Board of Retirement Regular Meeting

Sacramento County Employees' Retirement System

Agenda Item 17

MEETING DATE: **February 19, 2025**

SUBJECT: **ALM Study**

SUBMITTED FOR: **___ Action** **__X__ Information**

RECOMMENDATION

Receive and file the Asset Liability Modeling (ALM) Study presentation by SCERS' staff and general investment consultant, Verus.

PURPOSE

This item supports the 2025 Annual Investment Plan, which identifies concluding the asset liability modeling study in the first half of 2025, and supports SCERS' Master Investment Policy Statement, which calls for an ALM study to be conducted at least every five years.

BACKROUND

At the December meeting, Verus provided the initial modeling for the ALM study that SCERS is undertaking. The presentation at the December Board meeting covered the following areas:

- A review of SCERS' historical experience over the past 10 years related to fund performance, net cash flows, and funded status.
- Incorporation of both asset data and liability data from SCERS' actuary consultant Segal.
- Deterministic projections, which take a forward look at the impact on SCERS' funded status and contributions across several return outcomes.
- Initial modeling by Verus showing several asset allocation mixes.
- A variety of stochastic and risk metrics across Verus' modeled asset allocation mixes, including scenario analysis, stress tests, and the impact on SCERS' funded ratio and contribution rates.

With the run up in equity prices over the past year, and with interest rates remaining high, return expectations across many asset classes have declined and forecasted returns across asset classes are also narrower. The initial modeling that Verus conducted for the December meeting resulted in a tight range of asset mixes that were all fairly in line with each other, SCERS' current portfolio, and with SCERS' actuarial rate of return of 6.75%. In the current environment, targeting a higher return than that of the current portfolio entails taking on greater risk, both in the form of market volatility and illiquidity for marginal increases in return.

The SCERS Board reviewed the initial asset allocation mixed and provided feedback to Staff and Verus. Some takeaways from the Board included:

- There was not a lot of interest in taking more risk to reach for incremental returns.

- The Board expressed a preference toward increasing cash flow generation and liquidity within the portfolio without sacrificing returns.
- The Board asked Verus to include yield characteristics for each asset class to complement the return and risk forecasts.

ASSET ALLOCATION MIXES

For the February meeting, Verus has modeled revised mixes incorporating the Board's feedback.

Related to the yield measures of each asset class, Private Credit and Public Credit have the highest yield, so any increase in the Credit target allocation increases SCERS' yield and cash flow profile. Equities (public and private), Absolute Return, and Non-Core Real Estate have minimal yield, whereas traditional Fixed Income and Cash have moderate yield. All of the modeled mixes slightly increase the cash yield of the portfolio

As discussed at the December meeting, the modeling for the asset mixes consolidates the current Public Credit and Private Credit asset classes into a single asset class called "Credit". A Credit asset class simplifies the portfolio by incorporating a holistic view of credit across SCERS' portfolio and provides greater flexibility in implementation. While traditional loan origination private credit strategies would make up most of the asset class, allocations could also include public credit investments, strategies that purchase credit in the secondary markets, and other forms of credit. Staff and consultants are seeing more blurred lines between public and private credit, with many investment managers offering hybrid credit strategies that invest opportunistically across both public and private markets. A Credit asset class could also incorporate stressed credit strategies that currently reside within SCERS' Private Equity portfolio but might fit better from a risk and return profile within a broader Credit portfolio. The specific details of the Credit allocation would be presented later, including the portfolio construction characteristics and guidelines.

Below is a description of the modeled asset mixes that will be presented:

- **Mix A (slight de-risking approach)** – This asset mix reduces Growth assets and Real Return assets and increases Diversifying assets. Specifically, the mix
    - Reduces Public Equity by 2%
    - Reduces Absolute Return by 1%
    - Reduces Real Assets by 1%
    - Increases Fixed Income by 3%
    - Increases Cash by 1%
    - Total Credit remains the same

  This mix models to a 6.7% return vs. 6.8% for the current portfolio and a 11.5% Standard Deviation vs. 11.9% for the current portfolio, but a similar Sharpe Ratio of 0.30, which is a measure of risk adjusted returns. The yield of this portfolio is 2.95% vs. 2.87% for the current portfolio.

- **Mix B (slight shifting of risk toward higher yield segments) –** This asset mix slightly increases Growth assets, slightly decreases Real Return assets, while leaving Diversifying unchanged. Specifically, the mix:
    - Reduces Public (Global) Equity by 1%
    - Reduces Real Estate by 1%
    - Increases Credit by 2%

This mix models to a 6.8% return and a 11.9% Standard Deviation, which are both the same as the current portfolio, though the Sharpe Ratio of 0.31 is slightly higher than the current portfolio's 0.30. The yield of this portfolio increases to 2.97% vs. 2.87% for the current portfolio.

- **Mix C (slightly increasing risk for higher yield)** – This asset mix increases Growth assets combined with a slight reduction in Diversifying and Real Return assets.
    - Reduces Absolute Return by 1%
    - Reduces Liquid Real Return by 1%
    - Increases Credit by 2%

  This mix models to a 6.8% return, same as the current portfolio, and a slightly higher 12.0% Standard Deviation vs. 11.9% for the current portfolio. The Sharpe Ratio of 0.30 is the same as that for the current portfolio. The yield of this portfolio is 2.99% vs. 2.87% for the current portfolio and is the highest of the mixes.

As seen within the modeling, SCERS' risk/return profile barely changes across the mixes, and all the mixes have a forecasted return fairly in line with SCERS' actuarial rate of return of 6.75%. More significant changes to the mixes would need to be made to increase the return expectation of the portfolio. The narrower return expectations across asset classes are also keeping the return profile of the mixes close to that of SCERS' current asset allocation.

The modeling shows that the illiquidity of the portfolio increases with Mixes B and C (61% liquid/ 39% illiquid for the current portfolio and Mix A vs. 58% liquid / 42% illiquid for Mixes B and C). This is due to the increase in the Credit allocation for Mixes B and C, where Verus models Credit as illiquid. There are a couple of considerations within this dynamic. While most of the Credit allocation would consist of private credit, it would also contain some liquid credit exposure. Also, while private credit is considered an illiquid asset class, almost all the returns are in the form of cash yield which is distributed back to investors quarterly from the inception of the investment, meaning that private credit is significantly more liquid than most private market asset classes.

CONCLUSION

Staff and Verus do not believe that significant changes need to be made to SCERS' strategic asset allocation at this time, as targeting a higher return above the actuarial rate of return would entail taking on greater levels of risk, both investment risk and liquidity risk. SCERS' current strategic asset allocation takes a risk balanced approach that has ample return-generating, growth assets to drive performance toward the actuarial rate of return, while also maintaining enough uncorrelated/diversifying and inflation sensitive assets to reduce downside risk and the range of outcomes that the portfolio is subject to. It also has ample exposure to cash-flowing assets, given that SCERS is a mature public pension plan with negative cash flows (more benefit payments going out than contributions coming in). In addition, it has a reasonable liquidity profile to support SCERS' meaningful allocation to private/illiquid assets.

Staff and Verus believe that any changes to the strategic asset allocation should be minimal and should focus on increasing SCERS' cash flow profile while maintaining the return profile of the portfolio. Out of the modeled mixes, the preference is toward Mixes B and C, with an edge toward Mix B. Both mixes improve the cash flow/yield profile of the portfolio by slightly increasing the exposure to higher yielding credit strategies (mostly private credit), while slightly reducing allocations to lower returning, lower yielding, and/or more volatile parts of the portfolio.

Depending on feedback from the Board, Staff and Verus plan on bringing a recommended asset allocation mix to the Board at the March meeting.

ATTACHMENTS

- Board Order
- Verus Asset/Liability Study Presentation

Prepared by:

/S/

Steve Davis
Chief Investment Officer

Reviewed by:

/S/

Eric Stern
Chief Executive Officer

Retirement Board Order
Sacramento County Employees' Retirement System

Before the Board of Retirement
February 19, 2025

AGENDA ITEM:

ALM Study

THE BOARD OF RETIREMENT hereby accepts the recommendation of staff to receive and file the Asset Liability Modeling (ALM) Study presentation by SCERS' staff and general investment consultant, Verus.

I HEREBY CERTIFY that the above order was passed and adopted on February 19, 2025 by the following vote of the Board of Retirement, to wit:

AYES:

NOES:

ABSENT:

ABSTAIN:

ALTERNATES:
(Present but not voting)

_____
James Diepenbrock
Board President

_____
Eric Stern
Chief Executive Officer and
Board Secretary

Verus

PERSPECTIVES THAT DRIVE ENTERPRISE SUCCESS

FEBRUARY 2025

Asset-Liability Study

Sacramento County Employees' Retirement System

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VERUSINVESTMENTS.COM

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Executive Summary

Objectives:

— Review asset allocation mixes and provide direction to Staff and Verus for further refined portfolio options

Summary Findings:

— Achieving the actuarial rate of return in the current environment is reasonable but has recently become a bit more challenged

— The current Policy and generally similar portfolios are projected to achieve around the 6.75% actuarial rate of return

— Verus' CMA returns are based on 10-year projections which is far shorter than SCERS' investment horizon

— The difference in projected returns across asset classes is narrower than in the past, primarily due to higher equity valuations and higher interest rates

— The range of projected return outcomes is wide so though we focus on the median return, we would caution against putting too much emphasis on a single number

Asset Mixes

Asset mixes for consideration

Shown alongside the current Policy are 3 alternative asset mixes (described below).

Additionally, all 3 alternative asset mixes consolidate Bank Loans, High Yield, and Private Credit into a single Multi-Asset Credit asset class.

- Alt A: slightly lower return target than the Policy but with lower volatility
  - Increases Diversifying assets and decreases both Growth and Real Return assets
- Alt B: slight tilts around the Policy to improve risk/return tradeoff but with lower liquidity
  - Increases Growth assets and decreases Real Return assets
- Alt C: similar return target to the Policy but with higher volatility and lower liquidity
  - Increases Growth assets and decreases both Diversifying and Real Return assets

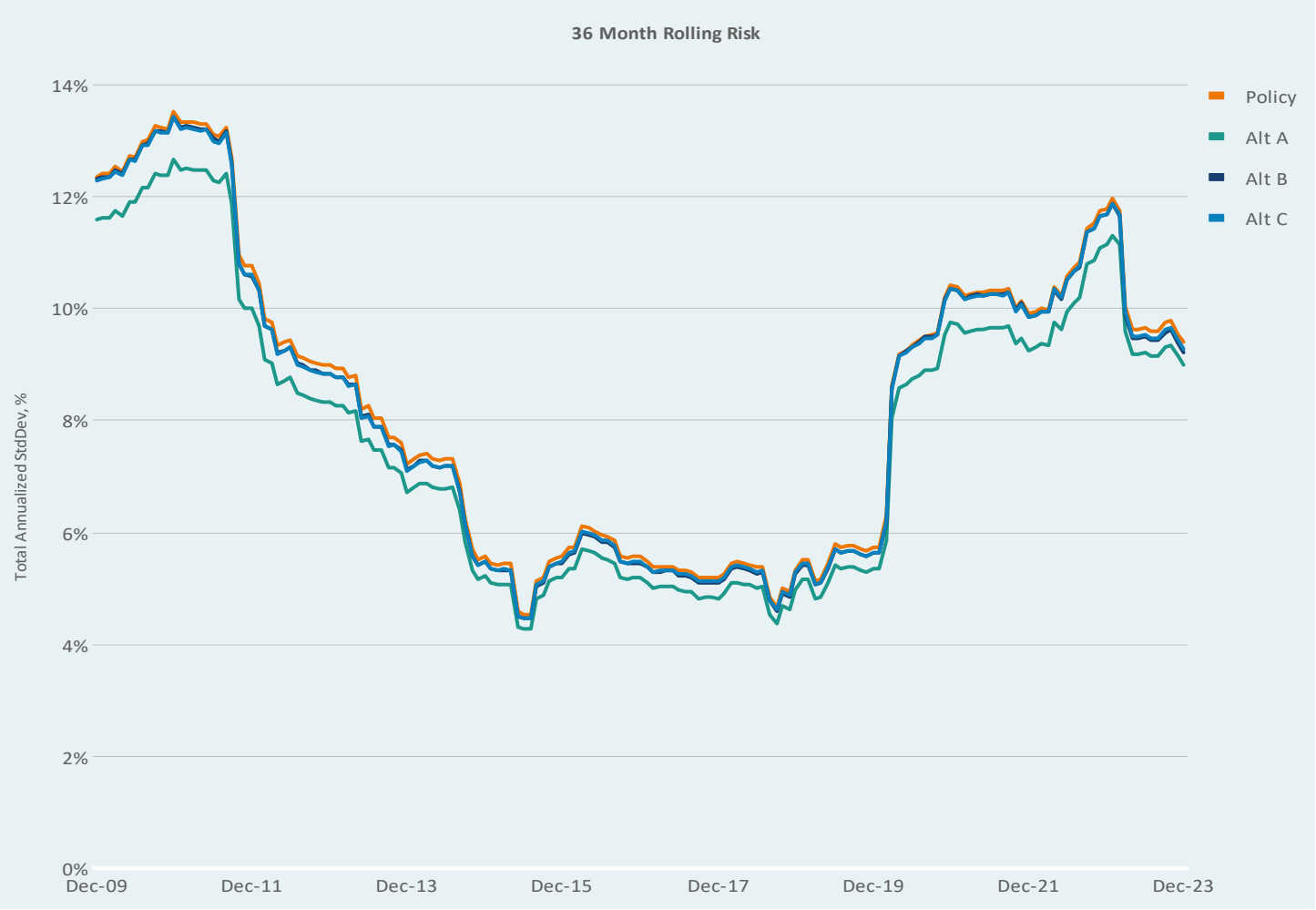
Portfolio alternatives

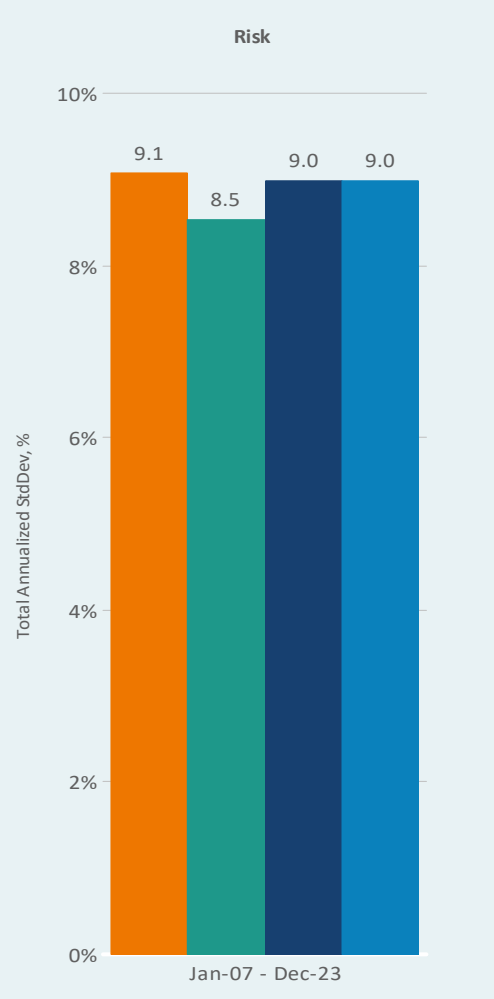
	Policy	A	B	C	Verus 2025 CMAs Return (g)	Standard Deviation	Sharpe Ratio (g)	Asset Class Yield
Global Equity	40	38	39	40	*6.0*	*16.7*	*0.13*	*1.8%*
High Yield Corp. Credit	1	-	-	-	*5.6*	*10.8*	*0.35*	*7.5%*
Bank Loans	1	-	-	-	*6.9*	*8.8*	*0.16*	*8.6%*
Private Equity	11	11	11	11	*8.0*	*10.9*	*0.37*	*0.0%*
Private Credit	5	-	-	-	*8.2*	*11.8*	*0.42*	*8.2%*
Credit*	-	7	9	9	*8.2*	*11.8*	*0.42*	*8.2%*
Total Growth Assets	***58***	***56***	***59***	***60***				
Core Plus Fixed Income	12	13	12	12	*4.4*	*4.7*	*0.13*	*5.1%*
US Treasury	4	6	4	4	*3.8*	*7.1*	*0.00*	*4.5%*
Diversifying Absolute Return*	7	6	7	6	*5.4*	*6.3*	*0.25*	*0.0%*
Cash	2	3	2	2	*3.8*	*1.1*	-	*3.8%*
Total Diversifying	***25***	***28***	***25***	***24***				
Core Real Estate	6	6	5	6	*7.2*	*12.5*	*0.27*	*4.0%*
Value Add Real Estate	1.5	1.5	1.5	1.5	*9.2*	*15.4*	*0.35*	*1.5%*
Opportunistic Real Estate	1.5	1.5	1.5	1.5	*10.2*	*21.2*	*0.30*	*0.0%*
Liquid Real Return*	1	1	1	-	*6.3*	*16.0*	*0.16*	*4.1%*
Private Real Assets*	7	6	7	7	*8.1*	*16.8*	*0.26*	*5.8%*
Total Real Return	***17***	***16***	***16***	***16***				
Total Allocation	**100**	**100**	**100**	**100**				

	Policy	A	B	C
Mean Variance Analysis				
Forecast 10 Year Return	***6.8***	***6.7***	***6.8***	***6.8***
Standard Deviation	11.9	11.5	11.9	12.0
1st percentile ret. 1 year	*-17.5*	*-16.7*	*-17.3*	*-17.5*
Sharpe Ratio	0.30	0.30	0.31	0.30
% in Liquid Assets	61%	61%	58%	58%
% in Illiquid Assets	39%	39%	42%	42%

**Multi-Asset Credit modeled with Private Credit; Diversifying Absolute Return modeled with Asymmetric Hedge Funds; Liquid Real Return modeled with Commodities; Private Real Assets modeled with Infrastructure*

Risk - long term





Left chart illustrates the historical annualized volatility (3-year rolling) of the current portfolio mix over time, if the current portfolio were held for this historical period and rebalanced according to the specified rebalancing frequency.

Performance during historical stress periods

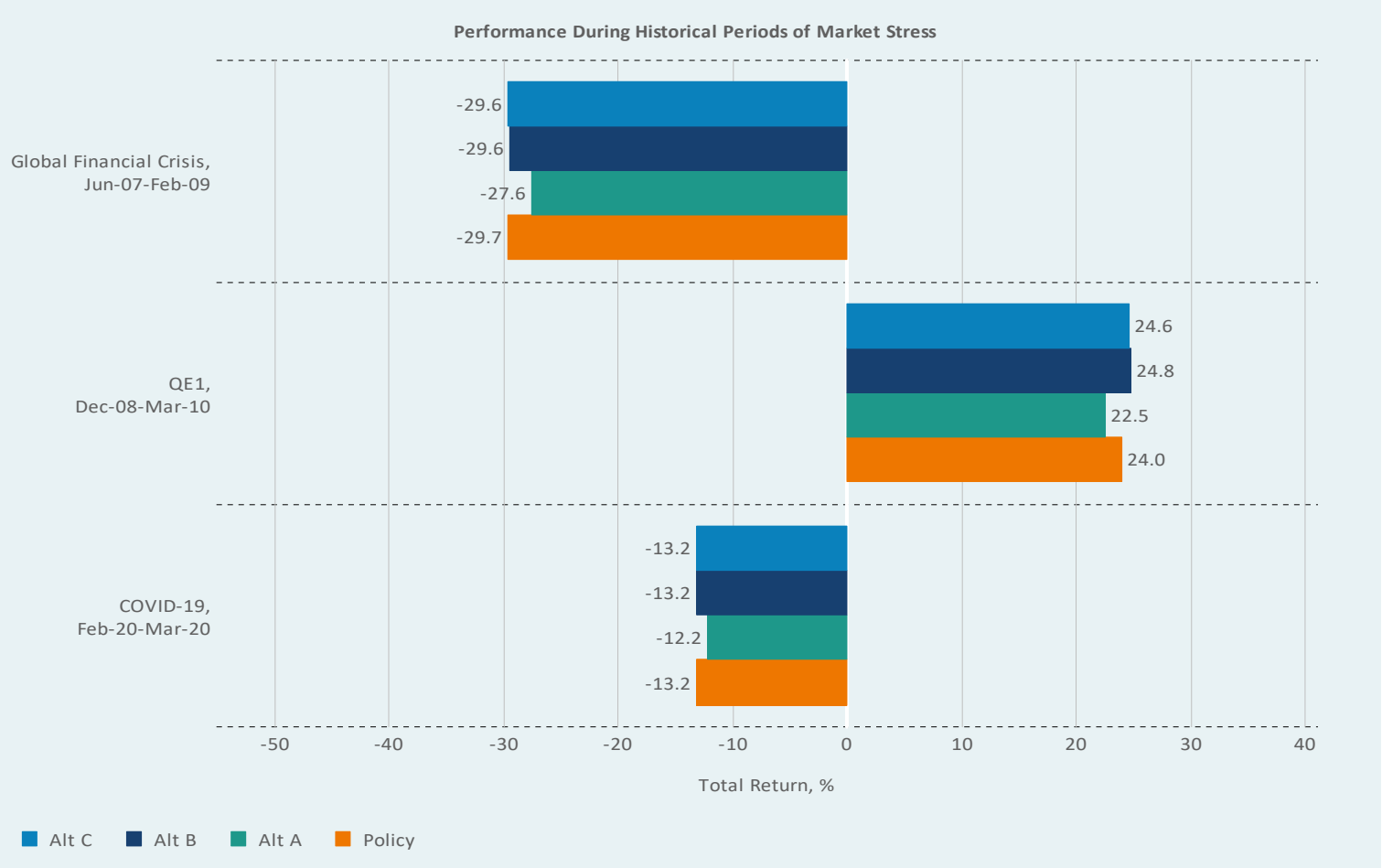


Chart illustrates how each portfolio asset mix performed during a variety of historical periods, given conditions at that historical time, and given the specified

Performance during historical stress scenarios

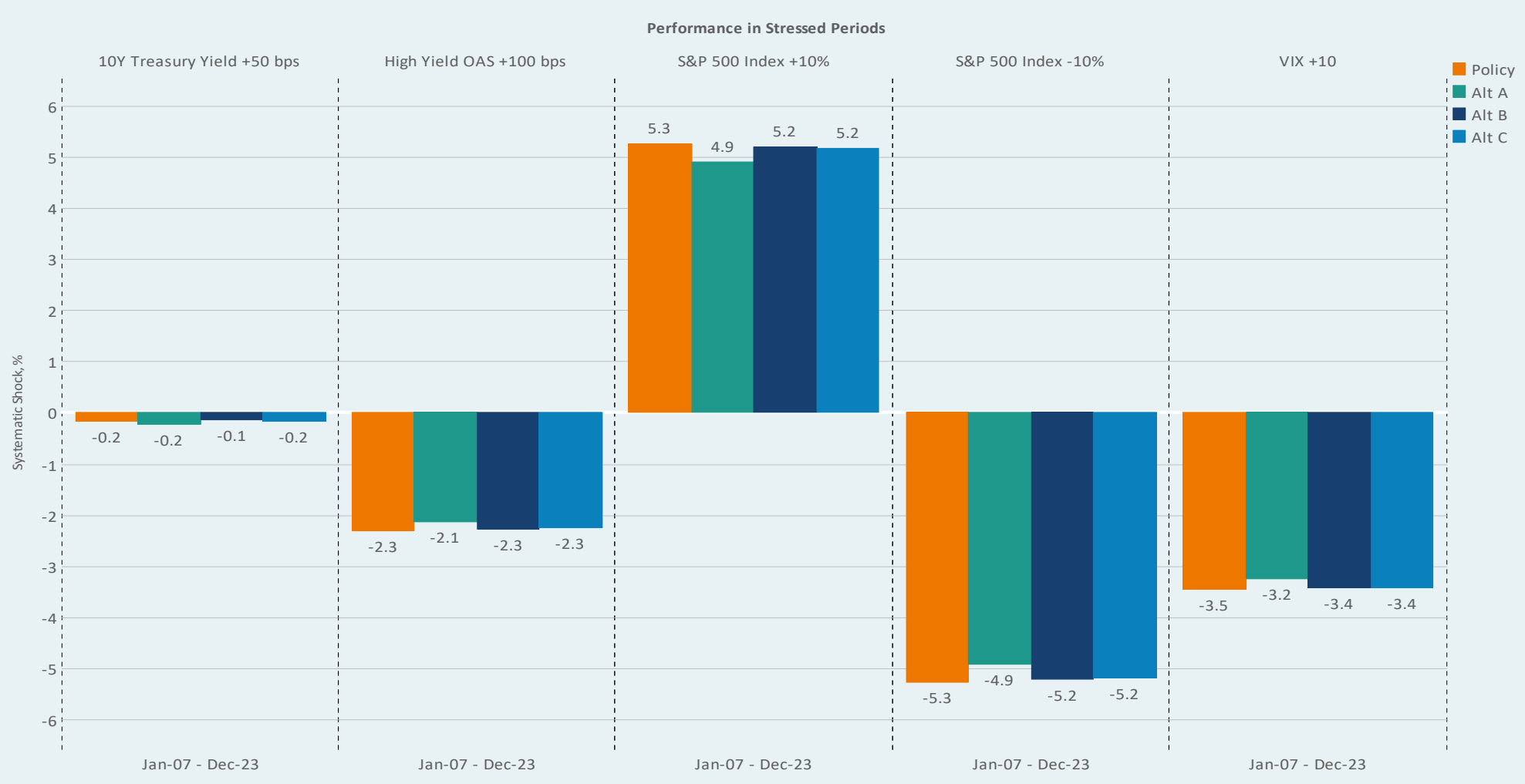
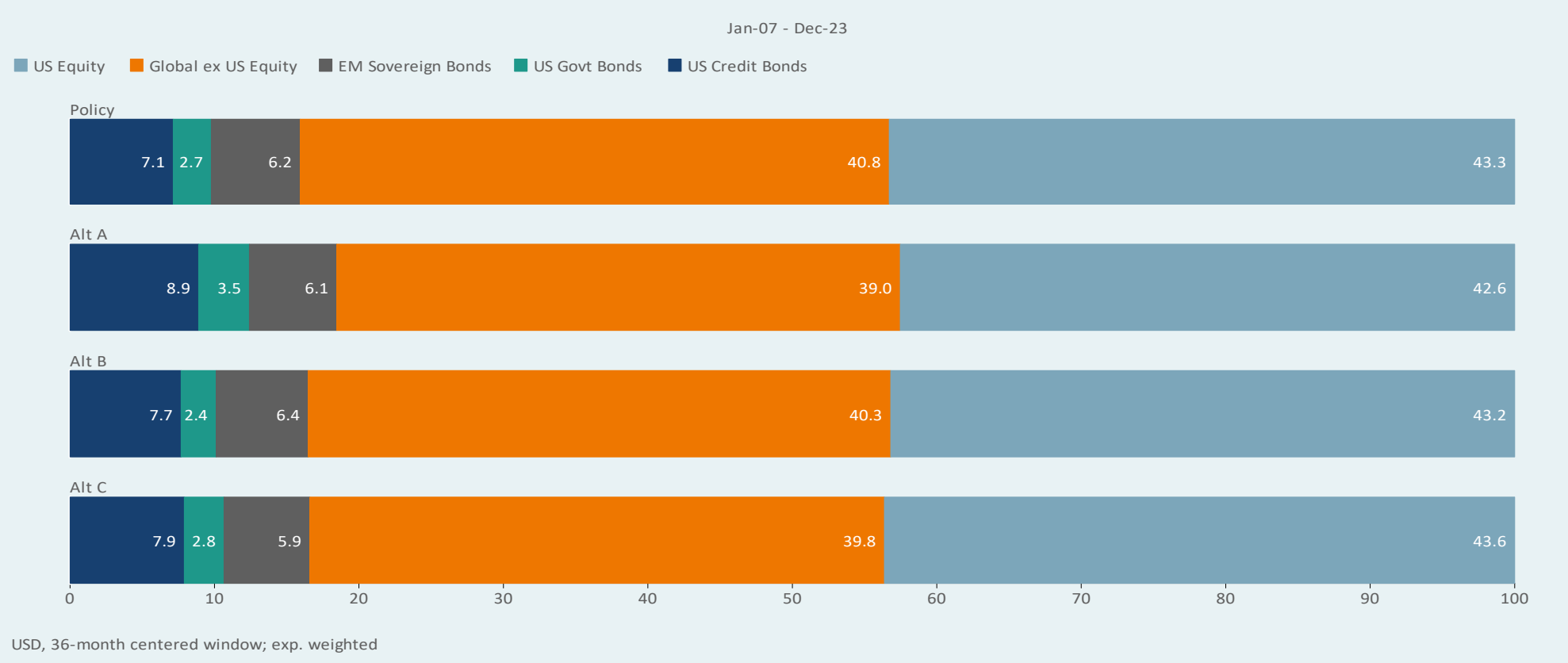


Chart estimates the total portfolio performance of each asset mix, given a specific shock to the portfolio. This is calculated based on the sensitivity of all of the

Historical asset loadings

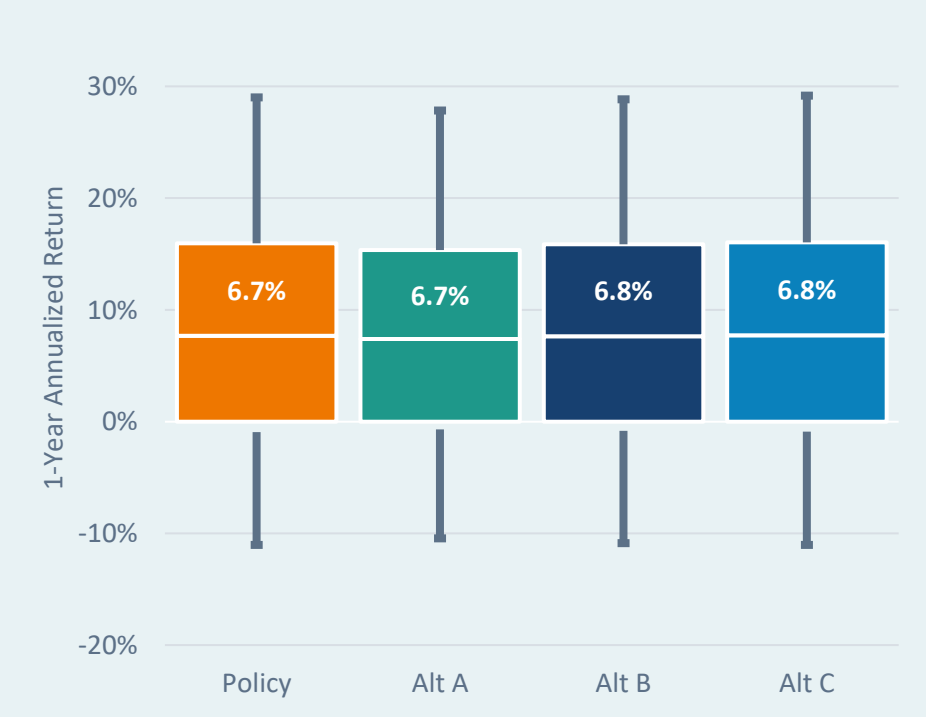


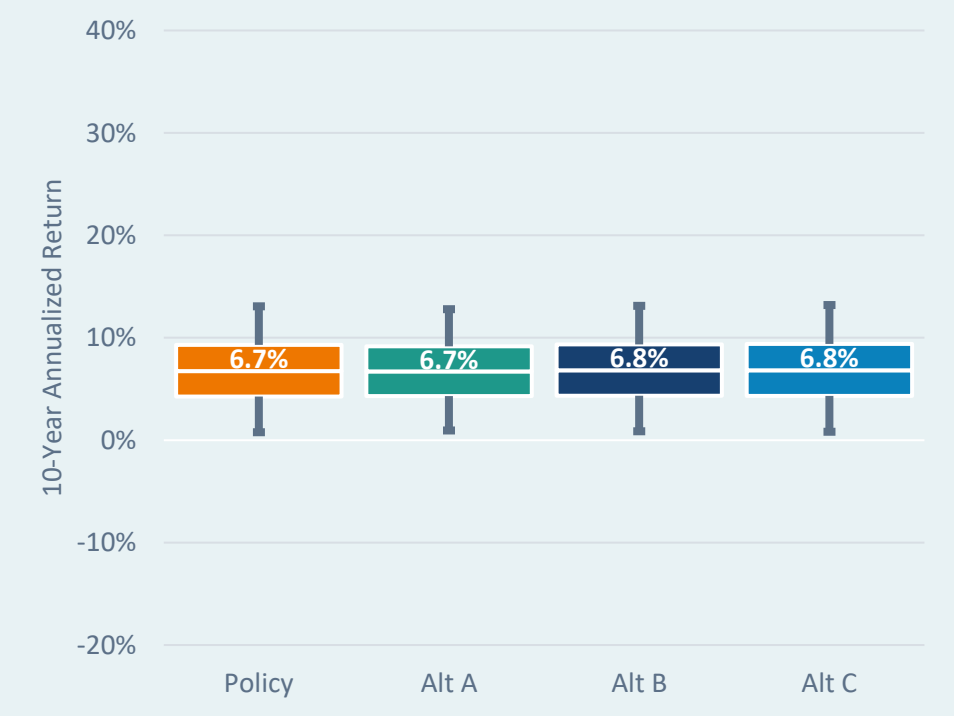
This chart is used to demonstrate the likely allocation of the fund's assets to different factors (US Equity, Global ex-US Equity, U.S Bonds, U.S Credit Bonds, and EM Sovereign Bonds). This chart is exponentially-weighted, meaning more emphasis is placed on more recent market behavior and less emphasis is placed on older

Stochastic Projections

Range of potential return outcomes

1 -YEAR					10-YEAR			
Policy	Alt A	Alt B	Alt C	Percentile	Policy	Alt A	Alt B	Alt C
28.1%	27.2%	28.0%	28.3%	95th	13.1%	12.8%	13.1%	13.2%
15.0%	14.7%	15.1%	15.2%	75th	9.3%	9.2%	9.4%	9.4%
6.7%	**6.7%**	**6.8%**	**6.8%**	**50th**	**6.7%**	**6.7%**	**6.8%**	**6.8%**
-0.9%	-0.7%	-0.8%	-0.9%	25th	4.3%	4.3%	4.3%	4.3%
-11.0%	**-10.4%**	**-10.9%**	**-11.0%**	**5th**	**0.8%**	**1.0%**	**0.9%**	**0.8%**

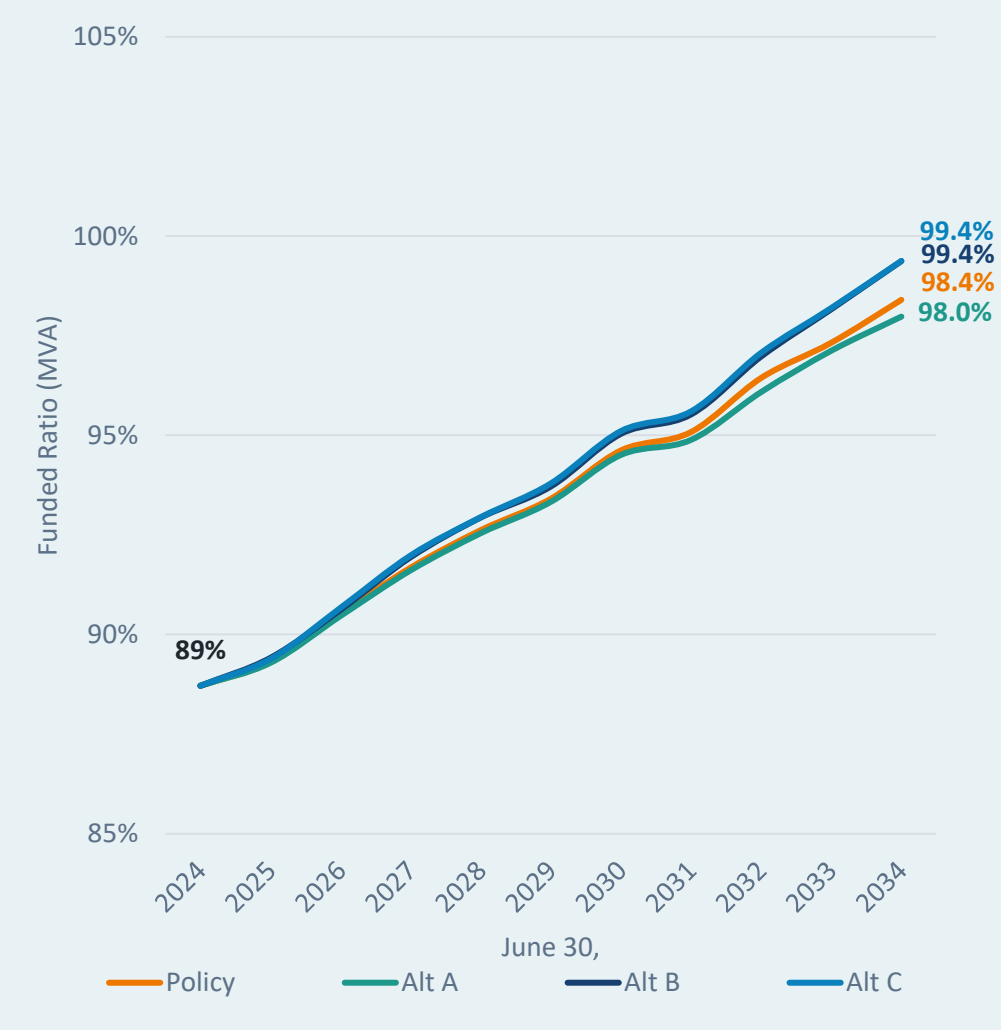




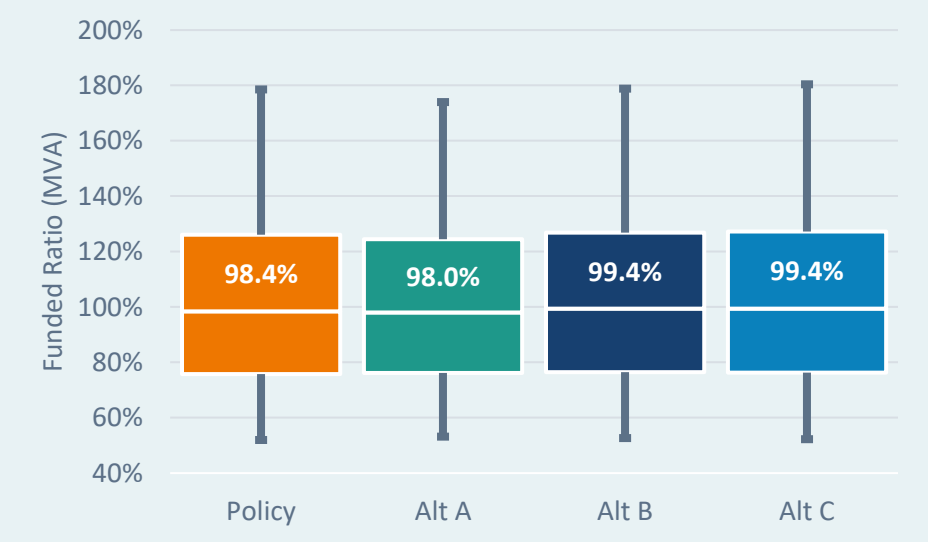
Source: MPI and Verus' 2025 capital market assumptions

Funded ratio (MVA)

FUNDED RATIO (MVA) MEDIAN PROJECTION



JUNE 30, 2034 FUNDED RATIO (MVA) DISTRIBUTION

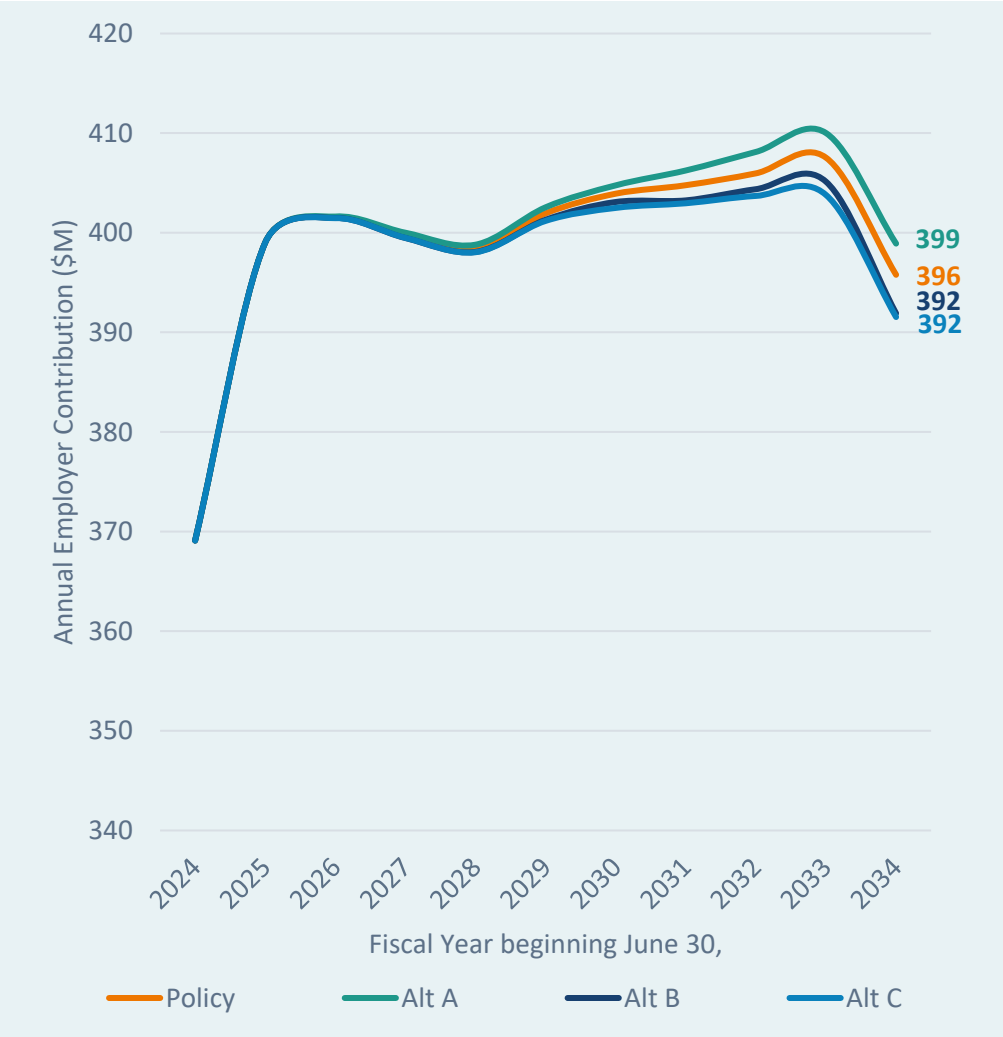


2034 Funded Ratio (MVA)	Policy	Alt A	Alt B	Alt C
Percentile				
95%	178.5%	174.0%	178.8%	180.4%
75%	126.1%	124.4%	126.8%	127.2%
50%	**98.4%**	**98.0%**	**99.4%**	**99.4%**
25%	75.7%	76.2%	76.4%	76.2%
5%	**52.0%**	**53.2%**	**52.6%**	**52.2%**
Probability				
> Policy	N/A	42%	80%	87%
> 100% Funded	48%	48%	49%	49%
> 89% Funded	61%	60%	61%	61%

Source: Reflects 5,000 simulations of assets and liabilities based on Verus' 2025 capital market assumptions. See appendix for details.

Annual employer contribution

ANNUAL EMPLOYER CONTRIBUTION ($M)



FISCAL 2035 EMPLOYER CONTRIBUTION ($M) DISTRIBUTION

Fiscal 2035 ER Contribution ($M)	Policy	Alt A	Alt B	Alt C
Percentile				
95%	**587**	**584**	**585**	**587**
75%	497	496	496	496
50%	**396**	**399**	**392**	**392**
25%	140	158	135	130
5%	0	0	0	0

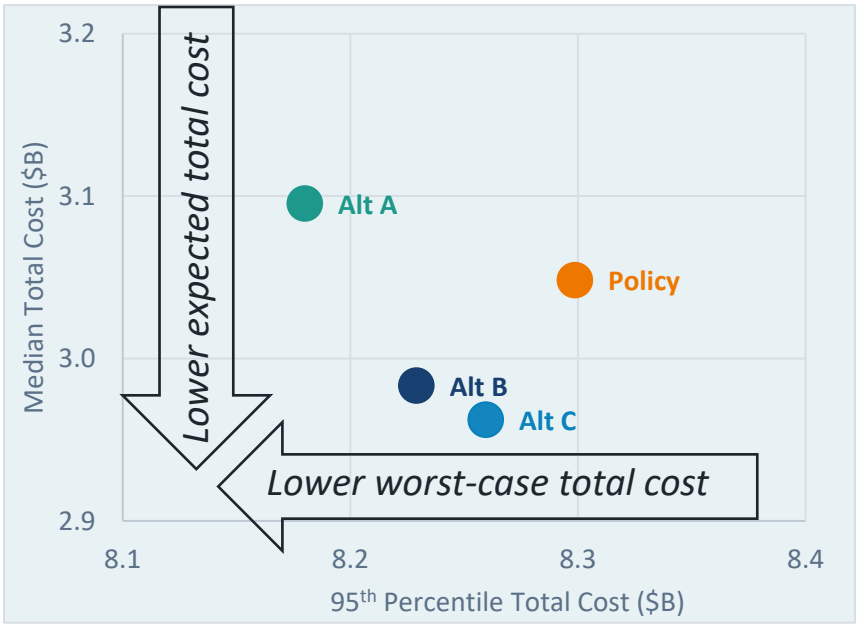
Source: Reflects 5,000 simulations of assets and liabilities based on Verus' 2025 capital market assumptions. See appendix for details.

Total full funding cost

TOTAL COST DISTRIBUTION ($M)

Total full funding cost ($B)	Policy	Alt A	Alt B	Alt C
Percentile				
95%	**8.30**	**8.18**	**8.23**	**8.26**
75%	5.67	5.61	5.58	5.59
50%	**3.05**	**3.10**	**2.98**	**2.96**
25%	1.20	1.23	1.17	1.16
5%	0.24	0.28	0.24	0.23

ILLUSTRATION OF RISK REWARD TRADEOFF



Metric estimates the total cost to achieve full funding, by summing together the following:

- Fiscal 2025 through 2034 cumulative contributions:
  - "What did we contribute during the projection?"
- Remaining deficit at 6/30/2034:
  - "What would we still need to contribute at the end of the projection to achieve full funding?"

Source: Reflects 5,000 simulations of assets and liabilities based on Verus' 2025 capital market assumptions. Metric is calculated on a present value basis with a 6.75% discount rate. See appendix for details.

Summary

- Projected returns across asset classes are narrower than in the past
- Expected returns across most asset classes (2024 vs. 2025 CMAs) has declined
- Achieving higher returns requires taking more of these risks:
  - Increased reliance on manager selection/skill
  - Increased reliance on private investments and illiquid investment structures
  - Increased reliance on use of leverage (implicitly or explicitly)
- Some implications of these risks to consider include:
  - Ability to source, select, and monitor investments with the same level of diligence and care as the current program
  - Higher explicit costs including fees, sourcing, managing, monitoring – private, illiquid investments are not scalable in the same way as liquid, transparent investments
  - Increase to private investments will take several years to achieve, interim asset allocation glidepath decisions should be taken into consideration
  - Growth in negative cash flows as plan matures will require increased liquidity
- However, with narrower projected returns across asset classes, there may be an opportunity to improve efficiency (the risk/return tradeoff).

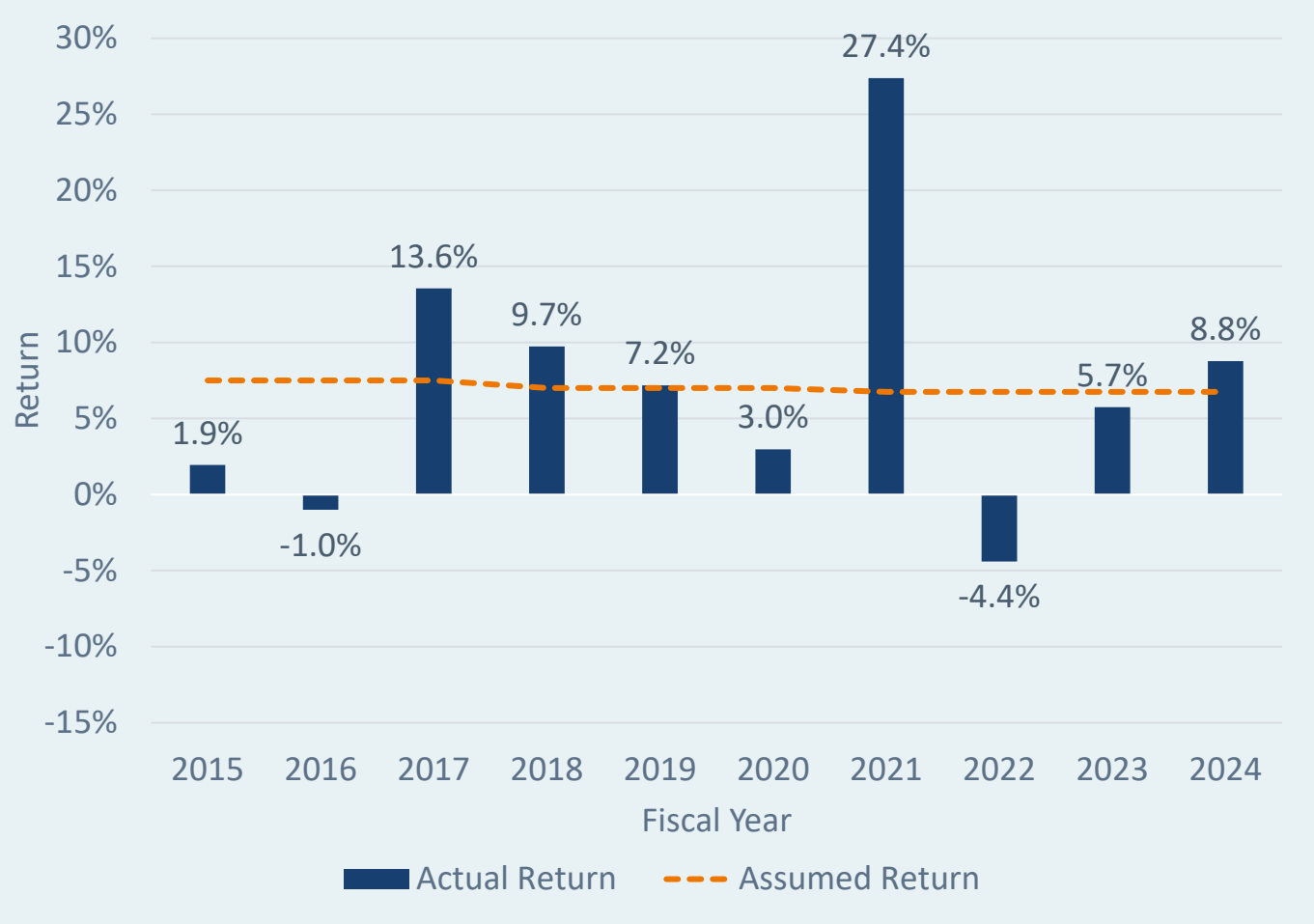
Since projected returns across asset classes are narrower than in the past, the amount of additional return per a unit of additional risk is lower.

Therefore, targeting a return materially higher than the assumed rate may not be worth the additional risk.

Appendix

Investment returns

ACTUAL VS. ASSUMED RETURNS



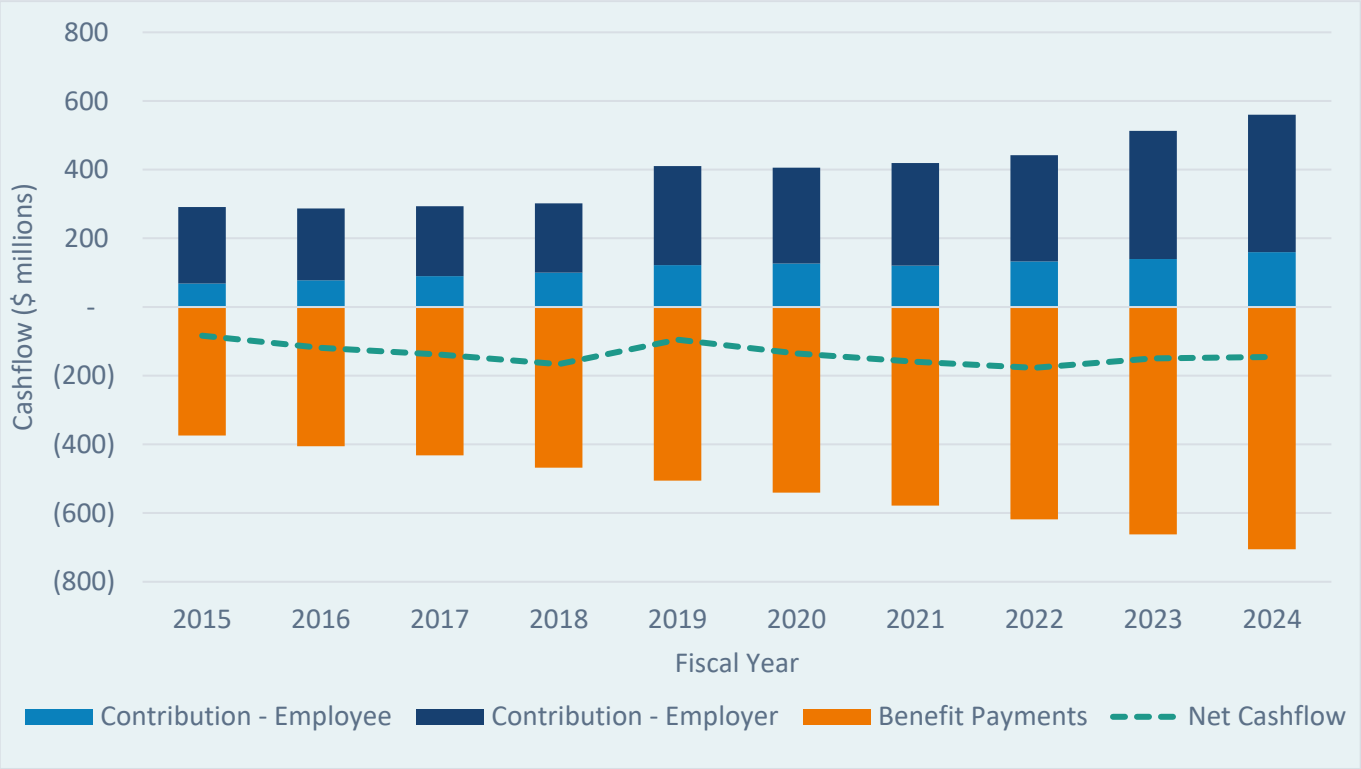
Annualized returns over the prior 10 years were 6.9%

The assumed investment return fell from 7.50% to 7.00% beginning in fiscal 2018 and fell to 6.75% beginning in fiscal 2021.

Source: SCERS' actuarial valuation reports.

Cash flows

TOTAL CASH INFLOWS VS. OUTFLOWS



Net Cashflow	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
$M	-84	-119	-139	-167	-95	-135	-159	-177	-150	-146
% of BOY Assets	-1.1%	-1.5%	-1.8%	-1.9%	-1.0%	-1.4%	-1.6%	-1.4%	-1.3%	-1.2%

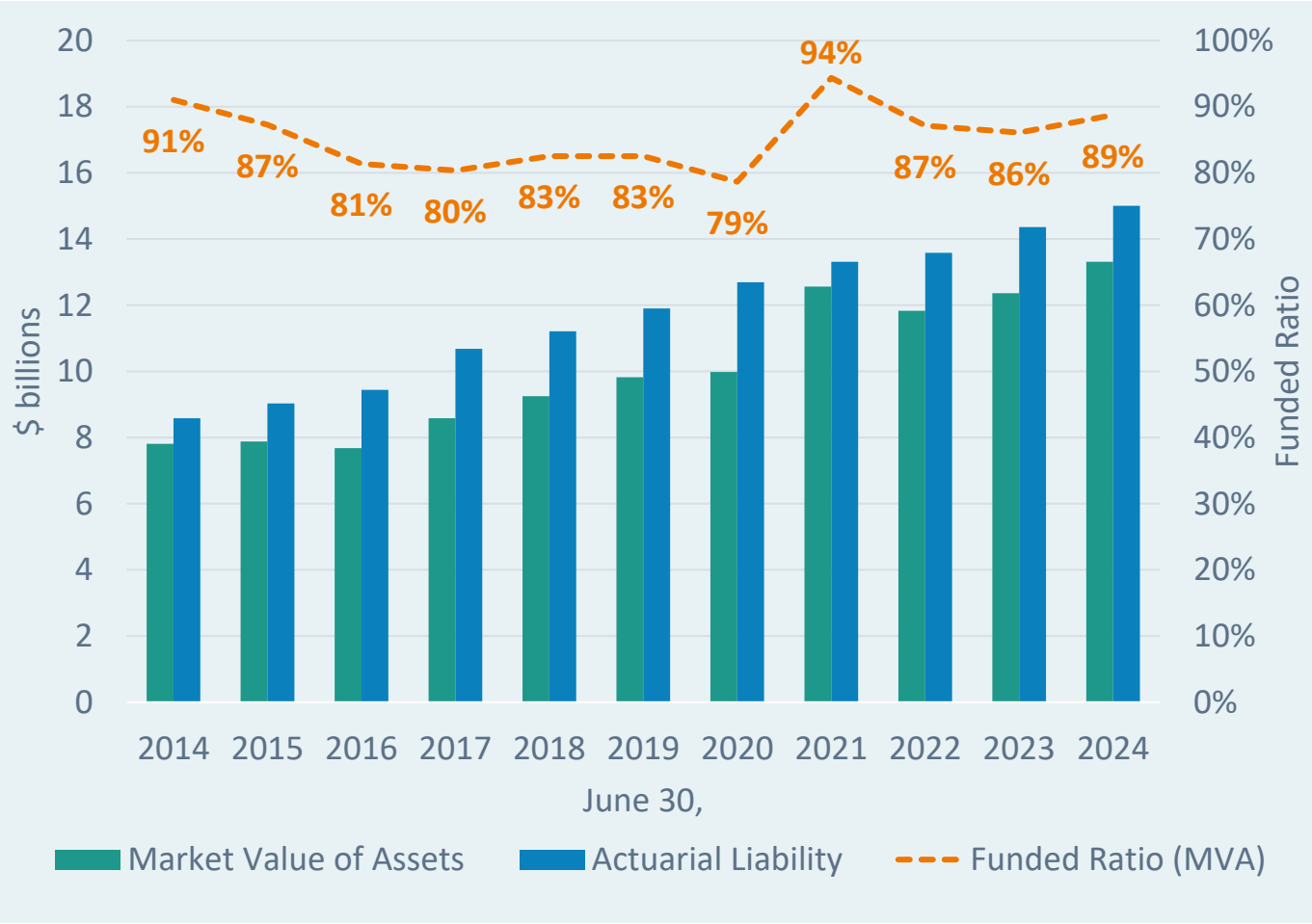
SCERS has made contributions in accordance with the actuarial funding policy over the last ten years.

As a percentage of assets, the cash outflow position has remained a relatively stable 1-2%.

Source: SCERS' actuarial valuation reports.

Funded status

ACTUARIAL VALUE OF ASSETS VS. ACTUARIAL LIABILITIES



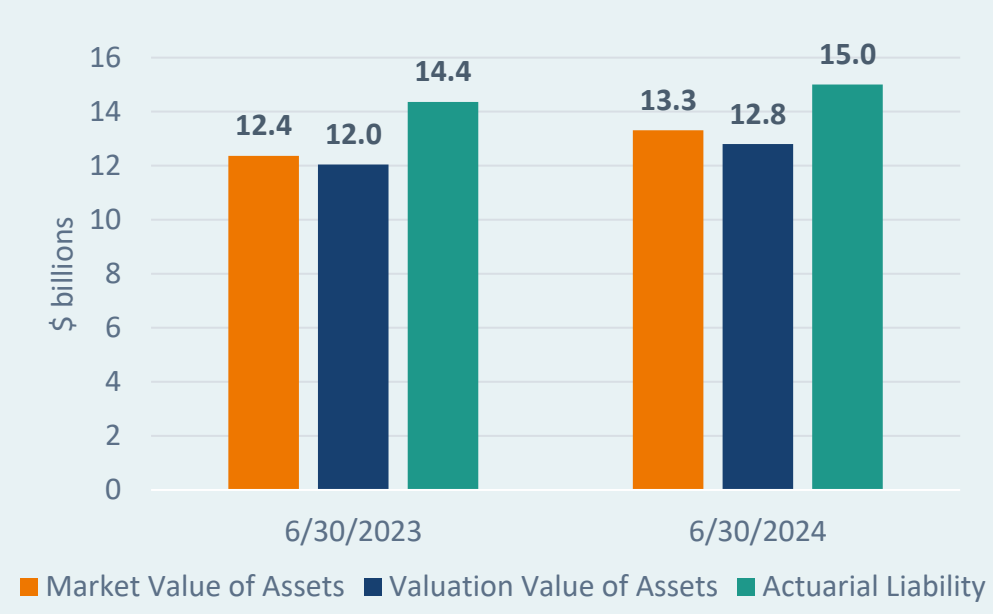
The asset growth has kept pace with liability growth and the funding levels have remained relatively stable over the last 10 years on a market basis.

Without decreasing the assumed investment return by 0.75% over the period, the plan would be 97% funded today.

Source: SCERS' actuarial valuation reports.

Current state

ASSETS AND LIABILITIES ($ BILLIONS)[1]



6/30/2023		6/30/2024
86%	MVA Funded Ratio	89%
84%	VVA Funded Ratio	85%
6.75%	Discount Rate	6.75%

	Policy
Allocation	
Total Growth	58.0
Total Diversifying	25.0
Total Real Return	17.0
Portfolio Metrics	
Forecast 10-Year Return	6.7
Standard Deviation	11.9
Return / Std. Deviation	0.57
1st Percentile Return	-17.5
Sharpe Ratio	0.30
% Illiquid	39%

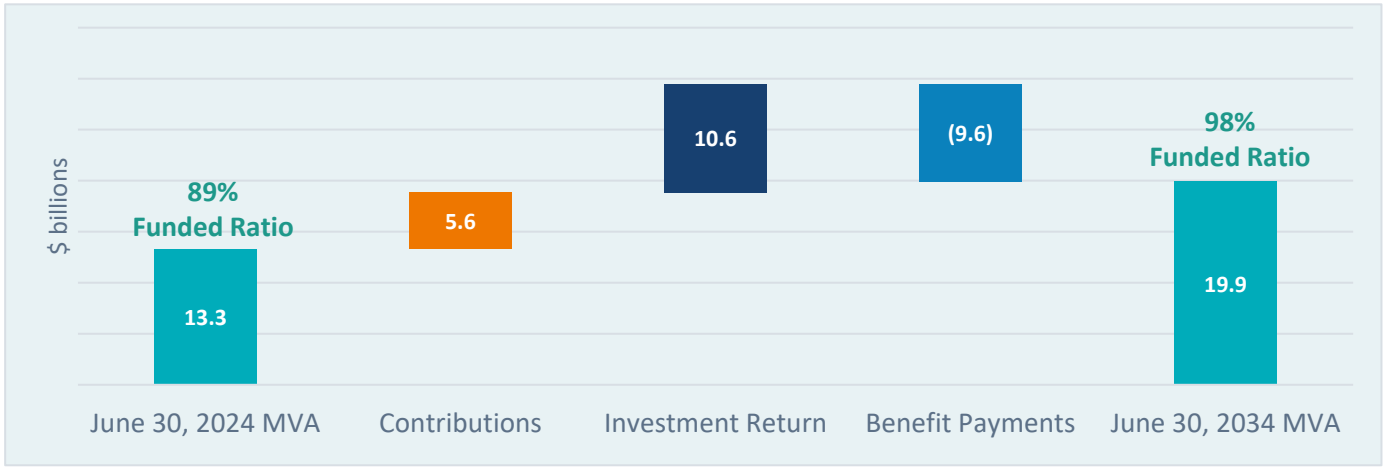
- SCERS' funding levels improved during fiscal 2024
- Contributions equaling the ADC are expected in the future
- A portion of excess returns on an AVA basis are allocated to the contingency reserve, which reduces valuation value of assets[2]
- Return forecast of policy allocation is 6.7%, relative to a 6.75% actuarial return assumption

[1]Based on SCERS' 2024 actuarial valuation reports.

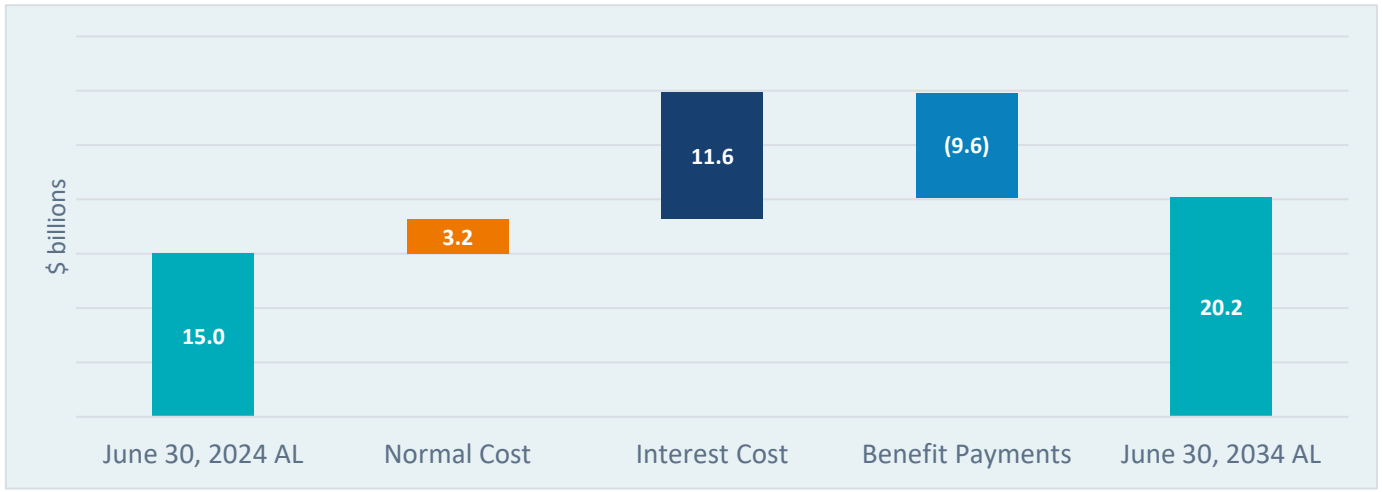
[2]Contingency reserve is credited with excess returns until it reaches 3% of the market value of assets. Reserve is $399M at 6/30/2024.

Median stochastic projection

10-YEAR MEDIAN STOCHASTIC MARKET VALUE OF ASSET PROJECTION



10-YEAR MEDIAN STOCHASTIC ACTUARIAL LIABILITY PROJECTION



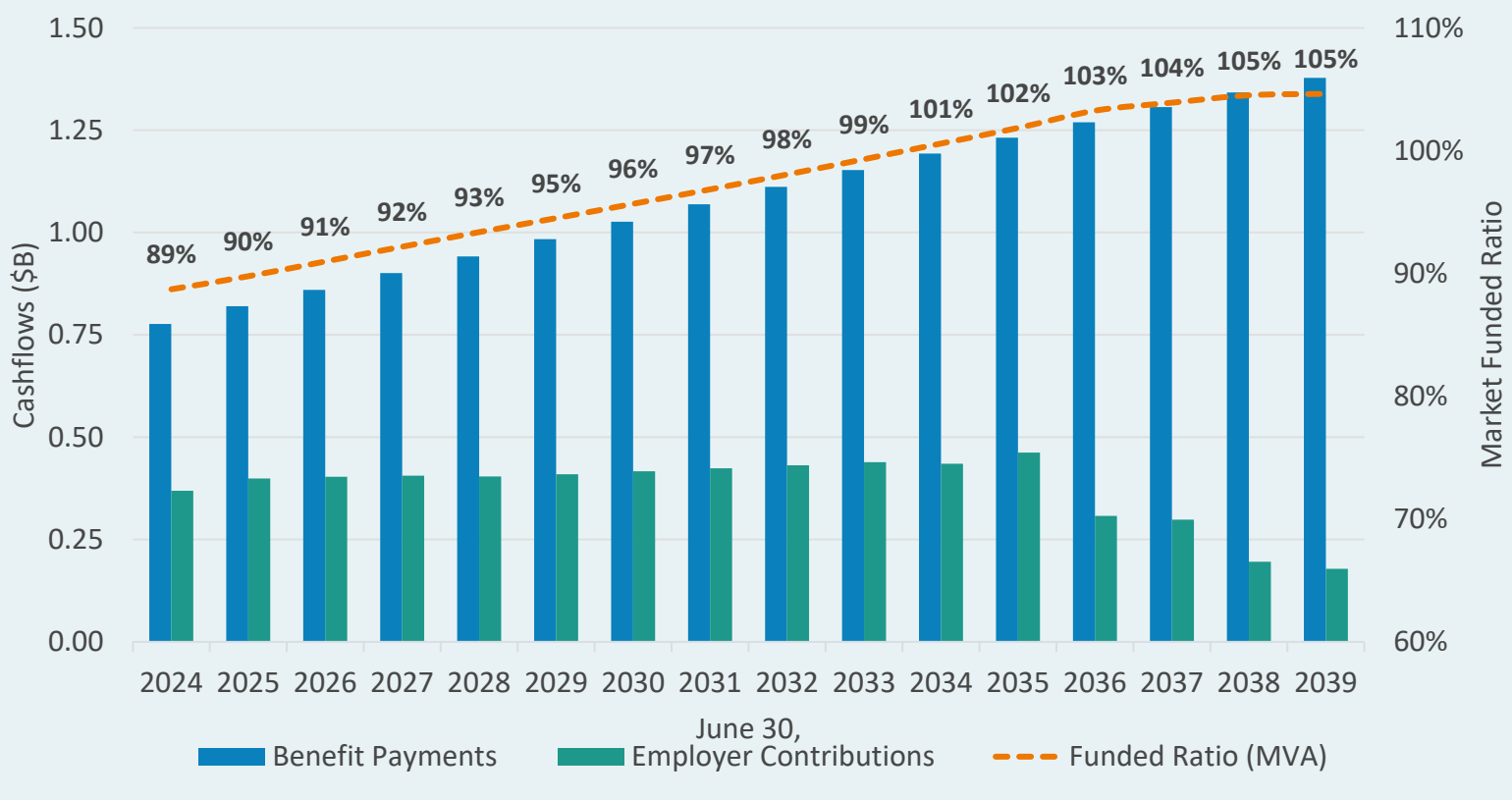
Metric	Median	1-in-20 Worst Case
2034 MVA Funded Ratio	98%	52%
10-Year Total Employer Contributions	$4.0B	$4.6B
2034 Employer Contribution ($M)	$396M	$585M
2034 Employer Contribution (% of Pay)	23%	33%

Under the policy allocation, the Plan's funded ratio is expected to improve to 98% in ten years.

Reflects the median stochastic projection under the policy allocation. See appendix for additional details.

Funded status and cashflow projection

Baseline return scenario



Net Cashflow	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
$B	-0.3	-0.3	-0.3	-0.3	-0.4	-0.4	-0.4	-0.5	-0.5	-0.5	-0.6	-0.6	-0.8	-0.8	-1.0	-1.0
% of BOY Assets	-2.0%	-1.9%	-2.1%	-2.2%	-2.4%	-2.5%	-2.6%	-2.6%	-2.7%	-2.8%	-2.9%	-2.8%	-3.6%	-3.6%	-4.1%	-4.2%

Assumes returns of 6.7% each year. See appendix for additional details.

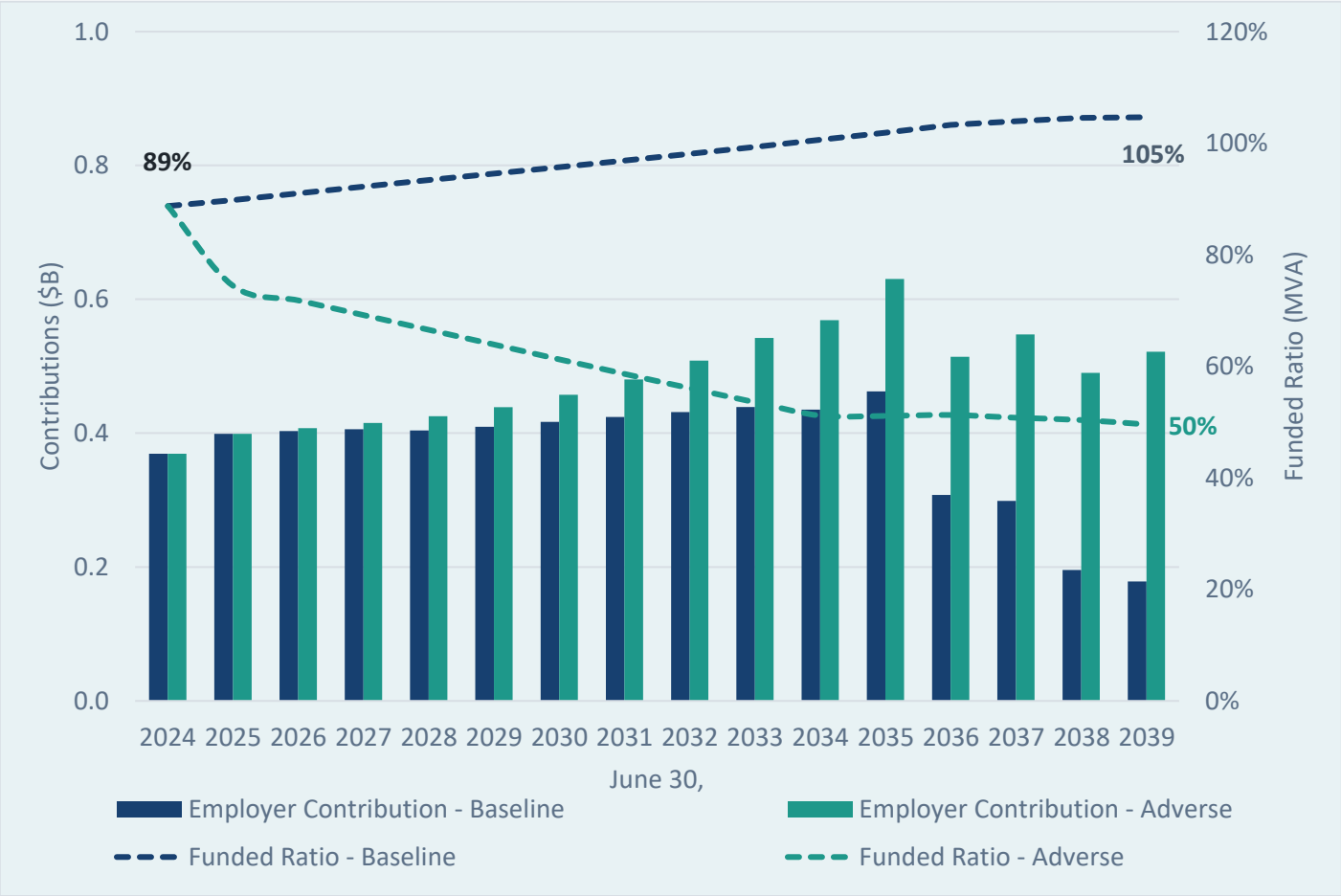
Assuming the 6.7% forecasted return of the policy portfolio is earned annually, the plan reaches full funding in 2034.

Employer contributions are expected to fall by ~$150M after fiscal 2036 and another ~$100M after fiscal 2038

Chart reflects employer contributions only. Annual employee contributions of ~$150M - $200M are expected annually in addition.

Funded status and cashflow projection

Baseline vs. adverse return scenario



The adverse return scenario is intended to represent a 1-in-20 worst case outcome:

Time	Return	Descriptions
Year 1	-11.0%	1-in-20 1-year performance
Year 2-10	2.2%	1-in-20 10-year performance
Year 11+	6.7%	Baseline

Relative to the baseline projection, the adverse scenario results in $1.7B in additional cash and the funded ratio is 55% lower after 15 years.

Assumes returns are as stated each year. See appendix for additional details.

Heat map

Funded status and contributions

Funded Ratio (MVA)																
June 30,	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
1%	89%	85%	81%	77%	74%	70%	67%	63%	60%	56%	53%	50%	47%	44%	40%	36%
2%	89%	86%	83%	80%	77%	74%	71%	68%	65%	63%	60%	57%	54%	51%	48%	45%
3%	89%	87%	84%	82%	80%	78%	76%	74%	72%	69%	67%	65%	63%	60%	57%	54%
Annual 4%	89%	87%	86%	85%	84%	82%	81%	79%	78%	77%	75%	74%	72%	70%	68%	65%
Investment 5%	89%	88%	88%	88%	87%	87%	86%	86%	85%	84%	84%	83%	83%	81%	80%	78%
Return 6%	89%	89%	90%	90%	91%	91%	91%	92%	92%	93%	93%	93%	94%	94%	93%	92%
7%	89%	90%	91%	93%	94%	96%	97%	99%	100%	102%	103%	105%	107%	107%	108%	109%
8%	89%	91%	93%	96%	98%	100%	103%	106%	108%	111%	113%	116%	119%	121%	123%	124%
9%	89%	92%	95%	98%	102%	105%	109%	113%	117%	121%	125%	128%	132%	136%	139%	143%

Annual Employer Contributions ($B)																
Fiscal Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	Total
1%	0.38	0.39	0.41	0.41	0.42	0.43	0.44	0.46	0.48	0.51	0.53	0.59	0.47	0.50	0.44	**6.87**
2%	0.38	0.39	0.41	0.41	0.42	0.43	0.44	0.46	0.48	0.50	0.52	0.57	0.44	0.47	0.41	**6.73**
3%	0.38	0.39	0.41	0.41	0.42	0.43	0.44	0.45	0.47	0.49	0.50	0.55	0.42	0.44	0.37	**6.58**
Annual 4%	0.38	0.39	0.41	0.41	0.42	0.43	0.44	0.45	0.46	0.48	0.49	0.53	0.39	0.41	0.33	**6.41**
Investment 5%	0.38	0.39	0.41	0.41	0.42	0.42	0.43	0.44	0.46	0.47	0.47	0.51	0.37	0.37	0.28	**6.23**
Return 6%	0.38	0.39	0.40	0.41	0.41	0.42	0.43	0.43	0.44	0.45	0.45	0.48	0.33	0.33	0.24	**6.01**
7%	0.38	0.39	0.40	0.40	0.40	0.41	0.41	0.42	0.43	0.43	0.43	0.45	0.29	0.28	0.17	**5.71**
8%	0.38	0.39	0.40	0.40	0.39	0.40	0.40	0.38	0.37	0.36	0.33	0.34	0.16	0.12	0.00	**4.81**
9%	0.38	0.39	0.40	0.40	0.38	0.38	0.37	0.34	0.31	0.28	0.23	0.21	0.01	0.00	0.00	**4.08**

The heat map shows the impacts of varying returns to the plan's funded status and contribution requirements.

Assumes returns are as stated in each year of the projection. See appendix for additional details. Total column reflects cumulative contributions from fiscal 2025 – 2039.

Assumptions and methods

Unless otherwise stated, all assumptions and methods are consistent with SCERS' 2023 actuarial valuation report.

Assets	**Cashflows:** Contributions are assumed to be made at the beginning of the fiscal year. Benefit payments and administrative expenses are assumed to occur at mid-year. **Stochastic assumptions:** Modeled using Verus 2025 CMAs. See appendix for details. Returns in stochastic scenarios are modeled randomly starting June 30, 2024. **Allocation:** Allocations are assumed to remain constant during projection. **Contingency Reserve Transfers:** Excess returns on an actuarial basis are credited to the contingency reserve, until it reaches 3% of the market value of assets. The contingency reserve offsets the valuation value of assets and is not assumed to be used for any purpose.
Liabilities	**Actuarial projection provider:** Liability projections were provided by Segal. **Actuarial Cost Method:** Entry Age Normal **Census Date:** June 30, 2023 **Discount Rate:** 6.75% Adjustments were made to reflect the actual starting assets and liabilities based on the June 30, 2024 valuation, which was produced after Segal furnished Verus with the requested information but before the asset-liability analysis was finalized.
Funding Methodology (ADC)	Future valuation gains and losses are amortized over a 20-year period, as a level percent of pay.
Actuarial Value of Assets	Six-year smoothing, subject to 30% corridor

2025 vs. 2024 return forecast

Source: Verus, as of 9/30/24

Methodology

SUMMARY OF THE VERUS APPROACH

— We use a fundamental building block approach to forecast asset class returns, based on several inputs. These include practitioner best-in-class thinking, historical data, and academic research. Each year Verus conducts an in-depth review of our methodology, analyzing new industry research findings and evaluating alternative forecasting approaches to determine whether an improvement to our methodology might be warranted. We maintain flexibility and openness to adjusting our approach if strong evidence suggests change is appropriate.
— For most asset classes, we use the long-term historical volatility after adjusting for autocorrelation.
— Correlations between asset classes are calculated based on the last 10 years. For illiquid assets, such as private equity and private real estate, we use BarraOne correlation estimates.

Asset	Return Methodology	Volatility Methodology*
Inflation	25% weight to the University of Michigan Survey 5-10 year ahead inflation expectation and the Survey of Professional Forecasters (Fed Survey), and the remaining 50% to the market's expectation for inflation as observed through the 10-year TIPS breakeven rate	-
Cash	1/3 * current federal funds rate + 1/3 * U.S. 10-year Treasury yield + 1/3 * Federal Reserve long-term interest rate target	Long-term volatility
Bonds	Nominal bonds: current yield; Real bonds: real yield + inflation forecast	Long-term volatility
International Bonds	Current yield	Long-term volatility
Credit	Current option-adjusted spread + U.S. 10-year Treasury – effective default rate	Long-term volatility
International Credit	Current option-adjusted spread + foreign 10-year Treasury – effective default rate	Long-term volatility
Private Credit	Levered gross return (SOFR + spread + original issuance discounts) – management fees – carried interest	Estimated volatility
Equity	Current yield + real earnings growth (historical average) + inflation on earnings (inflation forecast) + expected P/E change	Long-term volatility
Intl Developed Equity	Current yield + real earnings growth (historical average) + inflation on earnings (intl. inflation forecast) + expected P/E change	Long-term volatility
Private Equity**	US large cap domestic equity forecast * 1.85 beta adjustment	Implied annualized volatility, using actual historical private equity performance distribution
Commodities	Collateral return (cash) + spot return (inflation forecast) + roll return (assumed to be zero)	Long-term volatility
Hedge Funds	Return coming from traditional market betas + historical idiosyncratic/alpha return	Long-term volatility
Core Real Estate	Cap rate + real income growth – capex + inflation forecast	65% of REIT volatility
REITs	Core real estate	Long-term volatility
Value-Add Real Estate	Core real estate + 2%	Volatility to produce Sharpe Ratio (g) equal to core real estate
Opportunistic Real Estate	Core real estate + 3%	Volatility to produce Sharpe Ratio (g) equal to core real estate
Infrastructure	Current yield + real income growth + inflation on earnings (inflation forecast)	Long-term volatility
Risk Parity	Modeled as the 10-year return expectations of a *representative selection of Risk Parity strategies*	Target volatility

**Long-term historical volatility data is adjusted for autocorrelation (see Appendix)*

***Private Equity is modeled assuming an 8.0% floor for expected return, and a 3% return premium ceiling over U.S. Large Cap Equity. These adjustments are in place to recognize that higher interest rates (cost of leverage) act as a drag on expected Private Equity returns but that this drag has had limits historically, and to recognize that future Private Equity total universe performance is likely to be more anchored to public equity performance than in past times, given a more competitive market environment*

10-year return & risk assumptions

Asset Class	Index Proxy	Ten Year Return Forecast		Standard Deviation Forecast	Sharpe Ratio Forecast (g)	Sharpe Ratio Forecast (a)	10-Year Historical Sharpe Ratio (g)	10-Year Historical Sharpe Ratio (a)
		Geometric	Arithmetic					
Equities								
U.S. Large	S&P 500	5.3%	6.4%	15.5%	0.10	0.17	0.77	0.80
U.S. Small	Russell 2000	6.3%	8.4%	21.3%	0.12	0.22	0.35	0.44
International Developed	MSCI EAFE	6.7%	8.1%	17.5%	0.17	0.25	0.27	0.33
International Small	MSCI EAFE Small Cap	8.8%	10.8%	21.4%	0.23	0.33	0.27	0.35
Emerging Markets	MSCI EM	7.0%	9.6%	24.2%	0.13	0.24	0.14	0.22
Global Equity	MSCI ACWI	6.0%	7.3%	16.7%	0.13	0.21	0.52	0.57
Global Equity ex USA	MSCI ACWI ex USA	7.0%	8.7%	19.3%	0.17	0.25	0.24	0.31
Private Equity	CA Private Equity	8.0%	10.9%	26.0%	0.16	0.27	-	-
Private Equity Direct	CA Private Equity	9.0%	11.9%	26.0%	0.20	0.31	-	-
Private Equity (FoF)	CA Private Equity	7.0%	10.0%	26.0%	0.12	0.23	-	-
Fixed Income								
Cash	30 Day T-Bills	3.8%	3.8%	1.1%	-	-	-	-
U.S. TIPS	Bloomberg U.S. TIPS 5-10	4.0%	4.2%	5.5%	0.04	0.07	0.18	0.20
Non-U.S. Inflation Linked Bonds	Bbg World Govt. Inflation Linked ex U.S.	3.4%	3.7%	7.4%	-0.05	-0.01	-0.03	0.01
U.S. Treasury	Bloomberg Treasury 7-10 Year	3.8%	4.0%	7.1%	0.00	0.03	-0.02	0.01
Long U.S. Treasury	Bloomberg Treasury 20+ Year	4.1%	4.9%	13.4%	0.02	0.08	-0.06	0.01
Global Sovereign ex U.S.	Bloomberg Global Treasury ex U.S.	2.2%	2.7%	10.0%	-0.16	-0.11	-0.30	-0.26
Global Aggregate	Bloomberg Global Aggregate	3.4%	3.6%	6.7%	-0.06	-0.03	-0.17	-0.14
Core Fixed Income	Bloomberg U.S. Aggregate Bond	4.3%	4.4%	4.7%	0.11	0.13	0.04	0.06
Core Plus Fixed Income	Bloomberg U.S. Universal	4.4%	4.5%	4.7%	0.13	0.15	0.10	0.13
Investment Grade Corp. Credit	Bloomberg U.S. Corporate IG	4.6%	4.9%	8.4%	0.10	0.13	0.19	0.22
Short-Term Gov't/Credit	Bloomberg U.S. Gov't/Credit 1-3 Year	3.9%	3.9%	3.6%	0.03	0.03	0.00	0.00
Short-Term Credit	Bloomberg Credit 1-3 Year	4.2%	4.3%	3.6%	0.11	0.14	0.28	0.29
Intermediate Credit	Bloomberg U.S. Intermediate Credit	4.3%	4.5%	5.9%	0.08	0.12	0.19	0.25
Long-Term Credit	Bloomberg Long U.S. Credit	4.6%	5.2%	11.1%	0.07	0.13	0.13	0.19
High Yield Corp. Credit	Bloomberg U.S. Corporate High Yield	5.6%	6.1%	10.8%	0.17	0.21	0.45	0.47
Bank Loans	S&P/LSTA Leveraged Loan	6.9%	7.3%	8.8%	0.35	0.40	0.58	0.59
Global Credit	Bloomberg Global Credit	4.1%	4.4%	7.8%	0.04	0.08	0.07	0.10
Emerging Markets Debt (Hard)	JPM EMBI Global Diversified	7.7%	8.2%	10.5%	0.37	0.42	0.18	0.22
Emerging Markets Debt (Local)	JPM GBI-EM Global Diversified	5.8%	6.5%	12.1%	0.17	0.22	-0.10	-0.04
Securitized Credit	Bloomberg U.S. Securitized	4.7%	4.8%	4.0%	0.23	0.25	-0.03	-0.01

Investors wishing to produce expected geometric return forecasts for their portfolios should use the arithmetic return forecasts provided here as inputs into that calculation, rather than the single-asset-class geometric return forecasts. This is the industry standard approach, but requires a complex explanation only a heavy quant could love, so we have chosen not to provide further details in this document – we will happily provide those details to any readers of this who are interested.

10-year return & risk assumptions

Asset Class	Index Proxy	Ten Year Return Forecast		Standard Deviation Forecast	Sharpe Ratio Forecast (g)	Sharpe Ratio Forecast (a)	10-Year Historical Sharpe Ratio (g)	10-Year Historical Sharpe Ratio (a)
		Geometric	Arithmetic					
Fixed Income (continued)								
Private Credit	S&P LSTA Leveraged Loan Index	8.2%	8.8%	11.8%	0.37	0.42	-	-
Private Credit (Direct Lending - Unlevered)	S&P LSTA Leveraged Loan Index	7.1%	7.5%	8.8%	0.38	0.42	-	-
Private Credit (Direct Lending - Levered)	S&P LSTA Leveraged Loan Index	8.3%	8.9%	11.8%	0.38	0.43	-	-
Private Credit (Credit Opportunities)	S&P LSTA Leveraged Loan Index	8.8%	9.6%	13.4%	0.37	0.43	-	-
Private Credit (Junior Capital / Mezzanine)	S&P LSTA Leveraged Loan Index	8.6%	9.4%	12.9%	0.37	0.43	-	-
Private Credit (Distressed)	S&P LSTA Leveraged Loan Index	9.1%	12.7%	29.1%	0.18	0.31	-	-
Other								
Commodities	Bloomberg Commodity	6.3%	7.4%	16.0%	0.16	0.23	-0.11	-0.04
Hedge Funds	HFRI Fund Weighted Composite	5.0%	5.3%	7.5%	0.16	0.20	0.55	0.56
Hedge Fund of Funds	HFRI Fund of Funds Composite	4.0%	4.3%	7.5%	0.03	0.07	0.39	0.41
Hedge Funds (Equity Style)	Custom HFRI Benchmark Mix*	5.4%	6.3%	13.9%	0.12	0.18	0.37	0.42
Hedge Funds (Credit Style)	Custom HFRI Benchmark Mix*	5.2%	5.6%	9.2%	0.15	0.20	0.61	0.62
Hedge Funds (Assymetric Style)	Custom HFRI Benchmark Mix*	5.4%	5.6%	6.3%	0.25	0.29	0.55	0.56
Real Estate Debt	Bloomberg CMBS IG	6.8%	7.1%	7.4%	0.41	0.45	0.20	0.22
Core Real Estate	NCREIF Property	7.2%	7.9%	12.5%	0.27	0.33	-	-
Value-Add Real Estate	NCREIF Property + 200bps	9.2%	10.3%	15.4%	0.35	0.42	-	-
Opportunistic Real Estate	NCREIF Property + 300bps	10.2%	12.1%	21.2%	0.30	0.39	-	-
REITs	Wilshire REIT	7.2%	8.8%	19.2%	0.18	0.26	0.34	0.41
Global Infrastructure	S&P Global Infrastructure	8.1%	9.4%	16.8%	0.26	0.33	0.24	0.31
Risk Parity**	S&P Risk Parity 10% Vol Index	6.3%	7.1%	10.0%	0.25	0.33	0.40	0.44
Currency Beta	MSCI Currency Factor Index	2.2%	2.3%	3.3%	-0.48	-0.45	-0.30	-0.28
Inflation		2.4%	-	-	-	-	-	-
60/40 Portfolio	MSCI ACWI / Bbg U.S. Agg	5.5%	6.0%	10.9%	0.16	0.20	0.50	0.53

Investors wishing to produce expected geometric return forecasts for their portfolios should use the arithmetic return forecasts provided here as inputs into that calculation, rather than the single-asset-class geometric return forecasts. This is the industry standard approach, but requires a complex explanation only a heavy quant could love, so we have chosen not to provide further details in this document – we will happily provide those details to any readers of this who are interested.

**To represent hedge fund styles, we use a combination of HFRI benchmarks: Equity Style = 33% HFRI Fundamental Growth, 33% HFRI Fundamental Value, 33% HFRI Activist. Credit Style = 20% HFRI Distressed/Restructuring, 20% HFRI Credit Arbitrage, 20% HFRI Fixed Income-Corporate, 20% HFRI Fixed Income-Convertible Arbitrage, 20% HFRI Fixed Income-Asset Backed. Asymmetric Style = 50% HFRI Relative Value, 50% HFRI Macro*

***The Risk Parity forecast shown here assumes a 10% target volatility strategy. We recommend customizing this forecast to the target volatility specifications of the risk parity strategy that an investor wishes to model. Please speak with your Verus consultants for customization needs.*

Correlation assumptions

	Cash	US Large	US Small	Intl Large	Intl Small	EM	Global Equity	PE	US TIPS	US Treasury	Global Sovereign ex-US	US Core	Core Plus	Short-Term Gov't/Credit	Short-Term Credit	Long-Term Credit	US HY	Bank Loans	Global Credit	EM Debt USD	EM Debt Local	Commodities	Hedge Funds	Real Estate	REITs	Infrastructure	Currency Beta	Risk Parity
Cash	1.0																											
US Large	0.0	1.0																										
US Small	-0.1	0.9	1.0																									
Intl Large	0.0	0.9	0.8	1.0																								
Intl Small	0.0	0.9	0.8	1.0	1.0																							
EM	0.0	0.7	0.6	0.8	0.8	1.0																						
Global Equity	0.0	1.0	0.9	0.9	0.9	0.8	1.0																					
PE	-0.1	0.7	0.7	0.6	0.6	0.6	0.7	1.0																				
US TIPS	0.0	0.5	0.4	0.5	0.5	0.4	0.5	0.2	1.0																			
US Treasury	0.1	0.1	0.0	0.1	0.1	0.1	0.1	-0.1	0.8	1.0																		
Global Sovereign ex-US	0.2	0.4	0.3	0.5	0.5	0.5	0.5	0.1	0.7	0.6	1.0																	
US Core	0.1	0.4	0.3	0.4	0.4	0.4	0.4	0.0	0.8	0.9	0.8	1.0																
Core Plus	0.2	0.5	0.4	0.5	0.5	0.5	0.5	0.1	0.8	0.9	0.8	1.0	1.0															
Short-Term Gov't/Credit	0.3	0.2	0.1	0.3	0.3	0.3	0.3	0.0	0.7	0.8	0.6	0.8	0.8	1.0														
Short-Term Credit	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.2	0.7	0.5	0.7	0.7	0.8	0.7	1.0													
Long-Term Credit	0.1	0.6	0.5	0.6	0.6	0.6	0.6	0.2	0.8	0.7	0.8	0.9	0.9	0.7	0.8	1.0												
US HY	0.0	0.8	0.8	0.8	0.8	0.7	0.8	0.5	0.6	0.2	0.5	0.5	0.6	0.4	0.6	0.7	1.0											
Bank Loans	0.0	0.6	0.6	0.6	0.7	0.6	0.6	0.5	0.3	-0.1	0.2	0.2	0.3	0.1	0.5	0.4	0.8	1.0										
Global Credit	0.1	0.7	0.6	0.7	0.8	0.7	0.7	0.3	0.8	0.6	0.8	0.8	0.9	0.7	0.8	0.9	0.8	0.6	1.0									
EMD USD	0.1	0.7	0.6	0.7	0.7	0.7	0.7	0.4	0.6	0.4	0.7	0.6	0.7	0.5	0.7	0.8	0.8	0.7	0.9	1.0								
EMD Local	0.1	0.5	0.4	0.7	0.7	0.8	0.7	0.4	0.5	0.3	0.7	0.5	0.6	0.4	0.5	0.6	0.7	0.5	0.8	0.8	1.0							
Commodities	-0.1	0.4	0.4	0.4	0.4	0.5	0.5	0.3	0.2	-0.2	0.2	-0.1	0.0	-0.1	0.1	0.1	0.5	0.5	0.3	0.3	0.4	1.0						
Hedge Funds	0.0	0.8	0.9	0.8	0.9	0.8	0.9	0.6	0.4	-0.1	0.3	0.2	0.4	0.1	0.5	0.5	0.8	0.8	0.7	0.7	0.6	0.5	1.0					
Real Estate	-0.2	0.6	0.5	0.5	0.5	0.4	0.6	0.4	0.2	0.0	-0.1	0.1	0.1	0.0	-0.1	0.2	0.4	0.4	0.3	0.4	0.3	0.2	0.5	1.0				
REITs	-0.1	0.8	0.7	0.7	0.7	0.5	0.7	0.6	0.6	0.4	0.4	0.5	0.6	0.3	0.4	0.7	0.7	0.5	0.7	0.7	0.5	0.3	0.7	0.6	1.0			
Infrastructure	0.0	0.8	0.7	0.8	0.8	0.7	0.8	0.6	0.5	0.2	0.5	0.4	0.5	0.3	0.5	0.6	0.8	0.7	0.8	0.8	0.7	0.5	0.8	0.5	0.7	1.0		
Currency Beta	-0.1	0.0	-0.1	-0.2	-0.2	-0.2	-0.1	0.1	-0.2	-0.1	-0.3	-0.2	-0.2	-0.2	-0.3	-0.2	-0.2	-0.1	-0.3	-0.2	-0.3	-0.1	-0.1	0.1	0.0	-0.1	1.0	
Risk Parity	0.1	0.7	0.7	0.8	0.7	0.6	0.8	0.4	0.7	0.4	0.7	0.6	0.7	0.4	0.7	0.7	0.8	0.5	0.8	0.7	0.6	0.5	0.7	0.1	0.7	0.7	-0.2	1.0

Note: as of 9/30/24 - Correlation assumptions are based on the last ten years. Private Equity and Real Estate correlations are especially difficult to model due to appraisal-based pricing and lag problems that exist in the data – we have therefore used BarraOne correlation data to strengthen these correlation estimates.

Range of likely 10-year outcomes

10-YEAR RETURN 90% CONFIDENCE INTERVAL

Source: Verus 2025 Capital Market Assumptions, MPI

Notices & disclosures

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