



Board of Retirement Regular Meeting

Sacramento County Employees' Retirement System

Agenda Item 26

MEETING DATE: April 21, 2021

SUBJECT: Asset Liability Modeling Study

SUBMITTED FOR: ___ Consent ___ Deliberation and Action X Receive and File

RECOMMENDATION

Staff recommends that the Board receive and file the asset liability modeling (ALM) study presentation by SCERS' general investment consultant, Verus Advisory.

PURPOSE

This item supports the 2021 Annual Investment Plan, which identifies conducting an asset liability modeling study in 2021, and supports SCERS' Master Investment Policy Statement, which calls for an ALM study to be conducted at least every five years.

BACKGROUND

Over the past few months, SCERS has been working on an ALM study with the assistance of SCERS' general consultant, Verus. At last December's Board meeting, Verus and Staff provided an initial introduction to the ALM process, which included a recap of the last ALM study conducted in 2017, approaches to asset liability modeling, and expectations and considerations for the 2021 study.

At the March Board meeting, Verus led a discussion with the Board around the topic of Enterprise Risk Tolerance (ERT). To assist in the ERT assessment and discussion, Verus conducted interviews with SCERS Board members, the results of which will play a part in designing and recommending SCERS' strategic asset allocation. The general conclusion from the ERT assessment was that SCERS has the ability and willingness to accept risk; however, Board members are comfortable with the current strategic asset allocation and its risk profile.

The presentation at the April Board meeting will cover the following areas:

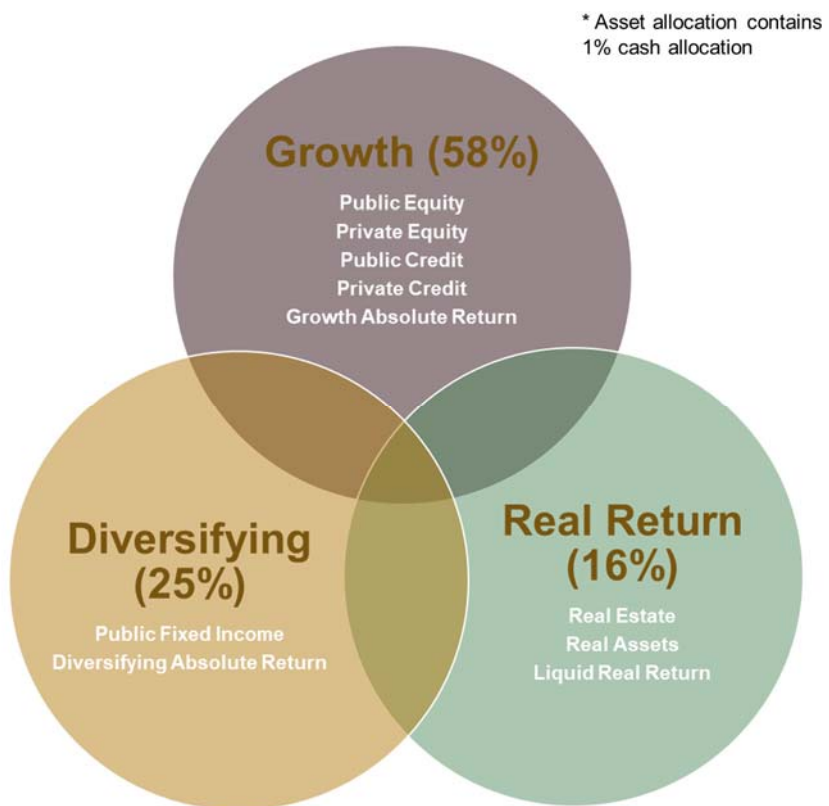
- A summary of downward trends in 10-year expected returns across most market segments.
- An evaluation of SCERS' historical experience over the past 10 years, which includes a review of total fund performance and the impact that this has had on SCERS' funded status, contributions, and benefit payments.

- Modeling by Verus to demonstrate several wide-ranging asset allocation mixes that would move toward and/or meet SCERS’ actuarial rate of return of 6.75%.
- Deterministic projections, which take a forward look at the impact on SCERS’ funded status and contributions across a number of return outcomes.
- A variety of stochastic and risk metrics across Verus’ modeled asset allocation mixes, including risk decomposition, scenario analysis, stress tests, and the impact on SCERS’ funded ratio and contribution rates.

Strategic Asset Allocation

SCERS’ current strategic asset allocation takes a functional approach that blends traditional and alternative asset classes, and links asset classes exposed to similar economic environments and risk factors, and which are expected to have similar roles and outcomes in a portfolio. The asset allocation breaks the portfolio into three asset categories, Growth, Diversifying, and, Real Return, with greater complexity reserved at the asset class level.

The Growth asset category includes those segments of the portfolio that tend to perform best in a high growth and low/moderate inflationary environment, including most equity and credit investments. In contrast, they tend to perform poorly during recessionary periods, when GDP growth is contracting, or during certain periods when unexpected inflation arises. Growth assets tend to comprise the dominant allocation within most institutional investment portfolios, including that of SCERS. The Diversifying asset category includes those segments of the portfolio which are expected to protect capital and perform better than the Growth asset category during dislocated and stressed market environments, including traditional fixed income and diversifying absolute return strategies. The Real Return asset category includes those segments of the portfolio that protect against inflation, generate cash flow, and provide further portfolio diversification, including real estate, infrastructure, energy, and agriculture investments.



The strategic asset allocation takes a somewhat risk-balanced approach that emphasizes having enough return-generating, growth assets to drive performance toward the actuarial rate of return,

but also maintaining enough uncorrelated/diversifying, cash-flowing, and inflation-sensitive assets to reduce downside risk and the range of outcomes that the portfolio is subject to. It has a meaningful allocation to private/illiquid assets, but a reasonable liquidity profile as measured by an annual liquidity analysis conducted by Verus.

The last asset allocation study in 2017 concluded with significant changes to SCERS' portfolio, which are still being implemented today, so it is anticipated that recommended changes from this ALM study should be less significant, and will build upon the 2017 study by retaining a functional asset allocation framework. Potential changes could focus on sizing of existing assets classes and portfolio construction modifications within asset classes.

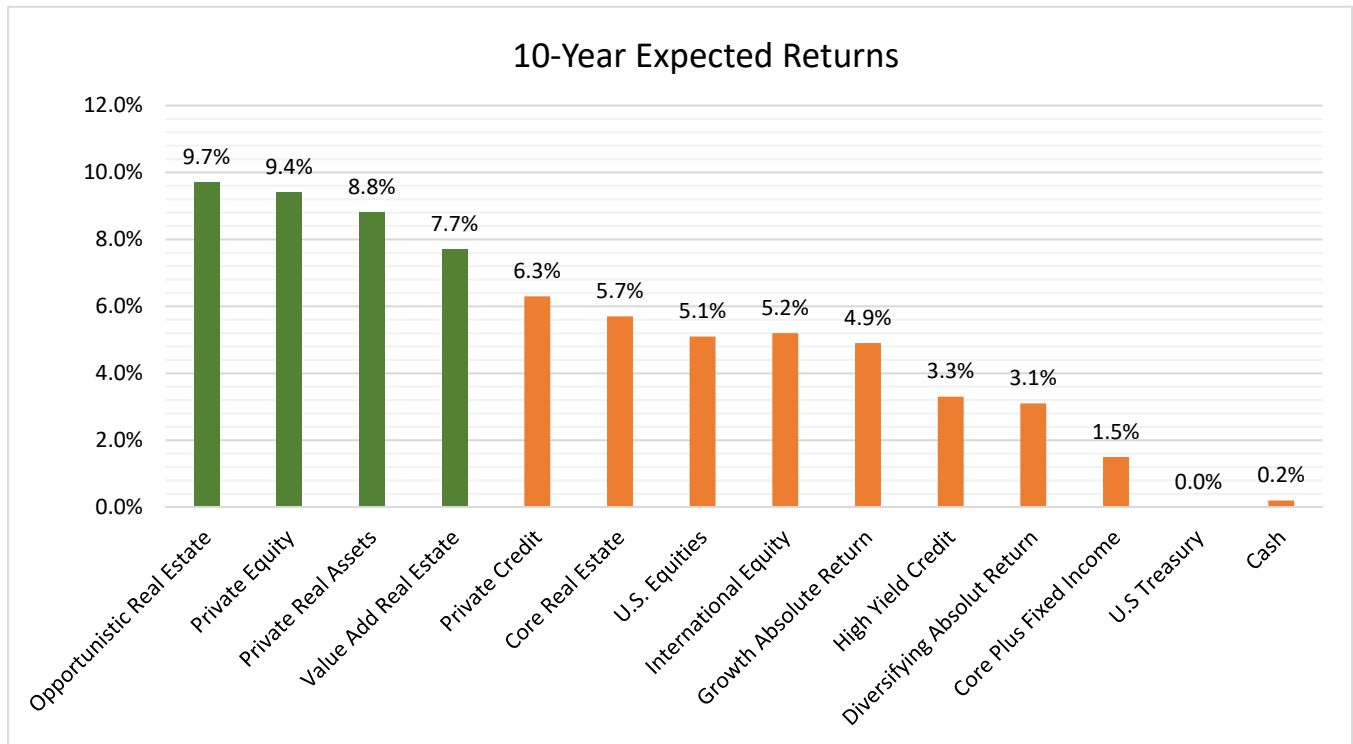
DISCUSSION

Return Expectations

Current Verus capital market assumptions (CMAs) show that most asset classes have seen their expected returns decrease and risk increase over the past few years, as most market segments have experienced significant upside, therefore reducing return premiums along the way. As shown in the Verus presentation, SCERS' current strategic asset allocation only models to a 5.53% return using updated CMAs, versus SCERS' 6.75% actuarial rate of return. The 5.53% return is down from a modeled expected return of 6.5% in January 2020 using last year's CMAs.

It should be noted that Verus modeled SCERS' portfolio and the other asset mixes within the presentation with a combination of Verus' CMAs for public market investments and real estate, and Cliffwater's CMAs for the alternative asset classes that Cliffwater advises SCERS on (hedge funds (absolute return), private equity, private credit, and real assets). Cliffwater provides a more granular calculation on some of the alternative asset classes.

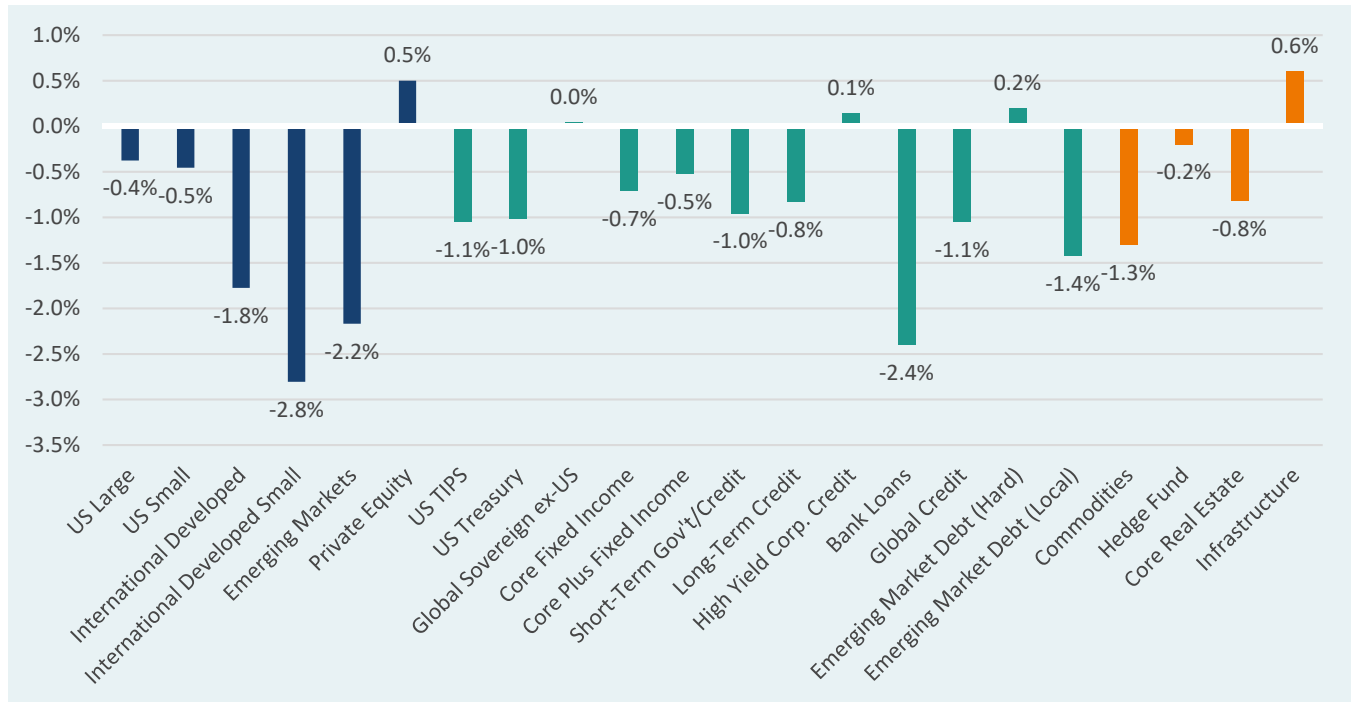
As shown below, the only asset classes that currently have a return expectation above SCERS' actuarial rate of return include private equity, non-core real estate (opportunistic and value add), and private real assets.



Source: Verus and Cliffwater

These asset classes currently make up only approximately 18.5% of SCERS’ asset allocation, so to model a portfolio near the actuarial rate, SCERS would need to increase the allocations to these segments and reduce exposure to lower returning segments such as fixed income, which would increase SCERS’ risk profile, including liquidity risk considerations. As shown on slide 6 of the Verus presentation, a 60/40 (public equity/fixed income) portfolio has historically returned over 7%; however, the projected 10-year return is well under 5%, due to the muted returns for both public equity and fixed income.

The Verus chart below shows the forecasted return changes across asset classes for 2021, versus those in 2020. While most asset classes are down, international equity particularly stands out, down 2% to 3% from last year’s forecasted returns, depending on the market, mostly due to a lower inflation assumption.



Source: Verus

Asset Allocation Mixes

Given the lower going forward return expectations, an emphasis for the modeling that is being presented at the April Board meeting is to demonstrate some wide-ranging changes that would need to be considered to model a portfolio with an expected return of 6.75%. The modeling also includes a couple of less wide-ranging portfolios that move SCERS closer the actuarial rate, though still below that target. These mixes are being presented to receive feedback and direction from the Board. More fine-tuned asset mix modeling will be presented at future Board meetings for consideration. Below is a description of the asset mixes modeled by Verus:

- High Private Equity** – This portfolio demonstrates how much SCERS would need to increase its exposure to an asset class (private equity) with one of the highest forecasted returns (9.4%) and which has performed well for SCERS. Private equity would necessitate a 24% allocation (up from its current allocation of 9%), combined with a reduction in lower-returning fixed income and cash exposures, to move the portfolio to the actuarial rate of return of 6.75%. This represents an unrealistic portfolio, as it would significantly reduce SCERS’ liquidity profile (52% of the portfolio would be in illiquid assets vs. 37% for the current portfolio) in addition to reducing a bulk of the uncorrelated ‘anchor to safety’ fixed income assets. It would also significantly increase the risk profile of the portfolio to a standard deviation of 13.2%, versus the current asset allocation’s measure of 10.4%, though the risk-adjusted return would stay the same, as measured by the Sharpe Ratio.
- Leverage Diversified** – This portfolio introduces the concept of portfolio leverage as a tool to increase returns. While this is not an avenue that Staff and Verus would

recommend for SCERS at this time, the use of portfolio wide leverage is used by some institutional investors for a variety of reasons, including increasing returns. This portfolio does model close to a 6.75% return, but also increases the risk profile of SCERS' plan considerably, as measured by the 12.8% Standard Deviation.

It should be noted that portfolio leverage can serve a variety of functions in an institutional portfolio. It can be used to increase returns (and risk) by increasing notional exposure to higher-returning asset classes across the portfolio, as in the case above. However, leverage can also be used to modestly enhance returns by increasing exposure to less correlated market segments rather than higher risk segments. It can also be used to reduce risk by increasing portfolio liquidity through more efficient implementation of existing portfolio segments.

- **High Risk Liquid Assets** – This portfolio was added under the assumption that SCERS did not have the willingness or ability to increase private markets exposure significantly to increase the return profile, due to liquidity constraints. It in turn increases exposure to liquid, higher-returning assets, particularly public equities, while reducing the exposure to fixed income. Since public equities are only forecasted to return between 5.0% and 5.5% over the next 10 years, and fixed income is only forecasted to earn from 0.7% (10-year U.S. Treasuries) to 3.3% (high yield credit), this portfolio doesn't do enough to move SCERS to the actuarial rate of return. It increases returns marginally to 5.95%, but increases the risk profile meaningfully, translating to a lower risk-adjusted return.
- **High Risk Assets** – This portfolio takes a more prudent approach to increasing exposure to higher-returning assets across both public markets and alternative assets, while decreasing the fixed income and cash allocations. It marginally increases allocations to several asset classes that have performed well for SCERS, such as private equity, private credit, real estate, and real assets, as well as a small increase to public equities, while slightly decreasing fixed income exposure. It marginally increases the expected return and risk profile, but has a higher Sharpe Ratio than the existing asset allocation, at 0.56 vs. 0.54.
- **High Cash-Flowing Assets** – This portfolio increases exposure to higher cash-flowing assets such as private credit, real estate, and real assets, while reducing public equity and absolute return. SCERS is cash flow negative as a plan (more benefit payments going out than contributions coming in), so an emphasis on the generation of portfolio cash flows is important. Overall, this portfolio increases the return profile slightly to 5.73%, while keeping portfolio risk in line with the current asset allocation. Overall, this portfolio contributes to a higher risk adjusted return, as measured by the Sharpe Ratio.

Liability Modeling

Similar to the 2017 ALM study, the modeling by Verus also incorporates SCERS' liability data, and demonstrates the impact that the various modeled mixes would have on SCERS' funded ratio and employer/employee contributions. The modeling includes:

Deterministic:

Deterministic projections take a forward view to determine the impact on SCERS' funded status and contribution rates under the assumption that SCERS earns its assumed rate of return of 6.75% over the next few decades, and also under various scenarios where SCERS falls short of its assumed rate of return, and the impact that this would have.

Verus estimates that if SCERS earns its actuarial rate of return of 6.75% over the next 20 years, the plan would be fully funded by 2040. However, shortfalls in earning the actuarial rate of return slows down the progress in getting the plan fully funded, and potentially increases contribution rates to make up the difference. Large drawdowns, such as what was experienced during the Global Financial Crisis, also impact the path toward becoming fully funded and potentially contribution rates.

The path toward earning the actuarial rate of return is bound to significant variability, as returns will come in above the rate some years and below in other years, which has also been demonstrated in the past by SCERS' actuarial consultant, Segal.

Stochastic and Risk:

These metrics provided by Verus break down the different model mixes across risk factors, and demonstrate how much exposure each mix would have to a specific risk factor (i.e., equity, credit, rate, currency, inflation, etc.). The Verus modeling also runs scenario and stress tests across a variety of market environments. The higher the exposure to higher-returning/higher-risk assets, the higher concentration to the equity risk factor and the higher the expected drawdown in dislocated market environments.

In addition, the metrics provide a range of outcomes across funded ratio and employer contributions for the different mixes. Higher exposure to higher-returning/higher-risk assets expose the plan to a wider potential range of outcomes, as it relates to returns, but also for SCERS' funded ratio and employer contributions.

CONCLUSION

As the Verus modeling demonstrates, a realistic consideration is that based on current 10-year forecasted returns, SCERS' asset allocation will fall short of the 6.75% actuarial rate of return, unless the risk profile of the plan increases significantly. In considering asset allocation adjustments, there is a trade-off between taking on more risk to potentially generate higher returns versus maintaining a sufficient level of diversifying and cash-flowing assets to reduce downside risk and the range of outcomes to which the portfolio is subject, and therefore accepting a lower projected return than what is assumed.

To assist in balancing this dilemma, an important consideration is that capital market assumptions produced by consultants and many asset managers are just that—assumptions. SCERS' historical experience (see page 11 of the Verus presentation) shows that in a given year the actual return will vary significantly from the actuarial rate; sometimes higher and other

times lower. It is important to understand that SCERS' actual experience will fall within a broad range of outcomes around the modeled median return, so caution should be placed in putting too large a weighting on a single number.

It should also be noted that the gap between expected returns and the actuarial return can potentially be closed through implementation and the generation of excess returns. As an example, over the past 3-year, 5-year, and 10-year periods, SCERS has earned excess returns of 1.3%, 1.1%, and 0.4%, respectively, net of fees, over the policy index benchmark. While there is variability to earning excess returns, and they are difficult to earn consistently, they do provide a potential mechanism to close some of the gap.

While sweeping asset allocation changes might not be preferred by the Board, there are more marginal revisions which the Board could consider to further close the gap, including:

- Private Equity – Strong performance on an absolute and relative basis and mature portfolio with positive cash flows:
 - More opportunities than available capital could warrant consideration toward a higher allocation to an asset class with a high expected return.
- Real Estate – Strong returns on an absolute and relative basis, and like private equity, more investment opportunities than available capital could warrant consideration toward a higher allocation.
- Real Assets – Consideration toward restructuring this asset class with a primary focus on infrastructure and agriculture, and an opportunistic approach to energy (less of a focus on volatile upstream energy).
- Fixed Income – Sizing considerations:
 - Balance role as anchor-to-safety and liquidity source versus muted expected returns for fixed income.
- Private Credit – Sizing consideration given high cash flow profile and relatively robust return expectations.
- Absolute Return – Consideration as to whether to maintain a separate asset class for Growth Absolute Return:
 - Can potentially integrate exposure opportunistically into the public equity and credit portfolios.
- Opportunities - what role should this asset class play going forward?

At the conclusion of the ALM study, the Board will decide on the ultimate asset allocation mix for SCERS' portfolio. The final asset allocation selection should not necessarily be made solely to achieve a desired return assumption, but rather should be made within a holistic framework, by identifying the proper blend of asset mixes that will provide a certain level of diversification that will best allow SCERS to achieve its desired outcomes. It should also be noted that while an asset liability study is conducted once every three to five years, an asset allocation study can be conducted more frequently. So regardless of the asset allocation changes made during this study, the asset allocation can be re-evaluated prior to the next ALM study as CMAs adjust.

ATTACHMENTS

- Verus Asset/Liability Modeling Presentation

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**PERSPECTIVES
THAT DRIVE
ENTERPRISE
SUCCESS**



APRIL 2021

Asset/Liability Modeling Presentation

Sacramento County Employees' Retirement System

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***Past performance is no guarantee of future results.** This document is provided for informational purposes only and is directed to institutional clients and eligible institutional counterparties only and is not intended for retail investors. Nothing herein constitutes investment, legal, accounting or tax advice, or a recommendation to buy, sell or hold a security or pursue a particular investment vehicle or any trading strategy. This document may include or imply estimates, outlooks, projections and other “forward-looking statements.” No assurance can be given that future results described or implied by any forward looking information will be achieved. Investing entails risks, including possible loss of principal. Additional information about Verus Advisory, Inc. is available on the SEC’s website at www.adviserinfo.sec.gov. Verus – also known as Verus Advisory™.*

I. Introduction

Summary

Objectives:

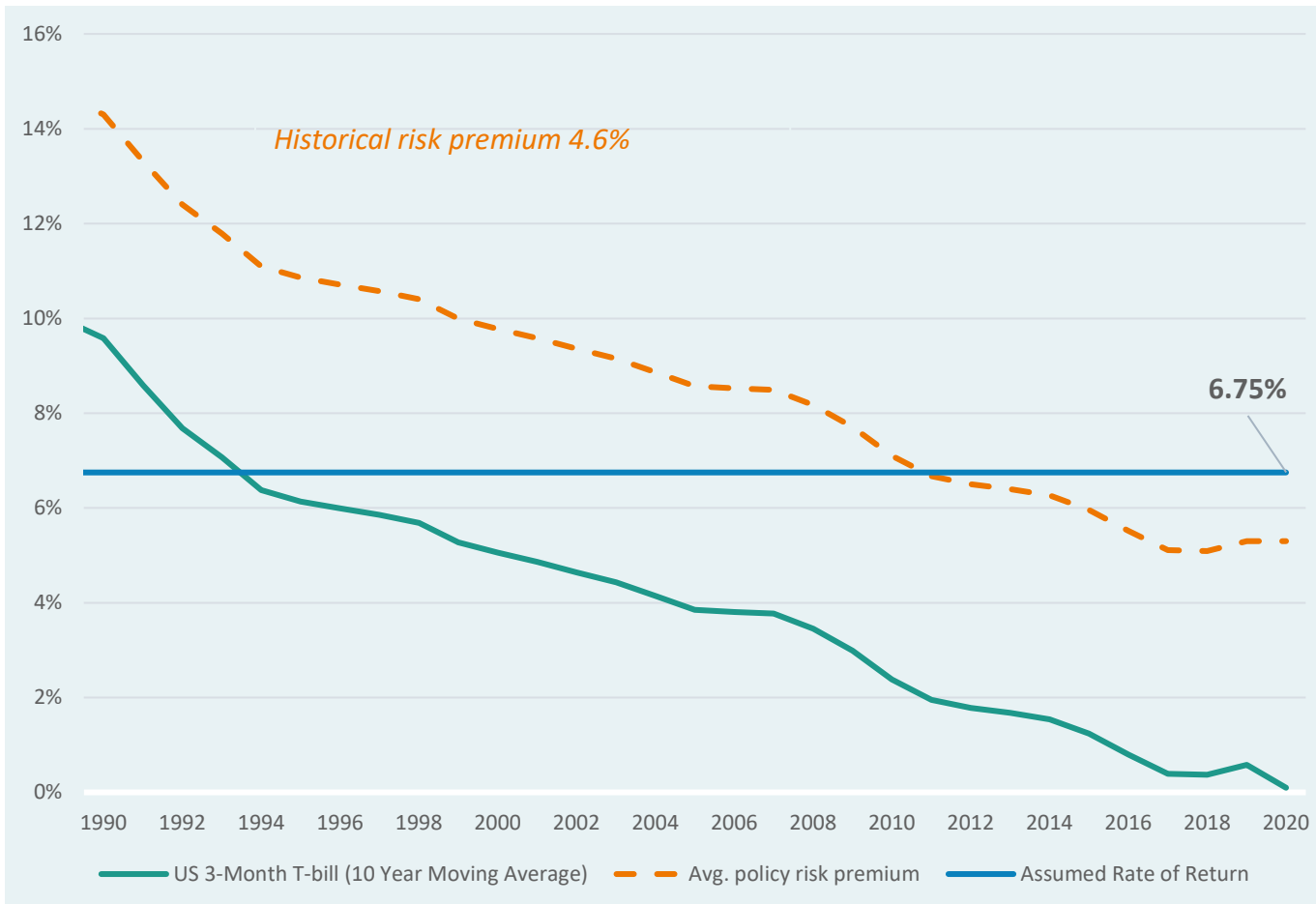
- Review asset allocation mixes and provide direction to Staff and Verus for further refined portfolio options

Summary Findings:

- Hitting the actuarial rate of return will be challenging in the current environment
- Portfolios that are projected to hit a 6.75% return may not be realistic to implement or would require SCERS to assume excessively high leverage and/or illiquidity
- Verus' CMA returns are based on 10-year projections which is far shorter than your investment horizon
- 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

Achieving 6.75% return used to be easier...

WHAT THE MARKET CAN PROVIDE

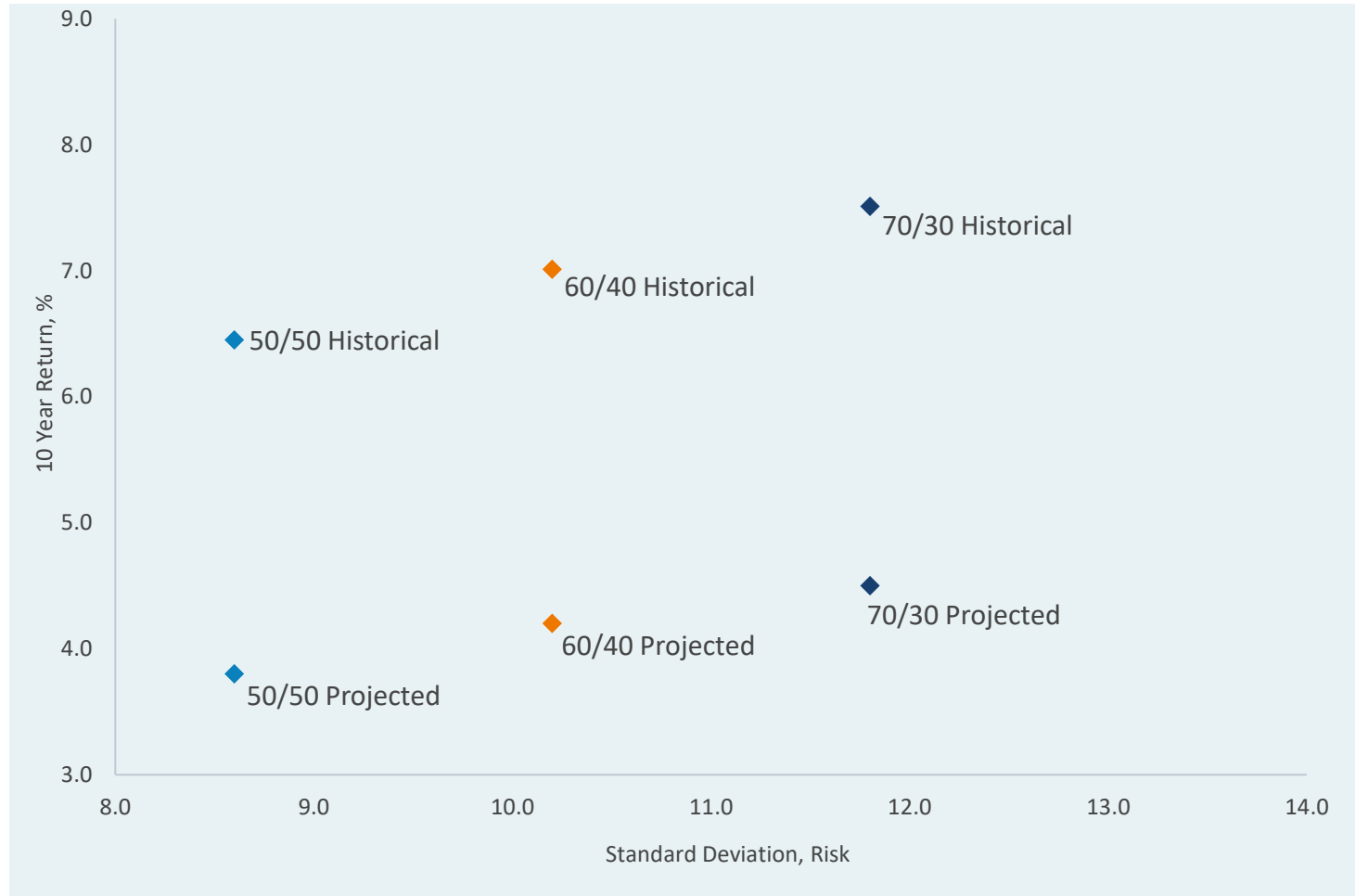


As of 12/31/2020. Avg. policy risk premium calculated using a domestic 60/40 portfolio (60% S&P 500 / 40% 10-year T Bonds from 1928-1977; 60% S&P 500 / 40% BBgBarc Agg. from 1977-2020). 10-year trailing T-Bill as of 12/31/2020 = 0.1%

¹Based on Verus CMA's

Comparing 10-year historical and projected returns

The mixes below reflect the divergence of historical and projected returns.



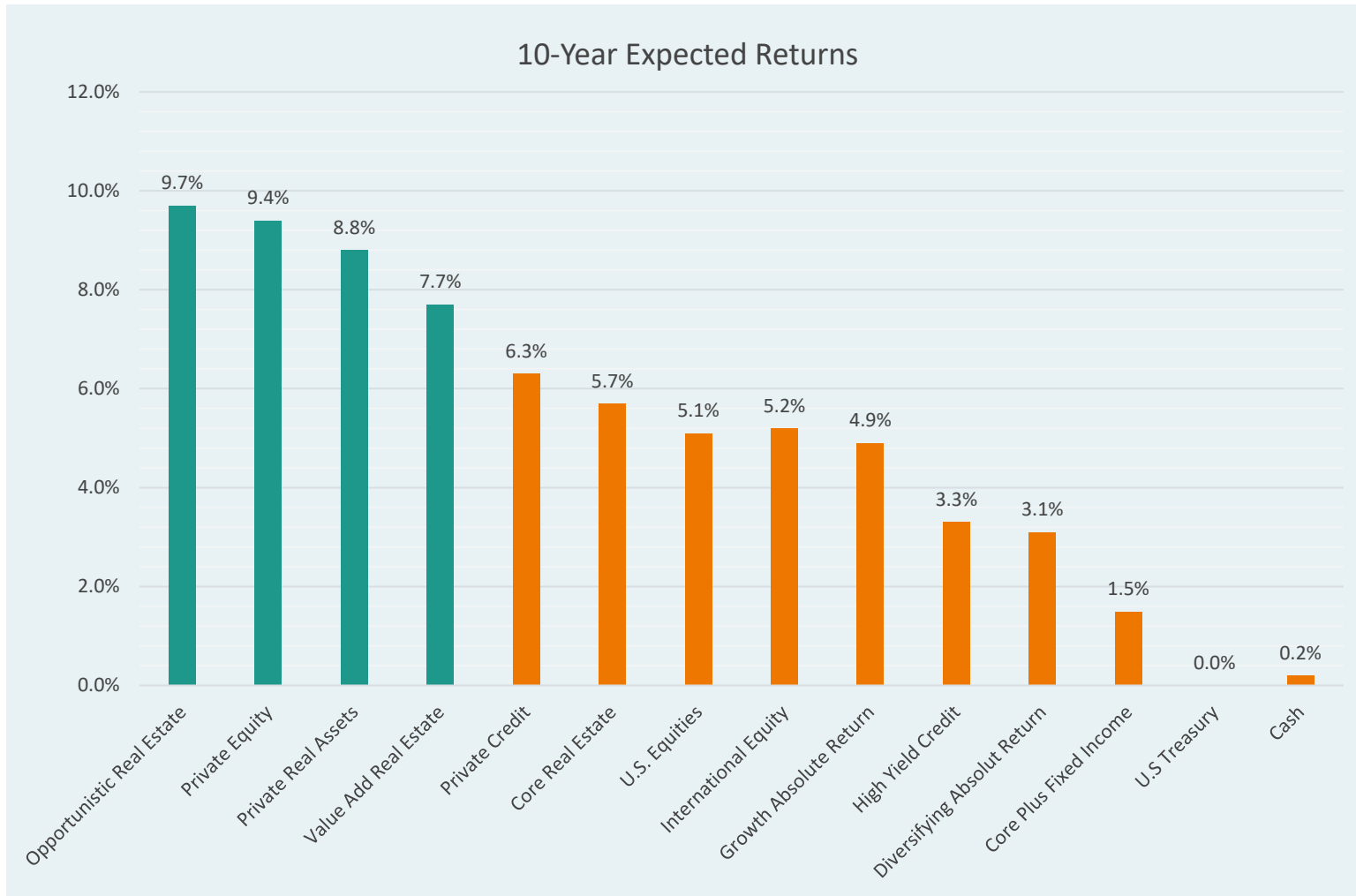
SCERS 10-year Policy expected returns are 1.7% lower per year than in 2016

SCERS 2016 Policy expected return – 7.2%

SCERS 2021 Policy expected return – 5.5%

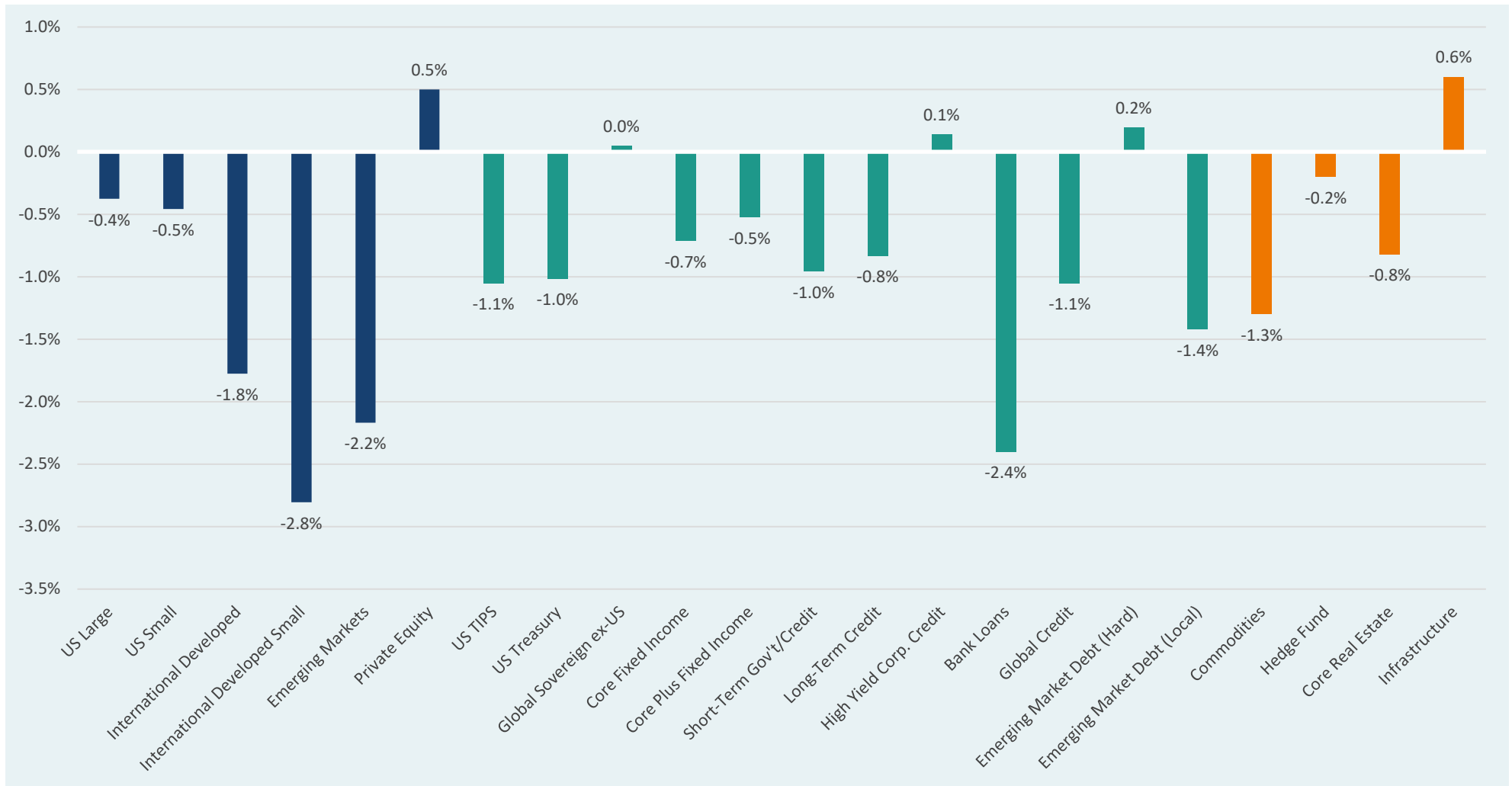
Projected returns based on Verus' Capital Market Assumptions (CMA'S); 10-year return series for both historical and projected

10-year capital market assumptions



Projected returns based on Verus & Cliffwater Capital Market Assumptions (CMA'S); 10-year return projected series

2021 vs. 2020 return forecast

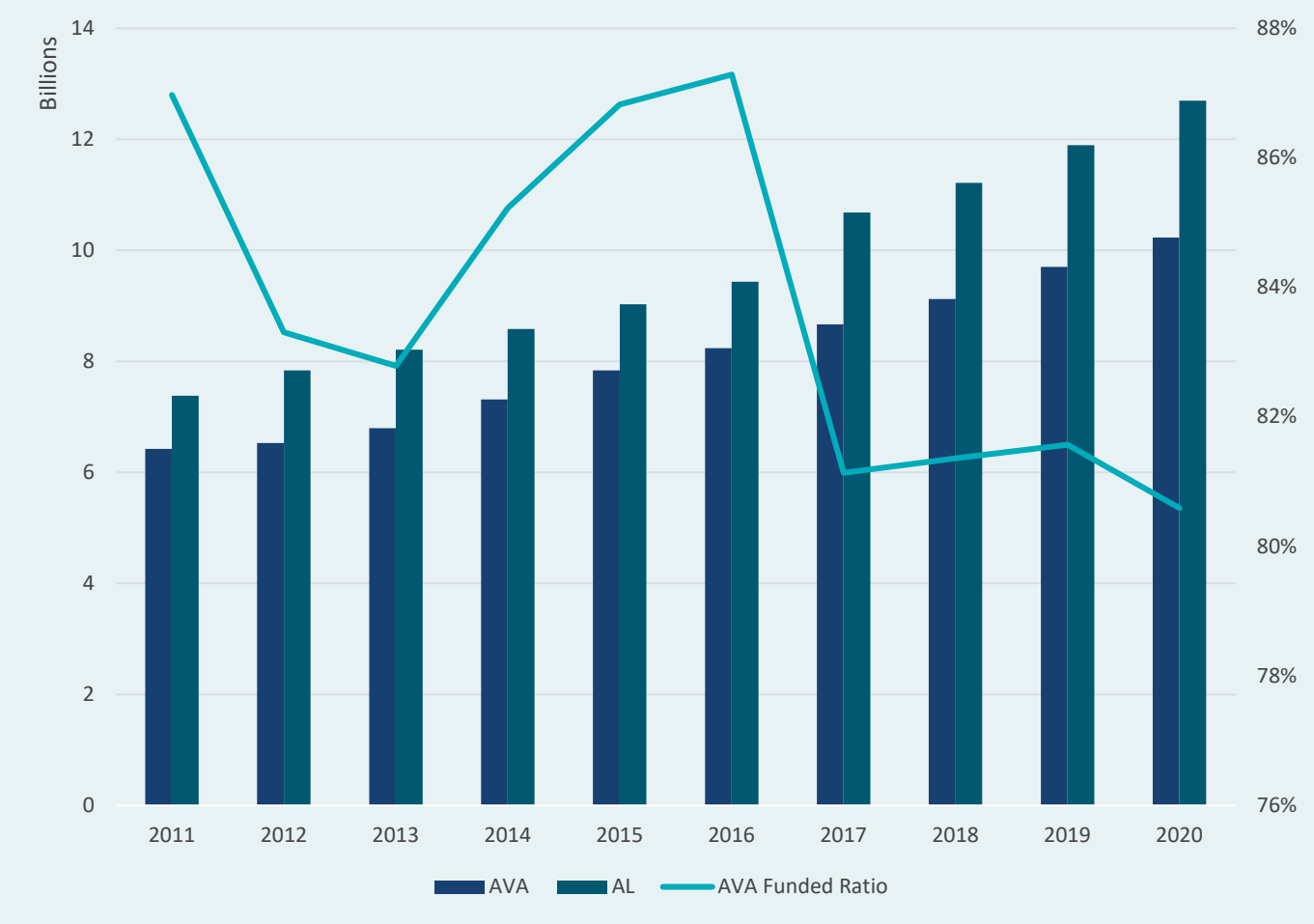


Note: year-over-year change of the select group of asset classes above is based on the 2020 CMA methodology

II. Historical experience

Historical Funded Status

SCERS HISTORICAL FUNDED STATUS

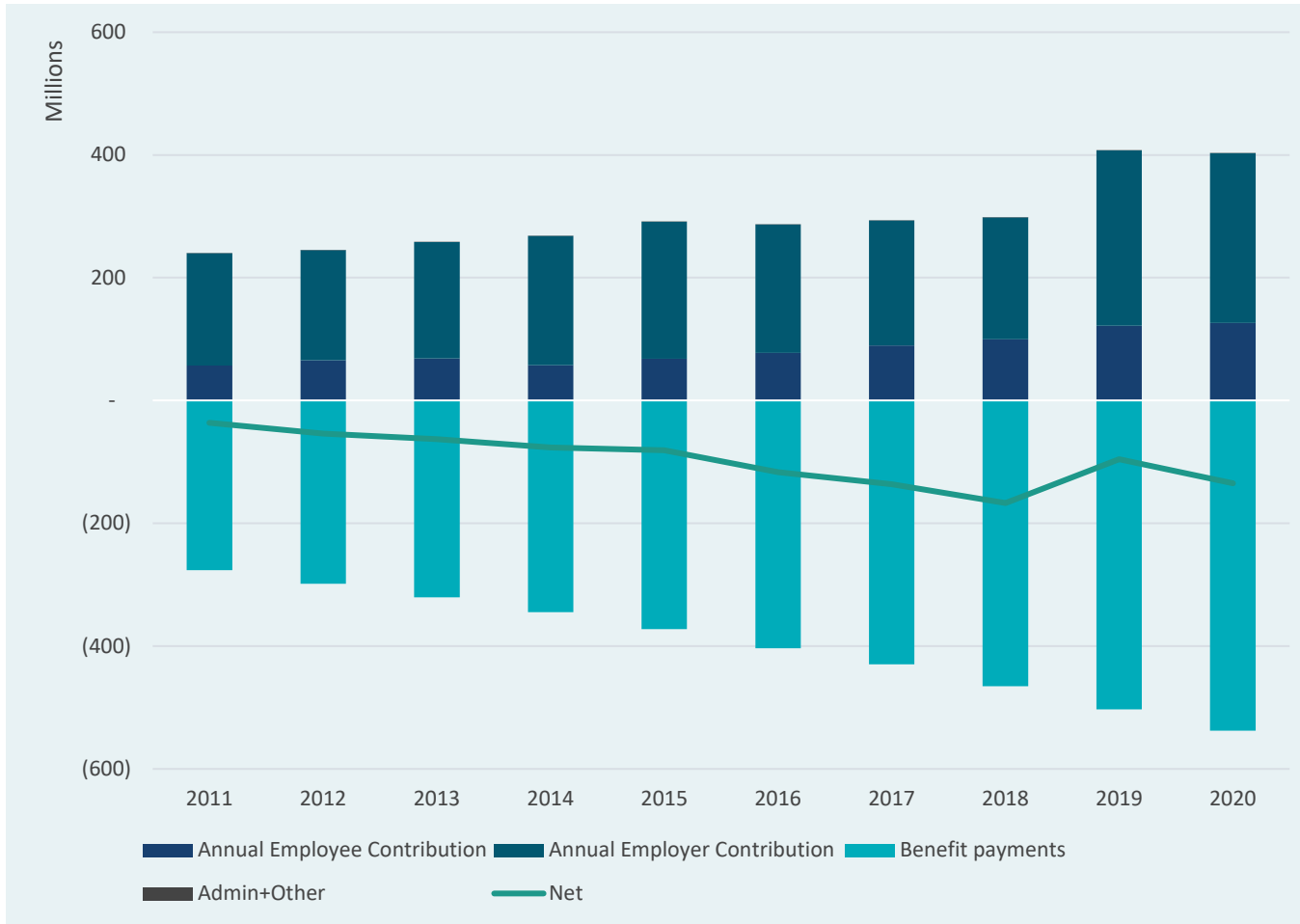


The dip in 2016/17 funded status was a combination of poor performance and the lowering of SCERS’ actuarial rate of return

Source: SCERS Actuarial Valuation 6/30/2020

Historical Cashflow

SCERS HISTORICAL CASHFLOW



Like most mature pension plans, SCERS has a growing negative cash flow profile

Liquidity management becomes more important as cash outflows increase over time

Source: SCERA 2020 CAFR

10 Year Historical Returns

SCERS HISTORICAL RETURN (NET)



SCERS has outperformed expectations over past ten years. However, year to year volatility can be high and require a long-term investment horizon to appropriately evaluate its success.

10-Yr Actual Average return (8.64%)
Current Assumed Return (6.75%)

Source: Verus. Returns reflect fiscal year.

III. Deterministic projections

Asset allocation mixes

Summary:

- Review six asset allocation mixes with the goal of providing feedback and direction to Staff and Verus to further narrow down possible asset allocation mixes

Current Policy	High PE	Leverage Diversified	High Risk Liquid Assets	High Risk Assets	High Cash Flowing Assets
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High Private Equity

	Policy	High PE	Return (g)
US Large	18.0	18.0	5.1
US Small	2.0	2.0	5.2
International Developed	16.0	16.0	5.1
Emerging Markets	4.0	4.0	5.4
High Yield Corp. Credit	1.0	1.0	3.3
Bank Loans	1.0	1.0	2.9
Growth Absolute Return*	3.0	3.0	4.9
Private Equity*	9.0	24.0	9.4
Private Credit*	4.0	4.0	6.3
Total Growth Assets	58	73	
Core Plus Fixed Income	10.0	0.0	1.5
US Treasury	5.0	0.0	0.7
Global Credit	3.0	3.0	0.3
Diversifying Absolute Return*	7.0	7.0	3.1
Cash	1.0	1.0	0.2
Total Diversifying	26	11	
Core Real Estate	5.0	5.0	5.7
Value Add Real Estate	1.0	1.0	7.7
Opportunistic Real Estate	1.0	1.0	9.7
Liquid Real Return	2.0	2.0	4.8
Private Real Assets*	7.0	7.0	8.8
Total Real Return	16	16	
Total Allocation	100	100	
Mean Variance Analysis			
Forecast 10 Year Return	5.53	6.68	
Standard Deviation	10.4	13.2	
1st percentile ret. 1 year	-16.0	-19.7	
Sharpe Ratio	0.54	0.54	
% in Liquid Assets	63.0%	48.0%	
% in Illiquid Assets	37.0%	52.0%	

- How much illiquidity risk would SCERS need to take in order to reach your required rate of return
- Private equity goes from 9% for Policy to 24% in High Private Equity scenario
- The source of funding for private equity comes from fixed income

Leverage Diversified

	Policy	Leverage Diversified	Return (g)
US Large	18.0	20.0	5.1
US Small	2.0	2.0	5.2
International Developed	16.0	17.0	5.1
Emerging Markets	4.0	5.0	5.4
High Yield Corp. Credit	1.0	1.0	3.3
Bank Loans	1.0	1.0	2.9
Growth Absolute Return*	3.0	7.0	4.9
Private Equity*	9.0	15.0	9.4
Private Credit*	4.0	4.0	6.3
Total Growth Assets	58	72	
Core Plus Fixed Income	10.0	12.0	1.5
US Treasury	5.0	6.0	0.7
Global Credit	3.0	3.0	0.3
Diversifying Absolute Return*	7.0	7.0	3.1
Cash	1.0	-19.0	0.2
Total Diversifying	26	9	
Core Real Estate	5.0	6.0	5.7
Value Add Real Estate	1.0	2.0	7.7
Opportunistic Real Estate	1.0	2.0	9.7
Liquid Real Return	2.0	2.0	4.8
Private Real Assets*	7.0	7.0	8.8
Total Real Return	16	19	
Total Allocation	100	100	
Mean Variance Analysis			
Forecast 10 Year Return	5.53	6.73	
Standard Deviation	10.4	12.8	
1st percentile ret. 1 year	-16.0	-19.0	
Sharpe Ratio	0.54	0.55	
% in Liquid Assets	63.0%	50.0%	
% in Illiquid Assets	37.0%	50.0%	

- How much leverage risk would SCERS need to take in order to reach your required rate of return
- Portfolio has 119% exposure to risk assets, mostly in the Growth category
- Cash is negative 19% to reflect the use of leverage

High Risk Liquid Assets

	Policy	High Risk Liquid Assets	Return (g)
US Large	18.0	21.0	5.1
US Small	2.0	4.0	5.2
International Developed	16.0	19.0	5.1
Emerging Markets	4.0	6.0	5.4
High Yield Corp. Credit	1.0	2.0	3.3
Bank Loans	1.0	1.0	2.9
Growth Absolute Return*	3.0	3.0	4.9
Private Equity*	9.0	9.0	9.4
Private Credit*	4.0	4.0	6.3
Total Growth Assets	58	69	
Core Plus Fixed Income	10.0	5.0	1.5
US Treasury	5.0	3.0	0.7
Global Credit	3.0	0.0	0.3
Diversifying Absolute Return*	7.0	7.0	3.1
Cash	1.0	0.0	0.2
Total Diversifying	26	15	
Core Real Estate	5.0	5.0	5.7
Value Add Real Estate	1.0	1.0	7.7
Opportunistic Real Estate	1.0	1.0	9.7
Liquid Real Return	2.0	2.0	4.8
Private Real Assets*	7.0	7.0	8.8
Total Real Return	16	16	
Total Allocation	100	100	
Mean Variance Analysis			
Forecast 10 Year Return	5.53	5.95	
Standard Deviation	10.4	12.1	
1st percentile ret. 1 year	-16.0	-18.6	
Sharpe Ratio	0.54	0.52	
% in Liquid Assets	63.0%	63.0%	
% in Illiquid Assets	37.0%	37.0%	

- What happens to return expectations if we were to increase the portfolios exposure to liquid risk assets
- Growth assets increase from 58% to 69%
- Fixed income is used as the source of funding for additional exposure to public equities and credit

High Risk Assets

	Policy	High Risk Asset	Return (g)
US Large	18.0	19.0	5.1
US Small	2.0	2.0	5.2
International Developed	16.0	16.0	5.1
Emerging Markets	4.0	4.0	5.4
High Yield Corp. Credit	1.0	1.0	3.3
Bank Loans	1.0	1.0	2.9
Growth Absolute Return*	3.0	3.0	4.9
Private Equity*	9.0	10.0	9.4
Private Credit*	4.0	5.0	6.3
Total Growth Assets	58	61	
Core Plus Fixed Income	10.0	10.0	1.5
US Treasury	5.0	3.0	0.7
Global Credit	3.0	0.0	0.3
Diversifying Absolute Return*	7.0	7.0	3.1
Cash	1.0	0.0	0.2
Total Diversifying	26	20	
Core Real Estate	5.0	5.0	5.7
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Total Real Return	16	19	
Total Allocation	100	100	
Mean Variance Analysis			
Forecast 10 Year Return	5.53	6.00	
Standard Deviation	10.4	11.1	
1st percentile ret. 1 year	-16.0	-16.7	
Sharpe Ratio	0.54	0.56	
% in Liquid Assets	63.0%	58.0%	
% in Illiquid Assets	37.0%	42.0%	

- High risk assets increases exposure to risk assets across the portfolio, both liquid and illiquid
- Diversifying assets are used to fund the additional exposure to both Growth and Real Return assets

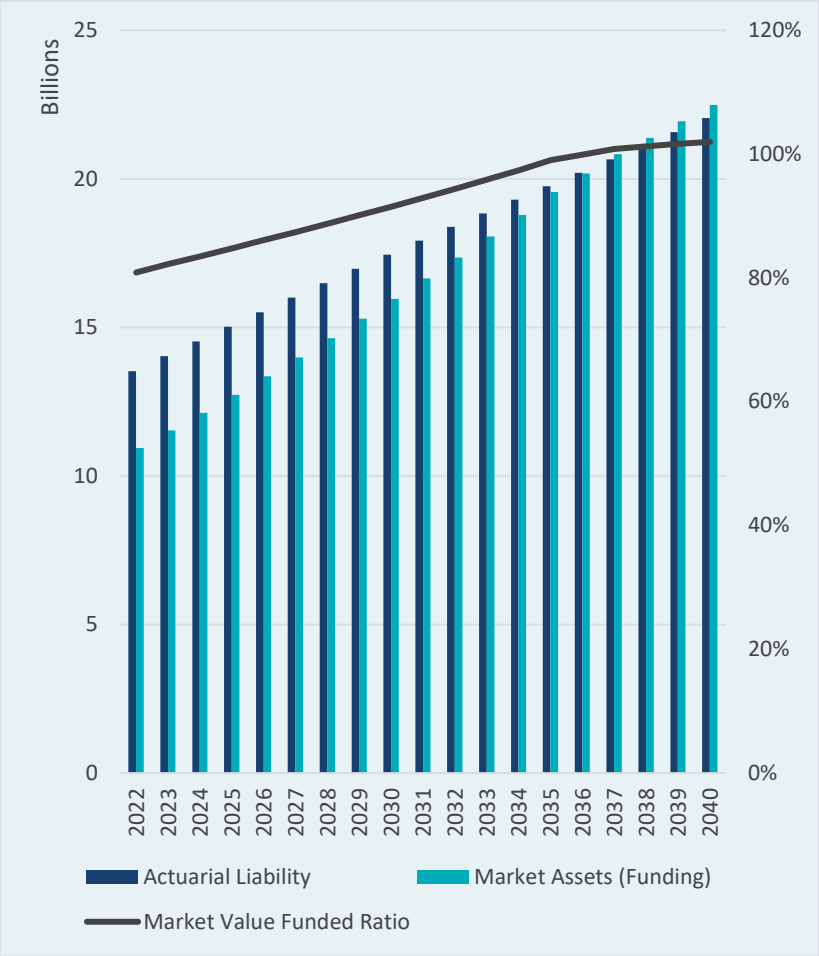
High Cash Flowing Assets

	Policy	High Cash Flowing Assets	Return (g)
US Large	18.0	17.0	5.1
US Small	2.0	2.0	5.2
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High Yield Corp. Credit	1.0	1.0	3.3
Bank Loans	1.0	1.0	2.9
Growth Absolute Return*	3.0	0.0	4.9
Private Equity*	9.0	9.0	9.4
Private Credit*	4.0	7.0	6.3
Total Growth Assets	58	56	
Core Plus Fixed Income	10.0	10.0	1.5
US Treasury	5.0	5.0	0.7
Global Credit	3.0	3.0	0.3
Diversifying Absolute Return*	7.0	6.0	3.1
Cash	1.0	1.0	0.2
Total Diversifying	26	25	
Core Real Estate	5.0	6.0	5.7
Value Add Real Estate	1.0	1.5	7.7
Opportunistic Real Estate	1.0	1.5	9.7
Liquid Real Return	2.0	1.0	4.8
Private Real Assets*	7.0	9.0	8.8
Total Real Return	16	19	
Total Allocation	100	100	
Mean Variance Analysis			
Forecast 10 Year Return	5.53	5.73	
Standard Deviation	10.4	10.5	
1st percentile ret. 1 year	-16.0	-15.8	
Sharpe Ratio	0.54	0.56	
% in Liquid Assets	63.0%	60.0%	
% in Illiquid Assets	37.0%	40.0%	

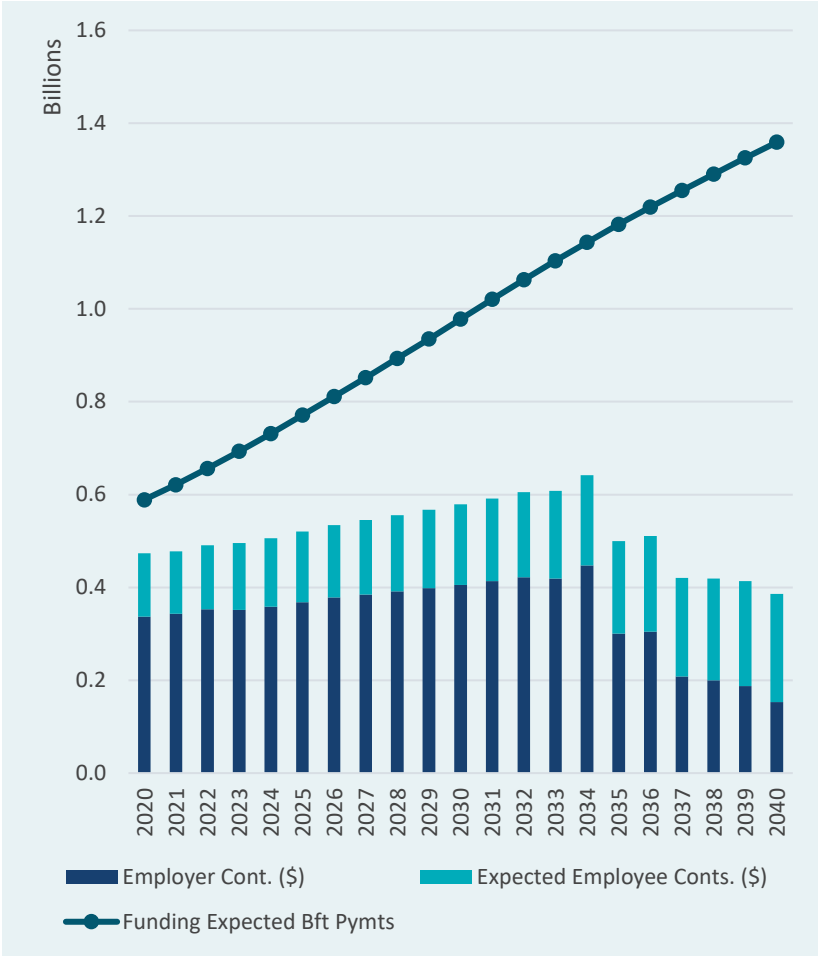
- High cash flowing assets holds higher allocations to asset classes that provide greater income returns
- Private credit, real estate and infrastructure allocations increase, relative to Policy
- Growth absolute return and public equities are reduced

Baseline Projection: 6.75% Return

FUNDED STATUS PROJECTION: 6.75% RETURN



CASHFLOW PROJECTION: 6.75% RETURN

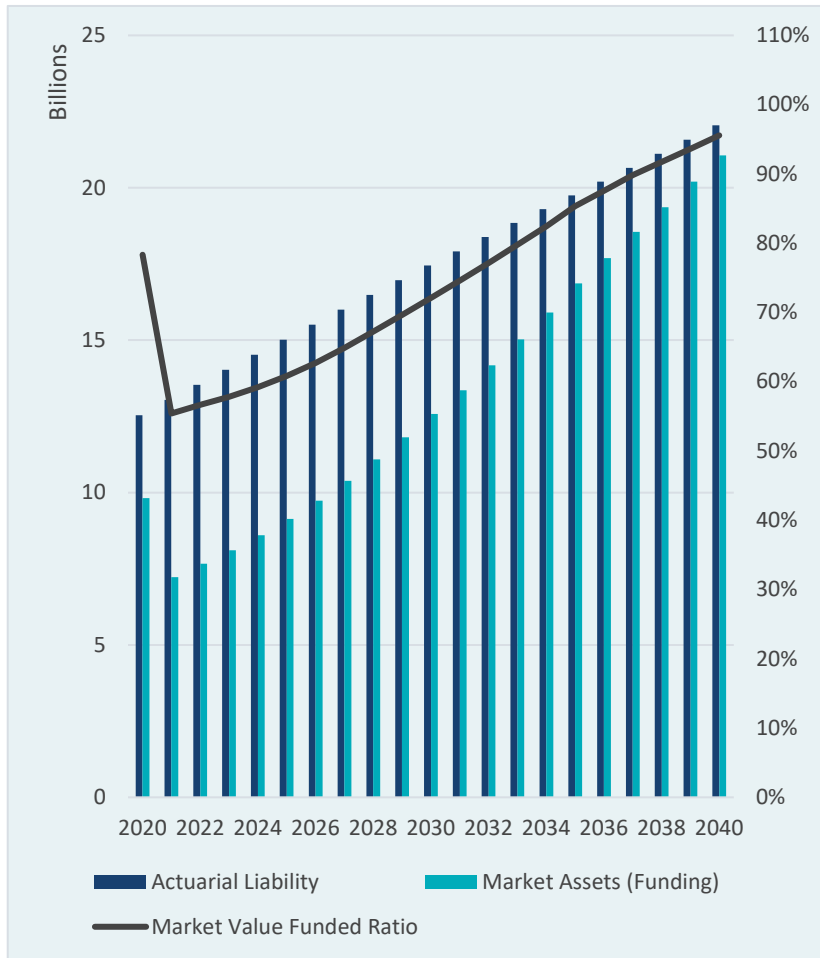


Funded status reaches 100% in 2040

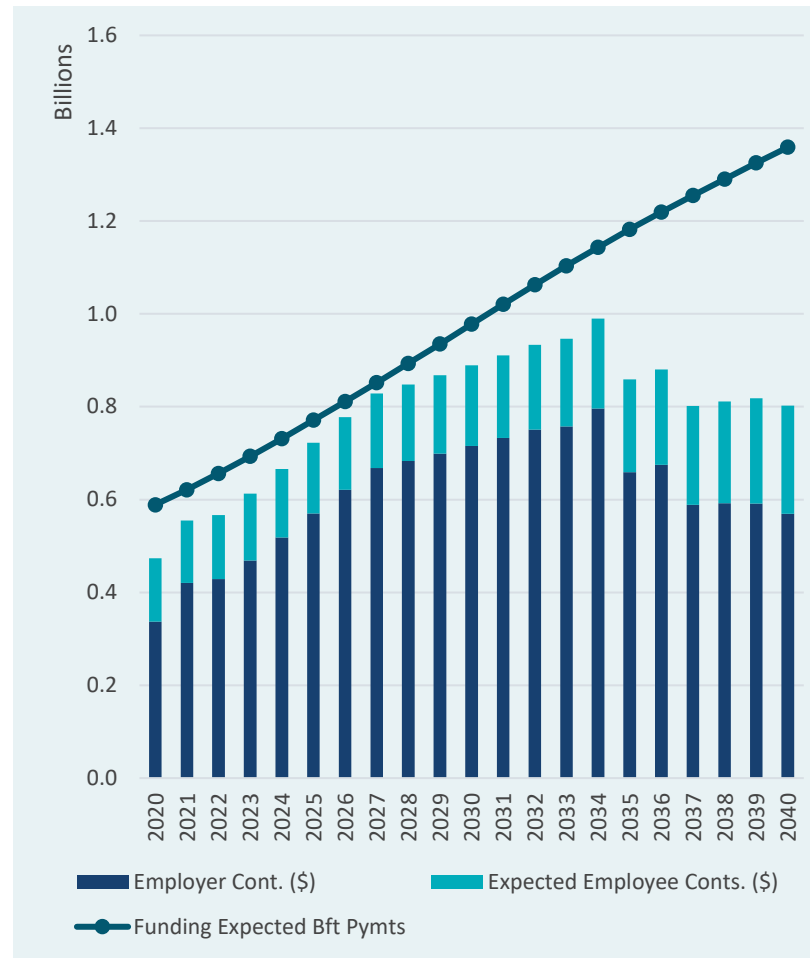
Source: Verus. Inflation assumed to be equivalent to the actuarial assumption of 2.75%

Drawdown Projection: -25% Year 1

FUNDED STATUS PROJECTION: -25% YR1 6.75% THEREAFTER



CASHFLOW PROJECTION: -25% YR1 6.75% THEREAFTER



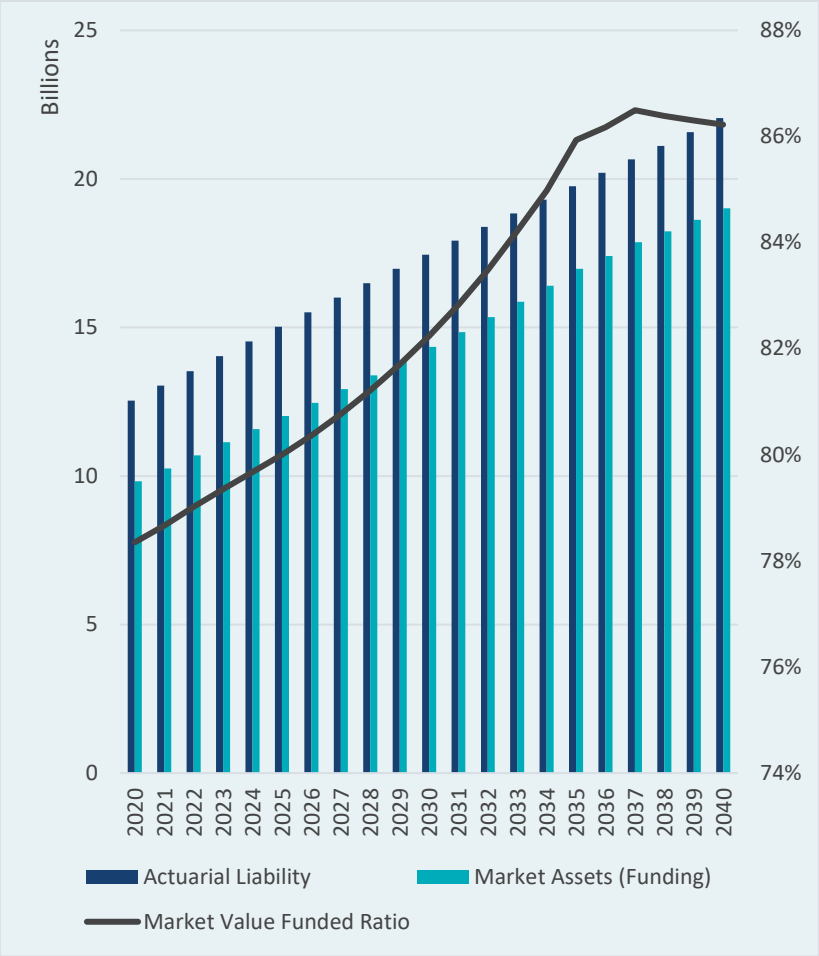
Assumes a GFC-like drawdown of 25% and then SCERS earns a 6.75% rate of return thereafter

Employer contributions increase substantially to make up for the loss in plan value

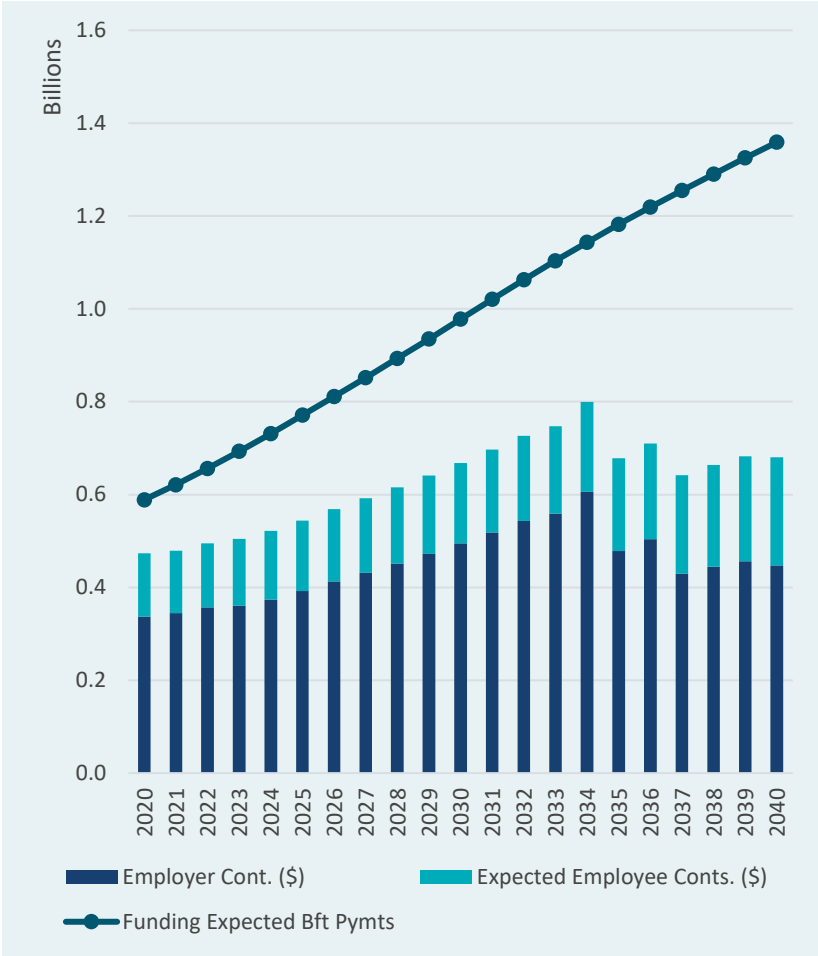
Source: Verus. Inflation assumed to be equivalent to the actuarial assumption of 2.75%

5.5% Return Projection

FUNDED STATUS PROJECTION: 5.5% RETURN



CASHFLOW PROJECTION: 5.5% RETURN



Instead of earning 6.75%, SCERS earns 5.5%

We assumed contributions do not increase to make-up for the lower return.

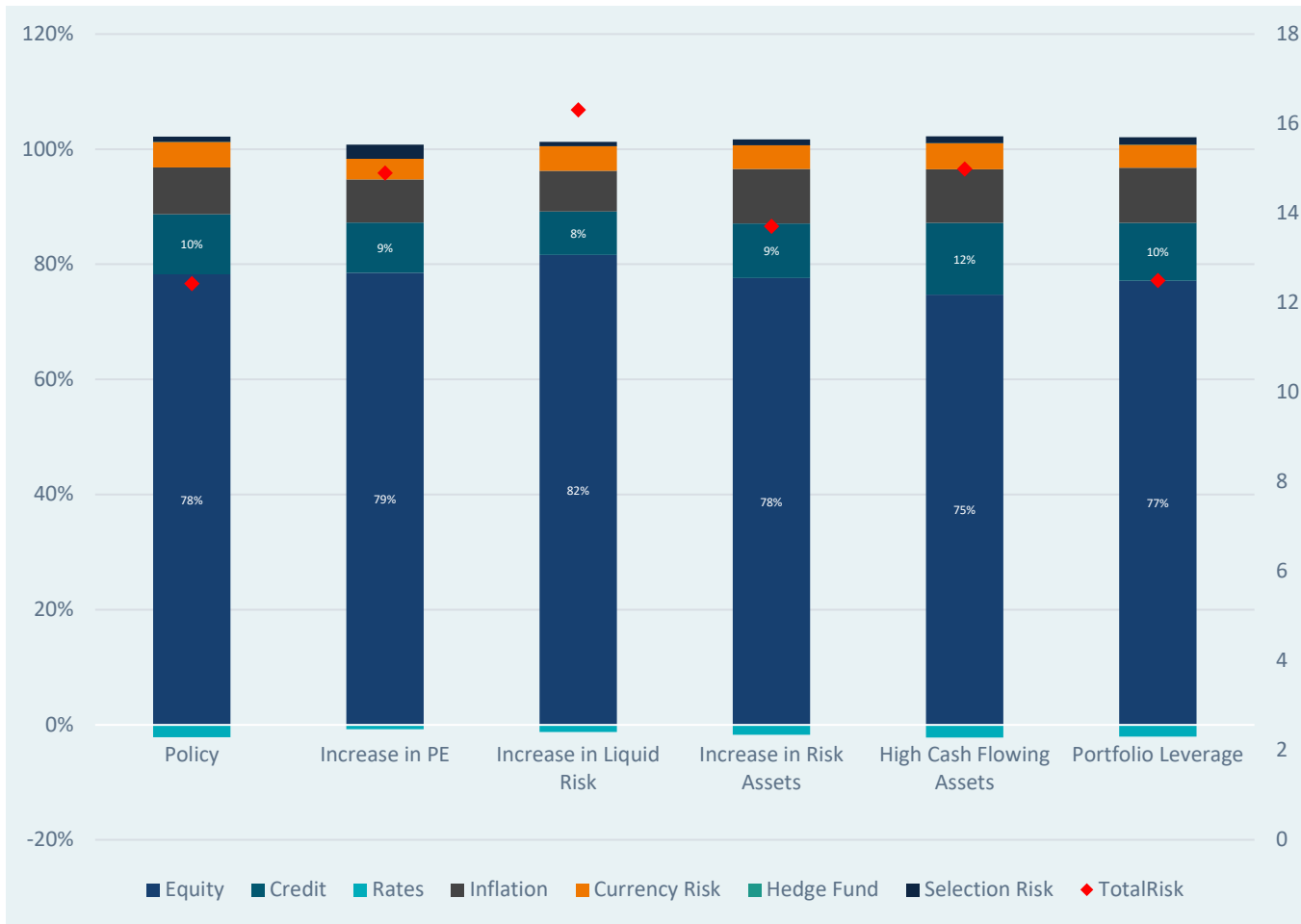
SCERS reaches 86% funded status by 2040

source: Verus. Inflation assumed to be equivalent to the actuarial assumption of 2.75%

IV: Stochastic & Risk

Risk Decomposition

BARRAONE RISK DECOMPOSITION: 1-YEAR PROJECTED VOLATILITY & BREAKOUT

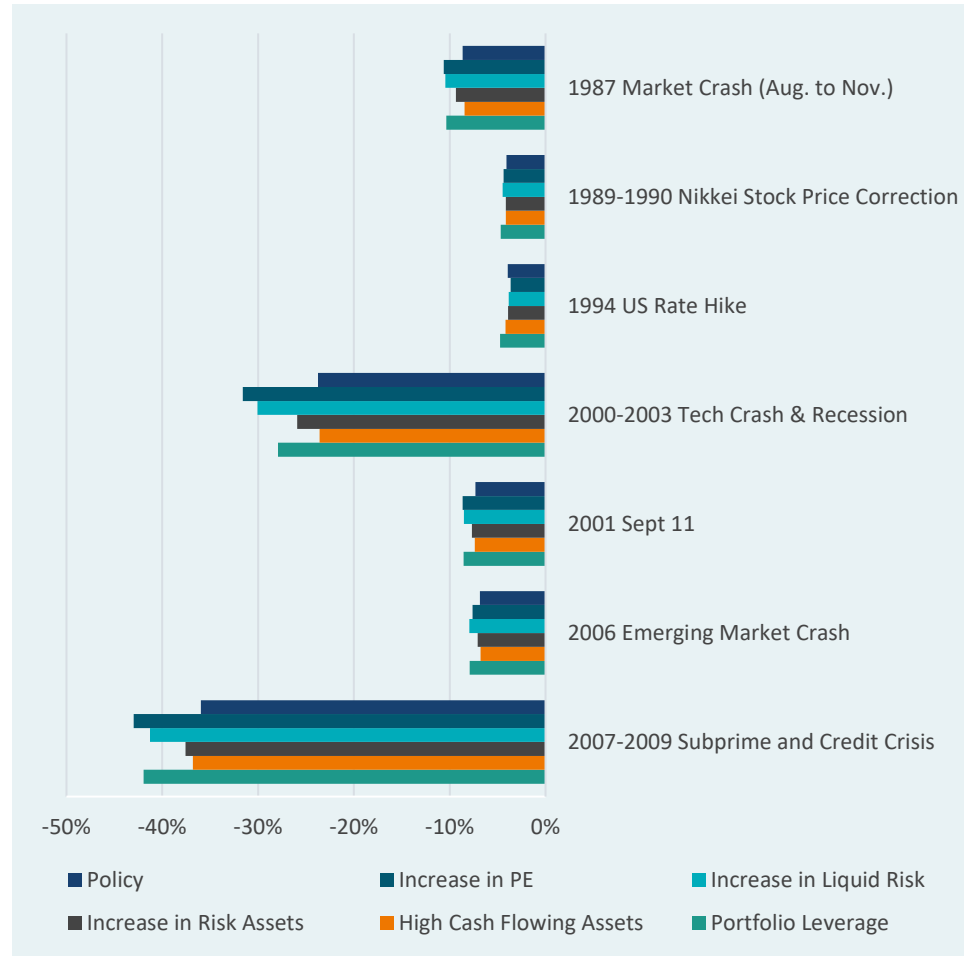


Equity risk dominates in all asset allocation mixes which is expected given the growth-oriented portfolios necessary to meet your required return

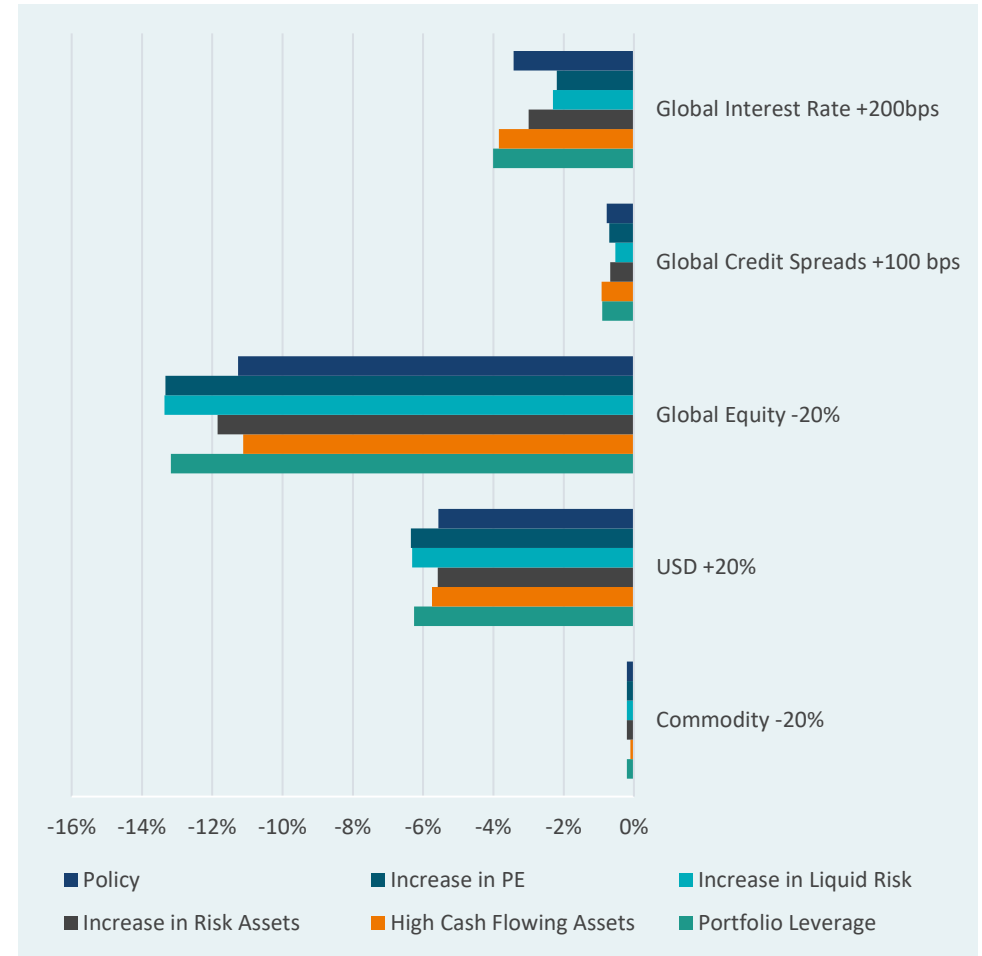
Source: MSCI BarraOne

Scenario and Stress Test

SCENARIO ANALYSIS



STRESS TEST



Source: MSCI BarraOne

Mix Median Projections

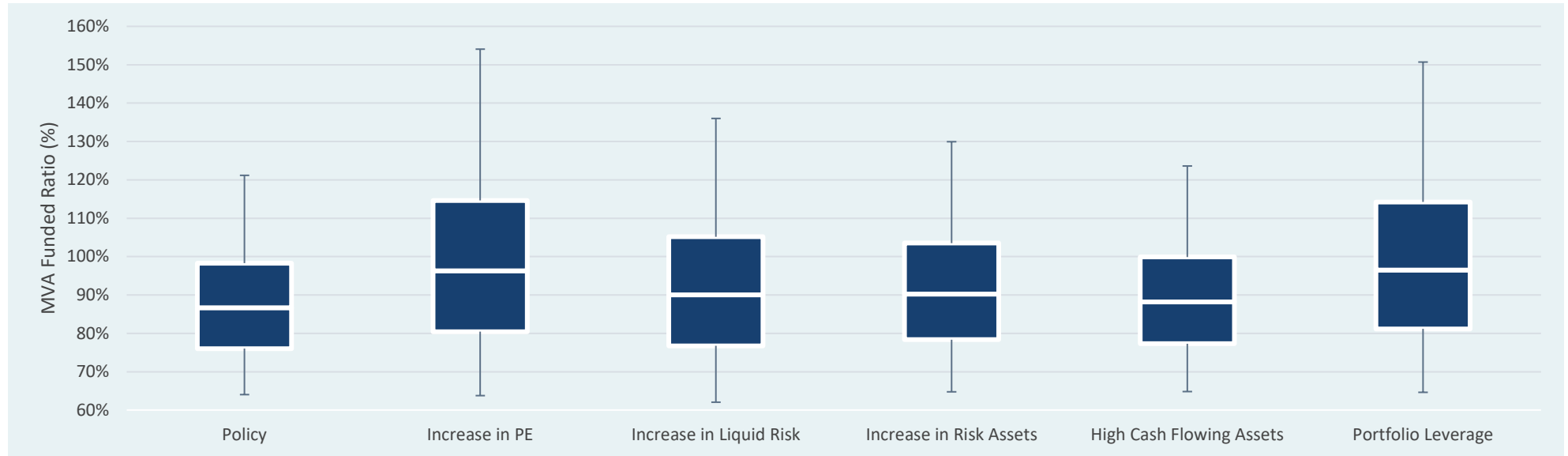
50TH PERCENTILE OUTCOME: MARKET VALUE ASSETS FUNDED RATIO BY MIX



Source: Verus. Inflation approximately equal to Verus CMA inflation assumptions.

Range of Funded Ratio Outcomes

MARKET VALUE OF ASSETS FUNDED RATIO: END OF YEAR 10

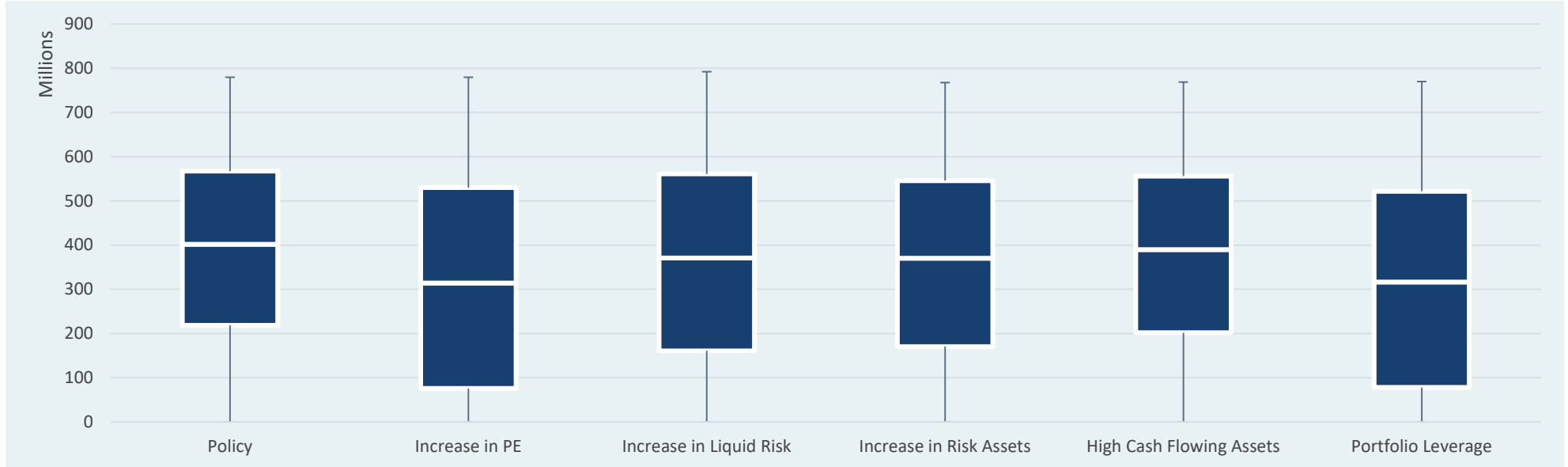


	Policy	Increase in PE	Increase in Liquid Risk	Increase in Risk Assets	High Cash Flowing Assets	Portfolio Leverage
Upper Quartile (75%)	98.3%	114.6%	105.2%	103.5%	99.9%	114.2%
Median Outcome (50%)	86.6%	96.3%	90.0%	90.2%	88.2%	96.5%
Lower Quartile (25%)	76.0%	80.4%	76.7%	78.3%	77.3%	81.1%

Source: Verus. Inflation approximately equal to Verus CMA inflation assumptions.

Range of Employer Contribution Outcomes

EMPLOYER CONTRIBUTION (\$): END OF YEAR 10



	Policy	Increase in PE	Increase in Liquid Risk	Increase in Risk Assets	High Cash Flowing Assets	Portfolio Leverage
Lower Quartile (25%)	567.3M	530.1M	561.1M	545.7M	556.2M	521.6M
Median Outcome (50%)	401.8M	314.0M	371.1M	370.4M	389.8M	316.4M
Upper Quartile (75%)	218.6M	75.8M	160.8M	170.5M	201.8M	78.0M

Source: Verus. Inflation approximately equal to Verus CMA inflation assumptions.

V. Conclusion

Summary

- Lower expected future returns across all broad market “beta” benchmarks
- Achieving higher returns requires taking more of these risks:
 - Increased reliance on equity risk
 - Increased reliance on manager selection/skill
 - Increased reliance on private investments and illiquid investment structures within asset classes
 - Increased reliance on use of leverage (whether 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 current program
 - Higher explicit costs including mgmt. fees, sourcing, managing, monitoring costs – 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 flow as plan matures will require increased liquidity

No easy answer as Plan’s decide between taking on more risk to try and achieve higher returns

OR

Accepting a lower projected return than what is currently assumed

VI. Appendix

Asset allocation mixes

	Policy	High PE	High Risk Liquid Assets	High Risk Asset	High Cash Flowing Assets	Leverage Diversified	Return (g)	Standard Deviation	Sharpe Ratio (a)
US Large	18.0	18.0	21.0	19.0	17.0	20.0	5.1	15.7	0.38
US Small	2.0	2.0	4.0	2.0	2.0	2.0	5.2	21.4	0.33
International Developed	16.0	16.0	19.0	16.0	15.0	17.0	5.1	17.9	0.36
Emerging Markets	4.0	4.0	6.0	4.0	4.0	5.0	5.4	25.5	0.32
High Yield Corp. Credit	1.0	1.0	2.0	1.0	1.0	1.0	3.3	11.3	0.34
Bank Loans	1.0	1.0	1.0	1.0	1.0	1.0	2.9	9.5	0.32
Growth Absolute Return*	3.0	3.0	3.0	3.0	0.0	7.0	4.9	7.8	0.60
Private Equity*	9.0	24.0	9.0	10.0	9.0	15.0	9.4	20.0	0.52
Private Credit*	4.0	4.0	4.0	5.0	7.0	4.0	6.3	6.0	0.84
Total Growth Assets	58	73	69	61	56	72			
Core Plus Fixed Income	10.0	0.0	5.0	10.0	10.0	12.0	1.5	4.0	0.50
US Treasury	5.0	0.0	3.0	3.0	5.0	6.0	0.7	6.7	0.10
Global Credit	3.0	3.0	0.0	0.0	3.0	3.0	0.3	7.4	0.05
Diversifying Absolute Return*	7.0	7.0	7.0	7.0	6.0	7.0	3.1	3.9	0.71
Cash	1.0	1.0	0.0	0.0	1.0	-19.0	0.2	1.2	-
Total Diversifying	26	11	15	20	25	9			
Core Real Estate	5.0	5.0	5.0	5.0	6.0	6.0	5.7	12.6	0.50
Value Add Real Estate	1.0	1.0	1.0	2.0	1.5	2.0	7.7	17.1	0.52
Opportunistic Real Estate	1.0	1.0	1.0	2.0	1.5	2.0	9.7	21.6	0.54
Liquid Real Return	2.0	2.0	2.0	2.0	1.0	2.0	4.8	8.4	0.56
Private Real Assets*	7.0	7.0	7.0	8.0	9.0	7.0	8.8	16.5	0.58
Total Real Return	16	16	16	19	19	19			
Total Allocation	100	100	100	100	100	100			
Mean Variance Analysis									
Forecast 10 Year Return	5.53	6.68	5.95	6.00	5.73	6.73			
Standard Deviation	10.4	13.2	12.1	11.1	10.5	12.8			
Return/Std. Deviation	0.5	0.5	0.5	0.5	0.5	0.5			
1st percentile ret. 1 year	-16.0	-19.7	-18.6	-16.7	-15.8	-19.0			
Sharpe Ratio	0.54	0.54	0.52	0.56	0.56	0.55			
% in Liquid Assets	63.0%	48.0%	63.0%	58.0%	60.0%	50.0%			
% in Illiquid Assets	37.0%	52.0%	37.0%	42.0%	40.0%	50.0%			