed Income & Cash (dur 7.3)	28.0%	25.0%	30.0%	19.0%	4.2%	27.0%	40.0%	40.0%	40.0%	38.9%	39.1%	32.2%
US Treasuries 5+ (dur 8.8)	7.6%	8.3%	10.0%	5.1%	0.0%	7.3%	20.0%	20.0%	20.0%	19.4%	19.5%	16.1%
IG Corporate Credits US 5+ (dur 8.8)	8.8%	8.3%	9.0%	6.0%	4.2%	8.5%	4.0%	4.0%	4.0%	3.9%	15.6%	12.9%
Mortgages US (dur 6.8)	8.8%	8.3%	10.0%	6.0%	0.0%	8.5%	12.0%	12.0%	12.0%	15.5%	3.9%	3.2%
IG Non Core Cash	2.8%	0.0%	1.0%	1.9%	0.0%	2.7%	4.0%	4.0%	4.0%	0.0%	0.0%	0.0%
Pension Cash	1.0%	1.0%	1.0%	1.0%	2.2%	7.3%	10.0%	6.7%	0.8%	0.0%	0.0%	0.0%
Real Assets	6.0%	11.0%	9.0%	5.5%	6.9%	4.7%	20.0%	20.0%	20.0%	20.0%	10.8%	3.8%
US TIPS (dur 2.1)	1.5%	0.0%	0.0%	1.4%	0.0%	1.2%	2.0%	2.0%	2.0%	0.0%	0.0%	0.0%
Private Natural Resources	3.0%	5.0%	3.0%	2.8%	3.2%	2.4%	8.2%	6.6%	6.0%	5.9%	2.7%	2.9%
Commodities (Bloomberg)	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	2.0%	1.7%	1.5%	1.5%	0.7%	0.7%
Gold	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.7%	0.6%	0.6%	0.3%	0.3%
Timberland	2.0%	0.0%	0.0%	1.8%	1.2%	1.6%	0.8%	0.7%	0.6%	0.6%	0.3%	0.0%
Farmland	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	1.7%	1.5%	1.5%	0.7%	0.0%
Agriculture	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.7%	0.6%	0.6%	0.0%	0.0%
Energy	1.0%	5.0%	2.0%	0.9%	2.0%	0.8%	1.6%	1.3%	1.2%	1.2%	0.8%	1.9%
Private Infrastructure	1.5%	6.0%	6.0%	1.4%	3.7%	1.2%	9.8%	11.4%	12.0%	14.1%	8.1%	1.0%
Multi-Strategy	2.0%	3.0%	7.0%	2.0%	18.3%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Strategic Asset Allocation

ALM risk measures – years 1-10

Risk Measures	SAA	MP1	MP2	Peers NCRS	Peers E&F	Actual 2024	65/35
Investment Return							
Geometric Mean	6.5%	7.1%	6.6%	6.8%	7.3%	6.3%	6.3%
Volatility	10.5%	11.6%	9.9%	11.8%	14.7%	9.9%	11.6%
5% CVaR (Annualized)	-14.9%	-15.7%	-13.2%	-16.8%	-19.6%	-13.8%	-17.1%
Probability of Return > 6.5%	49%	54%	50%	52%	55%	46%	49%
Funding Ratio*							
Median Funding Ratio	95.7%	98.2%	96.4%	96.7%	98.9%	94.9%	95.6%
5% CVaR Funding Ratio	71.5%	71.0%	74.2%	69.6%	63.1%	71.6%	64.4%
Probability FR > 85%	80%	82%	85%	79%	76%	80%	73%
Indexation*							
Purchasing Power Median	80.8%	81.7%	80.7%	81.4%	82.8%	80.4%	81.2%
Purchasing Power 95% CVaR	93.7%	94.8%	93.4%	94.4%	95.7%	93.2%	94.6%
Contributions							
Median Employer Contribution Rate	13.6%	13.0%	13.3%	13.3%	13.3%	13.9%	14.4%
95% CVaR Employer Contribution Rate	21.7%	22.0%	20.6%	22.5%	25.4%	21.5%	24.6%
Median Deficit Contribution (in Million USD)	624	537	603	579	487	659	625
Probability of Deficit Contribution	74%	70%	75%	72%	66%	76%	71%
Median Ultimate Net Cost (in billion USD)*	25	23	24	24	22	26	26
95% CVaR Ultimate Net Cost (in billion USD)*	52	52	49	54	59	53	61
Illiquidity							
Illiquidity %	21.3%	37.0%	30.4%	29.0%	55.4%	17.5%	0.0%

*End of period



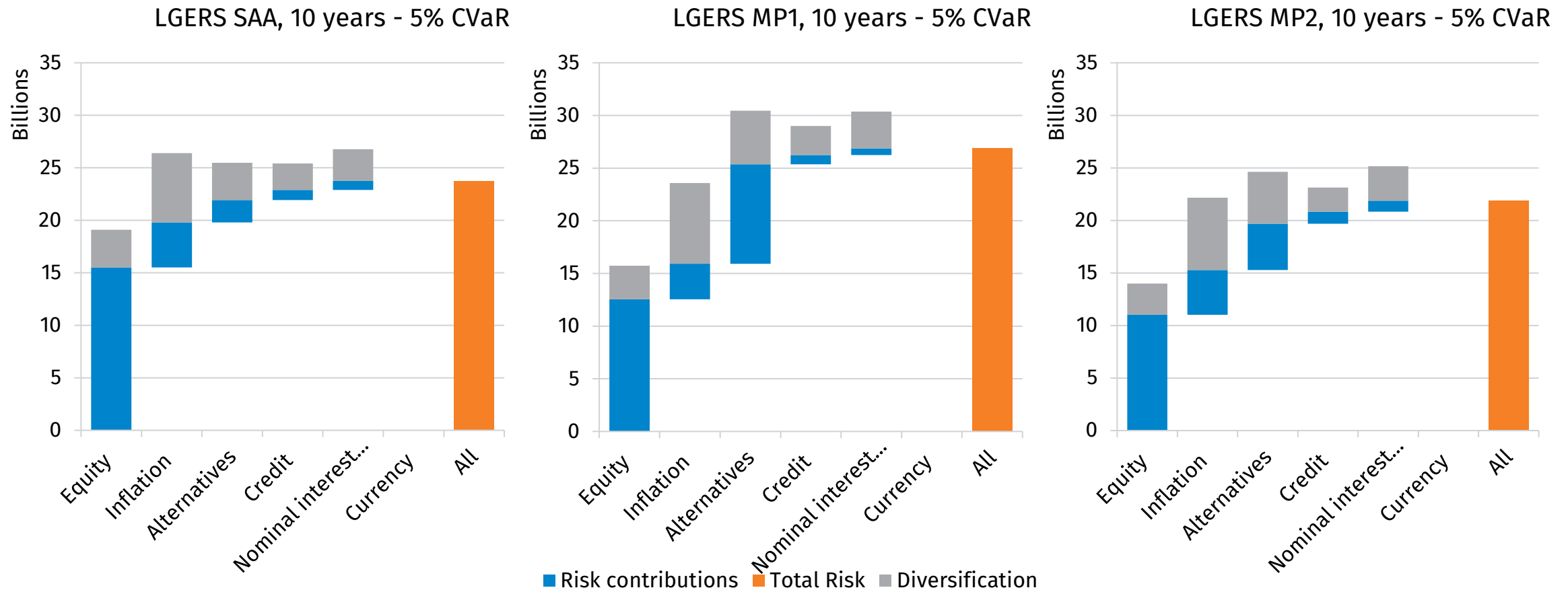
Strategic Asset Allocation

Allocations commentary

- Generally we see more Fixed Income, more Private/Real Assets, and less Public Equity
 - Fixed Income has an attractive risk/return outlook, driven by current interest rate levels
 - Within Real Assets, Infrastructure is attractive for its expected return rate in combination with its inflation correlation
 - Public Equity is “sacrificed” for assets with a stronger risk/return outlook, better diversification, or a stronger link to inflation
- In the risk averse portfolios, we see Multi Strategy, Cash and Credits.
 - Multi-strategy does show up only the most risk-averse portfolios. However, we also know that NCRS investments in this category have a higher risk / higher return profile than the series modelled (with similar risk/return ratio).
- Going towards riskier portfolios, these assets are exchanged for Real Estate, Private Equity, and (ultimately) Public Equity
 - Private Equity and Real Estate (esp. Value Add and Opportunistic) generate the returns required for these portfolios. Real Estate has the added benefit of its correlation with CPI in the long run
- Within Fixed Income, its Investment Grade that is the most attractive (Treasuries, IG credits and Mortgages)
 - Higher Yielding Credits become more attractive on the 20y horizon (especially Asset Based Financing).
- NCRS combined these insights with considerations around a.o. liquidity risk and implementation, to design MP1 and MP2.

Strategic Asset Allocation

Risk decomposition

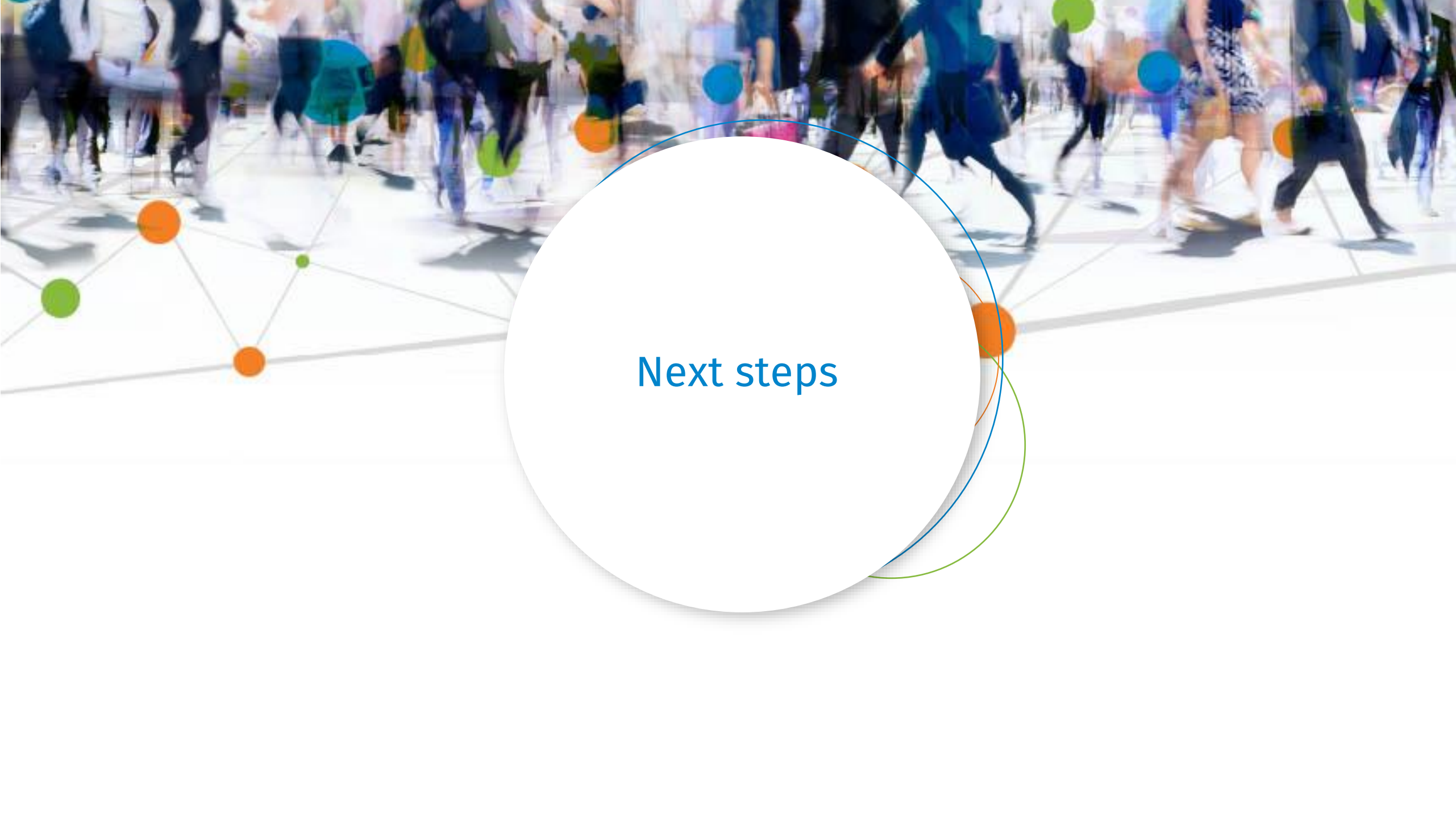




Strategic Asset Allocation

Risk decomposition commentary

- Finally, we zoom in on the risks of MP1 and MP2.
- Compared to the SAA, the overall risk goes up with MP1.
 - While Equity risk is reduced, the risk of alternative assets increases.
 - Ultimately this does result in better results for the central expectation.
- Compared to the SAA, the overall risk goes down with MP2.
 - While alternatives risk goes up, this is more than offset by lower equity risk.
 - Despite this lower risk-taking, the expected outcomes of MP2 are comparable or better than SAA.
- Both MP1 and MP2 show a clear improvement compared to the current SAA with higher expected outcomes and/or lower expected risks.

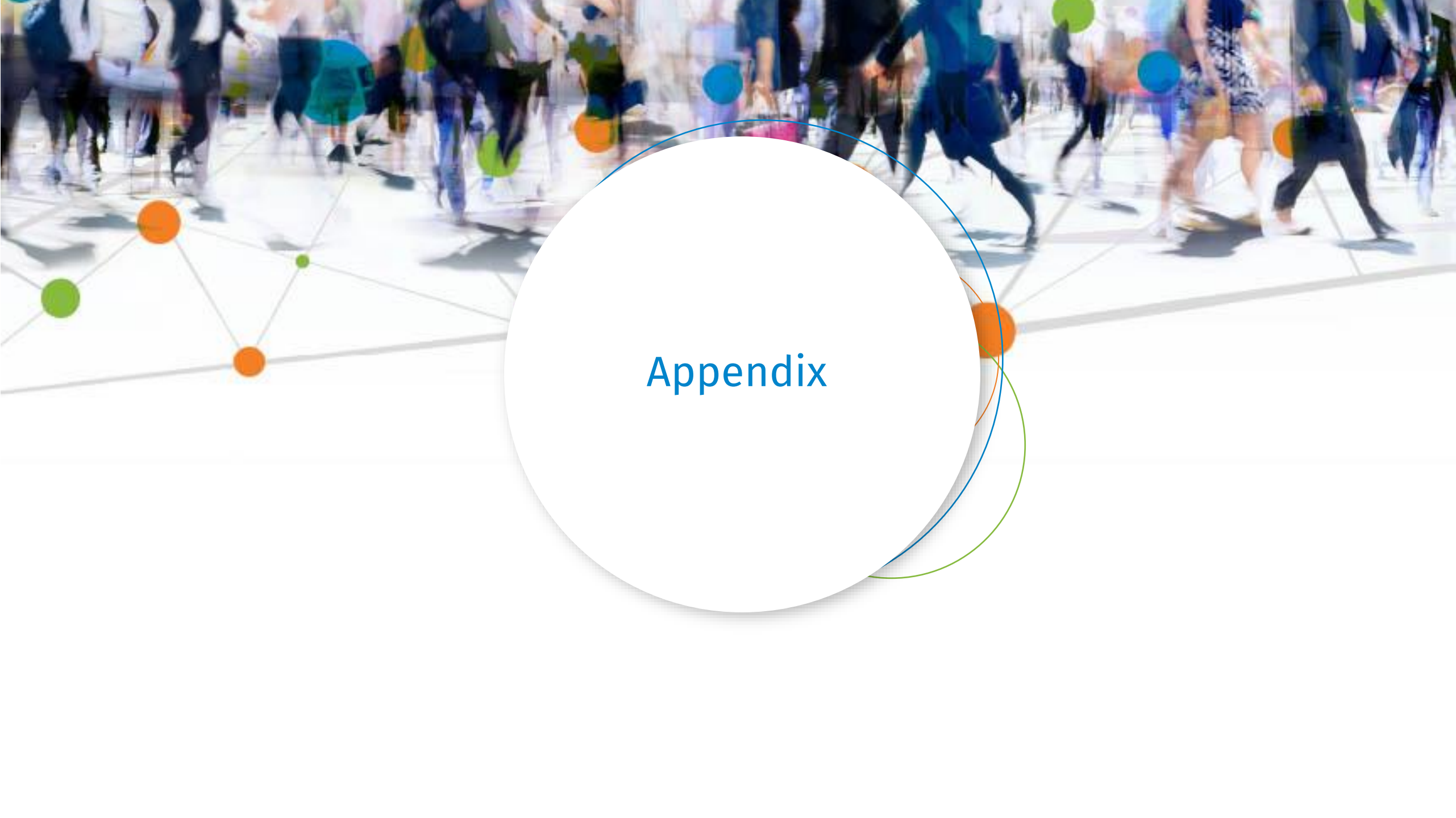


Next steps



Next steps

- Incorporate feedback.
- Sensitivity analyses and stress testing.
- Final decisions on strategic risk operating range, reference portfolio, and SAA.
- Preparations for regular ALM reporting.



Appendix

Appendix

Allocations – 20-year optimization (delta to 10-year allocations)

Optimized Allocations	SAA	OP4	OP5	OP6	OP7	OP8	OP9
Global Public Equity	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%
Private Equity	0.0%	2.0%	0.7%	1.6%	1.7%	3.0%	2.7%
Private Equity Buy-Out US	0.0%	1.3%	0.4%	0.0%	0.3%	1.4%	1.5%
Private Equity Venture Capital US	0.0%	0.7%	0.2%	0.6%	0.6%	1.1%	0.9%
Distressed Debt	0.0%	0.0%	0.0%	1.0%	0.8%	0.6%	0.3%
Real Estate	0.0%	-0.7%	-2.1%	-2.5%	-2.2%	-2.1%	-4.0%
Value Added Real Estate US	0.0%	-0.2%	-0.5%	-0.6%	-0.5%	-0.5%	-1.0%
Opportunistic Real Estate US	0.0%	-0.5%	-1.6%	-1.8%	-1.6%	-1.6%	-3.0%
Core Real Estate US	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Credits	0.0%	0.6%	5.7%	2.4%	5.9%	5.3%	7.8%
Performing Corporate	0.0%	0.0%	1.4%	-0.6%	0.0%	0.0%	2.1%
High-Yield (dur 3.9)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%
Leveraged Loans US	0.0%	0.0%	1.1%	-0.4%	0.0%	0.0%	0.5%
Direct Lending US	0.0%	0.0%	0.4%	-0.1%	0.0%	0.0%	0.0%
Distressed Debt (dur 3.3)	0.0%	0.0%	0.0%	1.1%	1.5%	1.3%	2.7%
Asset Based Financing (dur 6.6)	0.0%	0.6%	4.3%	1.8%	4.4%	3.9%	2.9%
IG Fixed Income & Cash (dur 7.3)	0.0%	0.0%	0.0%	-0.7%	-2.8%	-1.6%	-4.4%
US Treasuries 5+ (dur 8.8)	0.0%	0.0%	0.0%	-0.3%	-1.4%	-0.8%	-2.2%
IG Corporate Credits US 5+ (dur 8.8)	0.0%	0.0%	0.0%	-0.1%	-0.3%	-0.6%	-1.7%
Mortgages US (dur 6.8)	0.0%	0.0%	0.0%	-0.2%	-1.1%	-0.2%	-0.4%
IG Non Core Cash	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%
Pension Cash	0.0%	-1.5%	-4.3%	-0.8%	0.0%	0.0%	0.0%
Real Assets	0.0%	-0.4%	0.0%	0.0%	-2.6%	-4.6%	-3.8%
US TIPS	0.0%	0.0%	0.0%	-0.4%	0.0%	0.0%	0.0%
Private Natural Resources	0.0%	-1.8%	-0.5%	-0.4%	-0.8%	-1.1%	-2.9%
Commodities (Bloomberg)	0.0%	-0.4%	-0.1%	-0.1%	-0.2%	-0.3%	-0.7%
Gold	0.0%	-0.2%	-0.1%	0.0%	-0.1%	-0.1%	-0.3%
Timberland	0.0%	-0.2%	-0.1%	0.0%	-0.1%	-0.1%	0.0%
Farmland	0.0%	-0.4%	-0.1%	-0.1%	-0.2%	-0.3%	0.0%
Agriculture	0.0%	-0.2%	-0.1%	0.0%	-0.1%	0.0%	0.0%
Energy	0.0%	-0.4%	-0.1%	-0.1%	-0.2%	-0.3%	-1.9%
Private Infrastructure	0.0%	1.4%	0.5%	0.8%	-1.7%	-3.4%	-1.0%
Multi-Strategy	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Appendix

ALM risk measures – years 1-20

Risk Measures	SAA	MP1	MP2	Peers NCRS	Peers E&F	Actual 2024	65/35
Investment Return							
Geometric Mean	6.4%	7.0%	6.6%	6.7%	7.1%	6.2%	6.1%
Volatility	10.8%	11.7%	10.0%	12.0%	14.8%	10.1%	11.8%
5% CVaR (Annualized)	-15.3%	-16.1%	-13.6%	-17.1%	-19.9%	-14.2%	-17.8%
Probability of Return > 6.5%	49%	55%	50%	52%	55%	46%	49%
Funding Ratio*							
Median Funding Ratio	98.3%	104.6%	99.1%	101.6%	108.5%	96.2%	97.6%
5% CVaR Funding Ratio	67.7%	68.1%	70.2%	66.8%	61.3%	67.6%	60.2%
Probability FR > 85%	77%	82%	80%	79%	77%	75%	69%
Indexation*							
Purchasing Power Median	70.7%	72.8%	70.6%	72.2%	74.1%	69.9%	70.9%
Purchasing Power 95% CVaR	89.3%	91.1%	88.9%	90.8%	92.9%	88.5%	90.2%
Contributions							
Median Employer Contribution Rate	11.2%	10.1%	10.9%	10.7%	10.1%	11.7%	11.8%
95% CVaR Employer Contribution Rate	23.9%	24.0%	22.5%	24.8%	28.7%	24.0%	28.0%
Median Deficit Contribution (in Million USD)	495	332	455	415	274	559	529
Probability of Deficit Contribution	66%	59%	65%	62%	56%	68%	64%
Median Ultimate Net Cost (in billion USD)*	47	39	45	43	38	49	50
95% CVaR Ultimate Net Cost (in billion USD)*	107	103	102	108	115	110	125
Illiquidity							
Illiquidity %	21.3%	37.0%	30.4%	29.0%	55.4%	17.5%	0.0%

*End of period

Appendix

Capital Market Assumptions – returns in USD, net of fees

June 2025 OFS Net of fees	Arithmetic return	Year 1-10 Geometric return	Volatility	Arithmetic return	Year 1-20 Geometric return	Volatility
Total assets	7.0%	6.5%	10.5%	7.0%	6.4%	10.8%
Global Public Equity	7.8%	6.4%	17.7%	7.7%	6.2%	18.0%
Private Equity US	10.0%	8.0%	21.7%	10.2%	8.2%	21.8%
Private Equity Buy-Out US	9.1%	6.4%	25.7%	9.0%	6.1%	25.8%
Private Equity Venture Capital US	12.4%	6.6%	40.0%	12.3%	6.2%	40.3%
Distressed Debt	9.3%	6.0%	27.6%	10.3%	6.9%	28.4%
Real Estate	8.3%	6.4%	20.9%	8.2%	6.2%	21.0%
Value Added Real Estate US	9.0%	7.0%	21.7%	8.7%	6.6%	21.9%
Opportunistic Real Estate US	10.6%	8.0%	25.0%	10.3%	7.6%	25.2%
Core Real Estate US	7.3%	5.7%	19.1%	7.2%	5.6%	19.3%
Credits	6.4%	5.5%	14.1%	7.1%	6.1%	14.7%
Performing Corporate	5.5%	5.0%	10.0%	6.0%	5.5%	10.5%
High-Yield (dur 3.8)	5.7%	4.9%	13.9%	6.5%	5.5%	14.5%
Leveraged Loans US	5.4%	5.0%	8.6%	5.8%	5.4%	8.9%
Direct Lending US	5.2%	4.9%	7.5%	5.6%	5.3%	7.8%
Distressed Debt (dur 3.3)	9.3%	6.0%	27.6%	10.3%	6.9%	28.4%
Asset Based Financing (dur 3.7)	7.2%	6.3%	14.2%	7.6%	6.6%	14.7%
IG Fixed Income & Cash (dur 6.9)	5.2%	5.0%	7.0%	5.1%	4.8%	7.1%
US Treasuries 5+ (dur 8.8)	5.3%	5.0%	8.4%	5.0%	4.6%	8.4%
IG Corporate Credits US 5+ (dur 8.8)	5.9%	5.4%	10.9%	5.9%	5.4%	11.2%
Mortgages US (dur 5.4)	4.9%	4.8%	6.0%	4.9%	4.7%	6.2%
IG Non Core Cash	3.6%	3.6%	1.7%	3.4%	3.4%	2.1%
Pension Cash	3.6%	3.6%	1.7%	3.4%	3.4%	2.1%
Real Assets	7.1%	6.6%	10.1%	6.9%	6.5%	10.2%
US TIPS (dur 2.1)	4.3%	4.2%	3.6%	3.9%	3.9%	3.9%
Private Natural Resources	7.8%	6.9%	14.5%	7.8%	6.8%	14.5%
Commodities (Bloomberg)	7.1%	5.6%	18.8%	6.5%	4.9%	18.8%
Gold	5.5%	3.4%	22.5%	5.2%	3.0%	22.7%
Timberland	6.1%	5.5%	12.5%	6.1%	5.4%	12.5%
Farmland	6.2%	5.7%	10.8%	6.0%	5.5%	10.8%
Agriculture	5.9%	3.6%	23.4%	5.4%	3.1%	23.4%
Energy	11.0%	6.5%	34.0%	11.0%	6.1%	34.0%
Private Infrastructure	8.4%	6.9%	19.5%	8.2%	6.5%	19.5%
Multi-Strategy	4.6%	4.3%	8.4%	4.5%	4.1%	8.5%

Appendix

Correlation over simulation horizon (Annual, 30 Years)

Correlation Matrix																			
OFS June 2025 Annual Years 1-30	Fund	Global Public Equity	Private Equity	Real Estate	Value Added Real Estate US	Opportunistic Real Estate US	Core Real Estate US	Credits	Performing Corporate	Distressed Debt	Asset Based Financing	IG Fixed Income & Cash	Pension Cash	Real Assets	US TIPS	Private Natural Resources	Private Infrastructure	Multi-Strategy	CPI US
Fund	1.00	0.94	0.71	0.50	0.50	0.50	0.50	0.60	0.61	0.55	0.54	0.37	-0.01	0.63	0.04	0.64	0.36	0.61	-0.05
Global Public Equity		1.00	0.61	0.33	0.33	0.33	0.33	0.40	0.42	0.36	0.36	0.14	-0.09	0.58	-0.03	0.63	0.28	0.55	-0.06
Private Equity			1.00	0.30	0.30	0.29	0.30	0.57	0.55	0.55	0.44	0.14	-0.03	0.38	0.03	0.41	0.18	0.47	0.04
Real Estate				1.00	1.00	1.00	1.00	0.31	0.32	0.29	0.21	0.08	-0.06	0.43	0.03	0.27	0.50	0.25	0.08
Value Added Real Estate US					1.00	1.00	1.00	0.31	0.32	0.29	0.21	0.08	-0.06	0.43	0.04	0.26	0.50	0.25	0.08
Opportunistic Real Estate US						1.00	1.00	0.31	0.32	0.29	0.21	0.08	-0.06	0.43	0.04	0.26	0.50	0.24	0.09
Core Real Estate US							1.00	0.32	0.32	0.29	0.21	0.08	-0.06	0.43	0.03	0.27	0.50	0.25	0.08
Credits								1.00	0.98	0.98	0.81	0.40	0.04	0.29	0.02	0.28	0.19	0.43	-0.12
Performing Corporate									1.00	0.92	0.80	0.41	0.09	0.31	0.05	0.30	0.20	0.45	-0.11
Distressed Debt										1.00	0.79	0.36	-0.03	0.26	-0.02	0.25	0.17	0.39	-0.14
Asset Based Financing											1.00	0.53	0.04	0.19	0.02	0.22	0.05	0.39	-0.18
IG Fixed Income & Cash												1.00	0.28	0.09	0.21	0.10	-0.02	0.25	-0.16
Pension Cash													1.00	0.10	0.53	0.04	0.04	0.17	0.25
Real Assets														1.00	0.21	0.88	0.74	0.38	0.20
US TIPS															1.00	0.07	0.13	0.13	0.55
Private Natural Resources																1.00	0.34	0.39	0.05
Private Infrastructure																	1.00	0.19	0.22
Multi-Strategy																		1.00	0.08
CPI US																			1.00

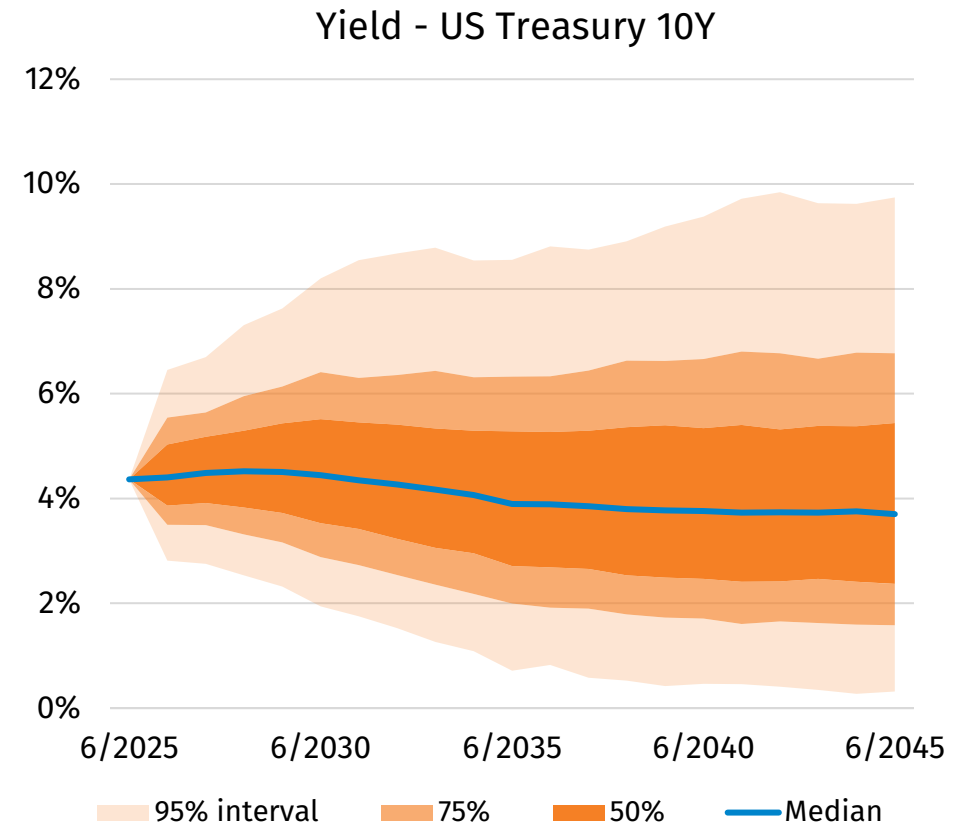
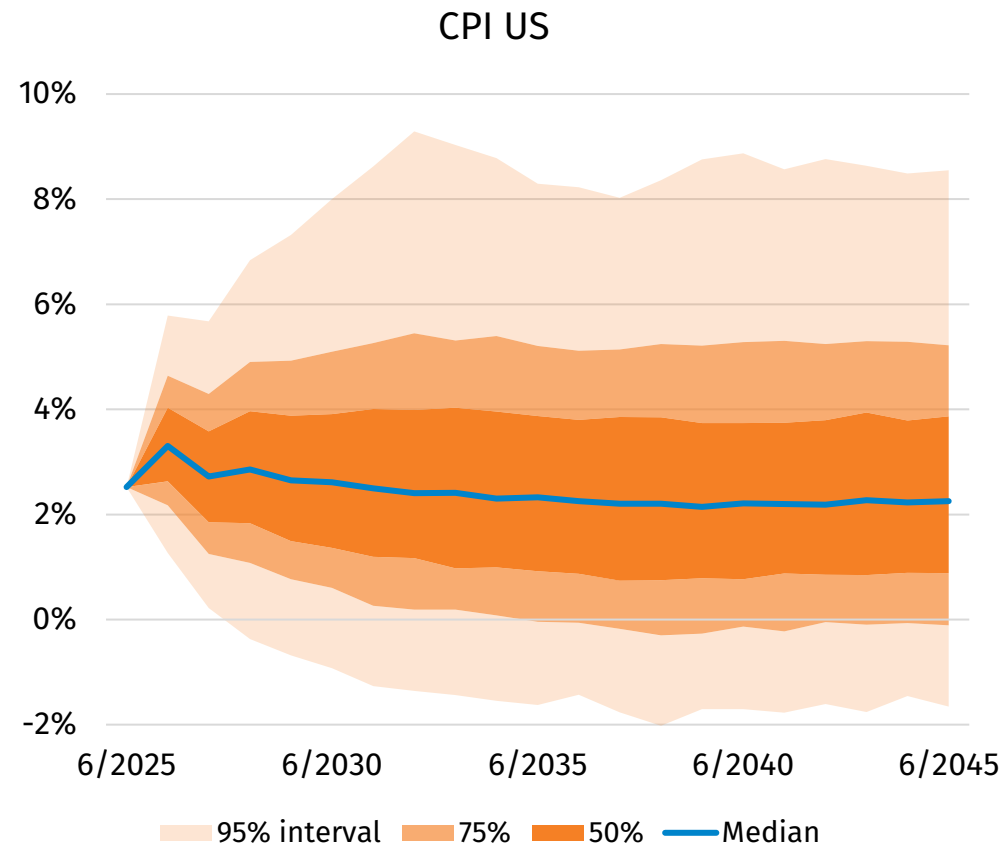
Appendix

Correlation over simulation horizon (Cumulative, 30 Years)

Correlation Matrix																			
OFS June 2025 Cumulative Years 1-30	Fund	Global Public Equity	Private Equity	Real Estate	Value Added Real Estate US	Opportunistic Real Estate US	Core Real Estate US	Credits	Performing Corporate	Distressed Debt	Asset Based Financing	IG Fixed Income & Cash	Pension Cash	Real Assets	US TIPS	Private Natural Resources	Private Infrastructure	Multi-Strategy	CPI US
Fund	1.00	0.84	0.73	0.34	0.33	0.29	0.37	0.37	0.46	0.14	0.40	0.46	0.53	0.66	0.53	0.72	0.26	0.67	0.36
Global Public Equity		1.00	0.59	0.13	0.13	0.11	0.15	0.09	0.15	-0.02	0.12	0.14	0.20	0.37	0.20	0.55	0.09	0.41	0.13
Private Equity			1.00	0.13	0.13	0.12	0.13	0.35	0.38	0.22	0.33	0.31	0.33	0.38	0.27	0.56	0.12	0.50	0.13
Real Estate				1.00	1.00	0.99	1.00	0.11	0.16	0.01	0.10	0.14	0.23	0.79	0.40	0.39	0.93	0.22	0.51
Value Added Real Estate US					1.00	0.99	0.99	0.10	0.15	0.01	0.10	0.13	0.22	0.78	0.39	0.38	0.94	0.22	0.48
Opportunistic Real Estate US						1.00	0.97	0.09	0.14	0.01	0.08	0.11	0.19	0.75	0.33	0.36	0.97	0.19	0.40
Core Real Estate US							1.00	0.11	0.17	0.00	0.11	0.15	0.25	0.81	0.44	0.40	0.89	0.24	0.55
Credits								1.00	0.96	0.84	0.76	0.80	0.71	0.32	0.60	0.27	0.09	0.53	0.27
Performing Corporate									1.00	0.69	0.78	0.87	0.85	0.42	0.72	0.37	0.13	0.65	0.33
Distressed Debt										1.00	0.56	0.51	0.34	0.10	0.29	0.08	0.02	0.22	0.11
Asset Based Financing											1.00	0.80	0.68	0.34	0.62	0.31	0.07	0.54	0.27
IG Fixed Income & Cash												1.00	0.86	0.42	0.77	0.38	0.10	0.65	0.33
Pension Cash													1.00	0.54	0.83	0.46	0.17	0.81	0.40
Real Assets														1.00	0.70	0.78	0.72	0.55	0.64
US TIPS															1.00	0.47	0.27	0.67	0.73
Private Natural Resources																1.00	0.33	0.56	0.34
Private Infrastructure																	1.00	0.17	0.31
Multi-Strategy																		1.00	0.32
CPI US																			1.00

Appendix

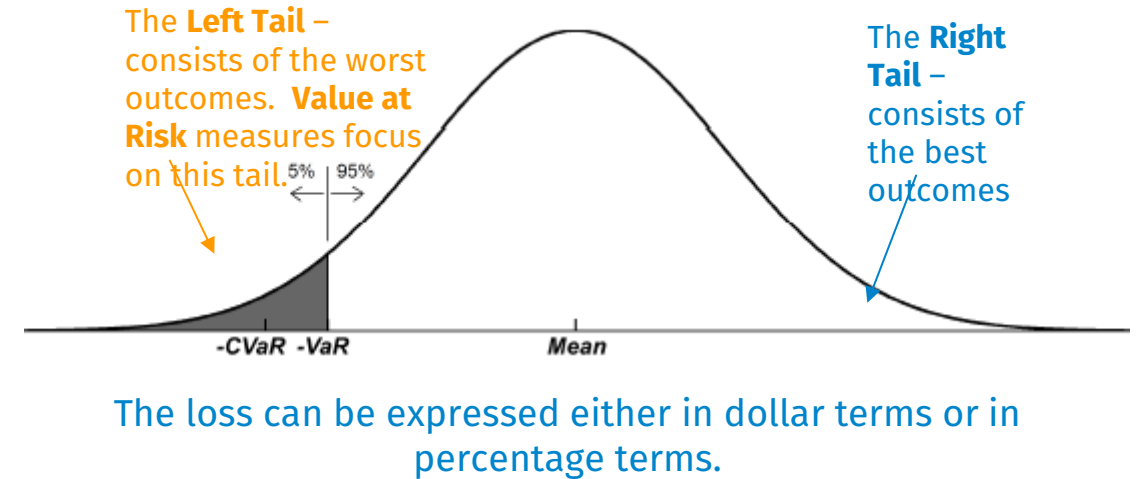
Development of key variables



Appendix

Definitions 1/2

- **Distribution** – asset returns occur over a range of outcomes or values. A distribution notes the likelihood of observing a certain value. Typically the mean is the most common with fewer observations farther from the mean. Typically, the distributions look like a bell. The ends of a distribution are often referred to as the “tails”.
- **Arithmetic Mean** – is just the average of all the possible outcomes. Computed as the sum of all the numbers in the series divided by the count of all numbers in the series.
- **Geometric mean** - sometimes referred to as compounded annual growth rate, is the average value which signifies the central tendency of the set of numbers by finding the product of their values.
- **Median** – value separating the higher half from the lower half of all outcomes. You can think of it as the ‘the middle’
- **Risk** – is a generic term referring to the likelihood of a loss. Higher risk generally refers to an increased likelihood of large losses.
- **Volatility** – is a measure depicting the range of possible return outcomes. In mathematical terms, it is referred to as the standard deviation of a distribution. The higher the volatility, the larger the range of outcomes, there is an increased likelihood of extreme outcomes.
- **VaR or Value at Risk** – Refers to a specific likelihood of a loss. For example, 5% VaR of \$1B refers to a 5% likelihood of losing at least \$1B. In mathematical terms, this would be referred to as the 5th percentile.
- **CVaR – Conditional Value at Risk** – refers to the average loss expected for a specific likelihood. For example, 5% CVaR of \$1.5B refers to a 5% likelihood of losing, on average, \$1.5B.





Appendix

Definitions 2/2

- **SAA** – Strategic Asset Allocation
- **CAA** – Current Asset Allocation
- **OP** – Optimized Portfolio
- **MP** – Model Portfolio
- **OFS** – Ortec Finance Scenarios – the stochastic scenario set used in this study



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