ITEM 17

SCERS
SACRAMENTO COUNTY
EMPLOYEES' RETIREMENT SYSTEM

For Agenda of:
December 21, 2016

December 16, 2016

TO: President and Members
Board of Retirement

FROM: Steve Davis
Chief Investment Officer

SUBJECT: Presentation of Asset Class Mixes and their Impact on Investment Performance, Funded Ratio and Contribution Rates

INTRODUCTION/BACKGROUND:

Over the past several months, SCERS has been working on an asset liability modeling ('ALM') study. This process has involved several steps including: (1) The identification of the objectives of the ALM study; (2) An Enterprise Risk Tolerance analysis and discussion with the Board, which helped to identify and prioritize investment-related objectives, principles and risks, and which included a survey which the Board completed, the results of which are playing a significant role in design of SCERS' ultimate strategic asset allocation; (3) Education by Staff and Verus on the various risk based approaches to asset allocation, and the identification of various approaches to identifying risk within a portfolio; and (4) The modeling of asset mixes against SCERS' liabilities.

At the November Board meeting, presented materials related to the last bullet point above, and in particular covered the following areas: (1) An evaluation of SCERS' historical experience over the past ten years, which included a review of SCERS' total fund performance and the impact that this has had on SCERS' funded status, contributions and benefit payments; (2) Deterministic projections, which took a forward look at the impact on SCERS' funded status, contributions and benefit payments across a number of return outcomes; and (3) Stochastic projections, which provided a variety of metrics across SCERS' current asset allocation and a range of common institutional portfolios, and included: (a) A 60/40 portfolio; (b) An 'Endowment Model'; (c) An 'Endowment Peer'

portfolio; (d) A 'Public Pension Peer' portfolio; and (e) a Verus-developed 'Risk Diversified' portfolio. The stochastic projects include risk/return forecasts, risk decomposition, sources of risk, economic regime diversification, scenario analysis, stress tests, and impact on SCERS' funded ratio and contribution rates.

Staff and Verus concluded the previous presentation indicating that the next phase of the ALM study will present asset class mixes that are closer to an asset allocation portfolio that will ultimately be recommended to your Board. Staff and Verus anticipated that these mixes and the recommended portfolio will lie somewhere between SCERS' current portfolio and the Risk Diversified portfolio. The ALM presentation at the December Board meeting will continue where the November Board meeting left off, but rather than providing modeling around a range of common institutional investment portfolios, it will perform a similar analysis on those mixes of portfolios that are closer to those which will be recommended to your Board. It is contemplated that a specific recommended portfolio will be presented for your consideration at the January Board meeting.

CAPITAL MARKET ASSUMPTIONS:

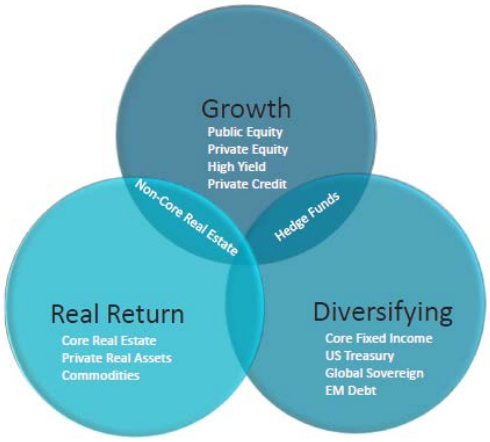
As you will recall, Verus incorporates its proprietary 10-year capital market return assumptions into the various asset allocations, to arrive at risk and return forecasts for each asset mix. The capital market assumptions combine 10-year return and standard deviation forecasts for the major segments of all asset classes, and also incorporate correlations across assets. Verus develops these assumptions for nearly all segments of SCERS' investable universe.

You will also recall that Staff asked Verus to incorporate Cliffwater's capital market assumptions for the absolute return and private real assets segments of the portfolio, in order to include separate assumptions for the growth and diversifying segments of absolute return strategies, and for the primary components of the private real assets segments of the portfolio (energy; infrastructure; timber).

ASSET CLASS FRAMEWORK:

Similar to prior discussions, the asset class mixes in this presentation are being presented in a functional asset class framework, rather than by conventional asset classes. As you will recall, prior education related to the ALM study focused on incorporating a risk factor approach and an economic regime approach into the ALM study. These two approaches seek to uncover hidden risks within conventional asset class labels in order to better diversify a portfolio. The risk factor approach views assets based on the systematic risks that a portfolio is exposed to, which include the equity risk premium, interest rates, credit, inflation, currency and hedge funds. This approach seeks to achieve portfolio diversification by better balancing and allocating risks across these factors. The economic regime approach views asset classes based on economic environments (or regimes), and assumes that economic environments will largely determine the return of an asset class. This approach seeks to better balance a portfolio among these environments, which include high GDP growth, GDP contraction (recession), high unexpected inflation, low

inflation and deflation. The functional asset class framework represents an integration of these risk factor and economic regime approaches.



Within the functional asset class framework, segments of SCERS' current asset allocation were re-grouped and re-classified in order to better identify the risk factors that particular segments are exposed to, and the roles that various segments play in SCERS' portfolio. The regrouping blends traditional and alternative asset classes, and relabels SCERS' current exposures at the asset class level, by linking asset classes that are exposed to similar economic environments and risk factors, and which would be expected to have similar roles and outcomes in a portfolio. The functional regrouping takes a simplified approach at the asset class level, by breaking the portfolio into three segments, with greater complexity reserved at the sub-asset class level. The simplified asset classes are: (1) Growth; (2) Diversifying; and (3) Real Return.

ASSET CLASS MIXES:

As referenced earlier, the asset mixes in the presentation represent portfolios that lie somewhere between SCERS' current policy portfolio and the Risk Diversified portfolio as it relates to overall exposures to the broad portfolio segments (Growth; Diversifying; Real Return). An objective of this presentation is to present asset class mixes that are closer to an asset allocation portfolio that will ultimately be recommended to your Board.

As you will recall, SCERS' current policy portfolio is best classified as an 'endowment light' model, with marginally higher exposure to alternative assets than that a typical public pension plan, but less than that of an Endowment Peer and the Endowment Model, while also including a meaningful level of exposure to publicly traded equity and fixed income. The Risk Diversified portfolio includes less exposure to the Growth segment (in particular public equities) than SCERS' current policy and a typical public peer, and rotates this exposure to the Real Return segment, while also increasing exposures to U.S. Treasuries and private credit, in order to create more balanced exposures across risk factors other than the equity risk premium. Within the presentation, Mixes 1 – 3 provide decreasing levels of exposure to the Growth segment and increasing levels of exposure to the Real Return segment, with varying levels of exposure to the Diversifying segment. The compositions of sub-segment exposures within each of the broad asset classes differ among the Mixes.

Of the three mixes, Mix 2 is the closest portfolio to that which Staff and Verus envision recommending to your Board at the January Board meeting. This is not the exact recommended portfolio, but rather a portfolio that represents and demonstrates many of the themes and priorities that have been identified during the ALM process. Depending on

feedback from the Board at the December Board meeting, Staff and Verus believe that the ultimate recommended portfolio could be similar to Mix 2, with some tweaks and adjustments.

MIX 2 COMPARED TO CURRENT POLICY:

SUMMARY OF ASSET CHANGES:

Below is a summary that compares SCERS' current policy portfolio to Mix 2, in a functional asset class format. The details of the changes are explained in the following sections.

Asset Class	SCERS' Current Policy	Mix 2	Difference
Growth	**63.0%**	**59.0%**	**-4.0%**
Public Equities	45.0%	41.0%	-4.0%
Private Equity	10.0%	9.0%	-1.0%
Public Credit (HY)	2.0%	2.0%	0.0%
Private Credit	0.0%	4.0%	4.0%
Growth Oriented Absolute Return	6.0%	3.0%	-3.0%
Diversifying	**22.0%**	**25.0%**	**3.0%**
Core/Core Plus Fixed Income	15.0%	10.0%	-5.0%
U.S. Treasury	0.0%	5.0%	5.0%
Global Fixed Income	3.0%	3.0%	0.0%
Diversifying Absolute Return	4.0%	7.0%	3.0%
Real Return	**15.0%**	**16.0%**	**1.0%**
Real Estate	7.0%	7.0%	0.0%
Private Real Assets	6.0%	7.0%	1.0%
Commodities	2.0%	2.0%	0.0%
	100.0%	100.0%	

GROWTH:

The overall allocation to the Growth asset class within Mix 2 is 59%, compared to the current asset allocation of 63%. You will recall that Growth assets tend to comprise the dominant allocation within most institutional investment portfolios. You will also recall the Growth segment includes public equities and private equity, as these segments are exposed to the equity risk factor and tend to perform best in a high growth and low/moderate inflationary environment. In contrast, they tend to perform poorly during recessionary periods, when GDP growth is contracting, or during certain periods when unexpected inflation arises.

The Growth segment also includes the growth oriented absolute return strategies that have a higher correlation and beta to equity markets and tend to perform better in a growth oriented market. Growth oriented absolute return strategies include equity long/short; long/short fixed income; event driven; and activist.

In addition, the Growth segment includes the return oriented segments of fixed income, including high yield credit and private credit.

With respect to the fixed income elements in the Growth segment, these strategies are more of a return generator where credit risk is the most prevalent risk factor, compared to those segments of fixed income within the Diversifying asset class. Return generating fixed income investments such as high yield credit and private credit will typically perform well in a higher growth environment

Within the Growth asset class, public equities move from 45% in the current allocation, to 41% in Mix 2, with an unchanged 50/50 split between domestic and international equities. This would reduce some of SCERS' exposure to the more volatile equity risk premium. Private equity is reduced by 1%, and a 4% dedicated allocation to private credit is introduced. Public credit (high yield) stays at a 2% allocation, while growth oriented absolute return decreases from 6% to 3%. The decrease in growth oriented absolute return is offset by an increase to diversifying absolute return within the Diversifying assets class. While the overall decrease in the Growth asset class amounts to only 4%, the overall downside profile of the asset class changes with the reduction in public equities and the addition of private credit.

With respect to private credit, SCERS currently allocates to private credit funds within the private equity portfolio. However, private credit has a different risk and return profile than private equity, and serves a different objective. While private equity is more about multiples of returns and outsized returns over public equities, private credit is more about cash flows and certainty of returns. Therefore, it warrants a separate allocation with a different benchmark. Staff and Verus still view private credit as belonging in the Growth assets class as its success is ultimately tied to a stronger growth environment, however it does serve as a diversifier within the Growth segment due to its expected lower downside and attractive cash flow component. The 4% private credit allocation would be funded from the reduction in public equity and the 1% reduction in private equity. As mentioned previously, the decrease in growth absolute return is offset by an increase to diversifying absolute return within the Diversifying assets class.

DIVERSIFYING:

The overall allocation to the Diversifying asset class is 25% in Mix 2, compared to the current policy allocation of 22%. As you will recall, the Diversifying segment includes those strategies which are expected to protect capital during dislocated market environments; for example strategies within this segment are expected to generally perform better than the growth segments of SCERS' portfolio, such as public equities, when broad financial markets experience distress. This could include having a positive profile when growth markets are negative, or at a minimum, experiencing significantly less muted downside returns. Diversifying assets can still experience periods of negative returns, however, they are expected to have a positive return profile over longer periods of time.

A key component of a Diversifying asset class are the more diversifying fixed income strategies, which include SCERS' core and core plus fixed income strategies, as well as the diversified global fixed income strategy. These strategies generally have meaningful

exposure to government securities, including U.S. Treasuries, G7 government bonds and government agency bonds, as well as exposure to high quality corporate credits, and some currency exposure. Exposure to higher yielding/lower quality credits can comprise a smaller portion of some of these strategies, but in the context of a Diversifying asset class, these would need to be re-evaluated. Several risk factors impact these fixed income strategies, including interest rates, credit and currencies.

SCERS' current allocation to core/core plus fixed income is 15%. A key change to Mix 2 is the rotation of 5% of SCERS' core/core plus fixed income into a 5% dedicated U.S. Treasury allocation. U.S Treasuries are considered 'anchor to safety' assets, and one of the most diversifying components of a portfolio, generally generating positive returns when equity returns are negative. Historically when equity assets have been down significantly, investors have tended to gravitate toward safe haven assets such as government bonds, and particularly U.S. Treasuries. U.S. Treasury yields have been near historic lows due to global central bank accommodative monetary policies and the large amounts of quantitative easing that have flooded the markets. As a result, a risk to U.S. Treasuries in the current environment is interest rate risk. In a potentially rising interest rate environment, U.S. Treasuries are susceptible to negative returns, even if they still serve as an anchor to safety in a dislocated market environment. It should be noted that Treasury rates have increased significantly during the second half of 2016, especially subsequent to the U.S. presidential election. The 10-year U.S. Treasury rate currently sits at 2.5%, up from lows under 1.5%. So, this could create a better entry point for SCERS to add dedicated U.S. Treasury exposure to the portfolio. Another advantage of having U.S. Treasury exposure is that it is one of the most liquid segments of the markets, providing a source of liquidity for SCERS' overall portfolio if a situation called for it.

Another component of the Diversifying asset class is a dedicated allocation to diversifying absolute return strategies. These strategies tend to have low or negative correlations to the equity markets, and tend to have positively skewed distribution return profiles (lower probability of large negative outcomes), and a smaller degree of kurtosis (smaller/narrower left tails). Many of these strategies have historically generated positive returns when the broad equity markets have been down. Examples of diversifying absolute return strategies include systematic global macro; discretionary global macro; market neutral; relative value; and multi-strategy. The Diversifying asset class increases diversifying absolute return strategies from 4% in the current policy, to 7% in Mix 2. As you will recall, the 3% increase in diversifying absolute return is offset by the 3% decrease to growth oriented absolute return strategies within the Growth asset class. SCERS' aggregate exposure to absolute return strategies remains at 10% (same as the current policy), but shifts exposure away from growth oriented absolute return strategies and toward diversifying absolute return strategies, which serves to reduce the overall growth profile of SCERS' total portfolio, and provides diversification which can better protect the portfolio during down markets.

REAL RETURN:

The Real Return segment represents a carry-over asset class from SCERS' current asset allocation. SCERS has historically named this asset class Real Assets, but in a functional asset class format a Real Return label is more fitting. Real Return provides a combination of objectives for SCERS' overall portfolio, including: (1) Inflation hedge; (2) Moderate generator of cash flows; and (3) Diversifier to other segments of SCERS' portfolio. The segment includes a combination of real estate exposure, private real assets exposure (energy; infrastructure; natural resources), and commodities.

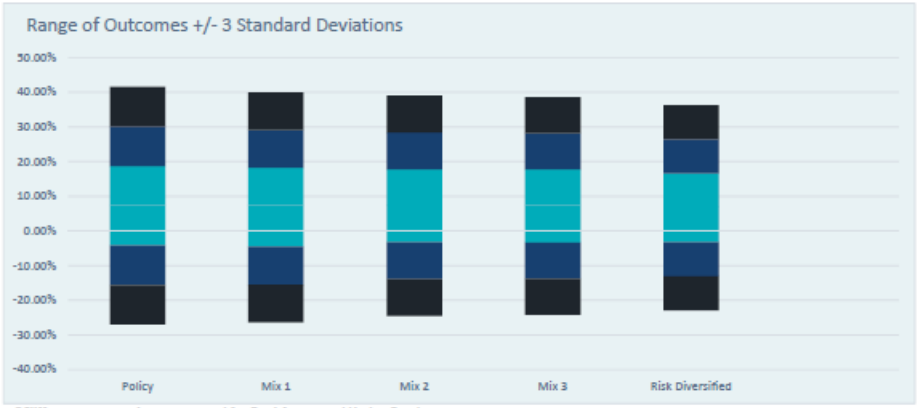
The overall allocation to the Real Return asset class is 16% in Mix 2, up slightly from the current policy target of 15%. Real Estate and commodities remain at 7% and 2% allocations, respectively, however private real assets increases from 6% and 7%. From a risk and return perspective, private real assets is an attractive segment of the market. It is a broad segment that includes energy, infrastructure, agriculture, timber and mining, and Staff and Consultants are seeing ample opportunities within this segment to justify a slight increase in the target allocation. In addition, it offers a good combination of attractive returns, meaningful cash flows and less correlated returns compared to the equity markets.

STOCHASTIC PROJECTIONS:

Similar to the November Board meeting, within the stochastic projections section of the presentation, Verus has provided a variety of metrics across the asset allocation mixes. These include risk/return forecasts; risk decomposition; sources of risk; economic regime diversification; scenario analysis; stress tests; and impact on the SCERS' funded ratio and contribution rates.

The objective of the stochastic projections is to present a range of forecasts outside of those typically projected in a mean variance framework. For instance, Verus has provided forecasted 10-year returns and standard deviation for each asset allocation mix. The asset allocation mixes provide a range of expected returns from a low of 6.8% for the Risk Diversified portfolio to 7.3% for three of the other asset mixes. It should be noted that the range of expected returns are narrower than that of the previous presentation

	Policy	Mix 1	Mix 2	Mix 3	Risk Diversified
Mean Variance Analysis					
Forecast 10 Year Return	7.3%	**7.3%**	**7.2%**	**7.3%**	**6.8%**
Standard Deviation	11.4%	10.9%	10.6%	10.4%	9.8%
Return/Std. Deviation	0.64	0.67	0.68	0.70	0.70
Sharpe Ratio	0.51	0.53	0.54	0.56	0.54



**Cliffwater assumptions were used for Real Assets and Hedge Funds*
Risk/Return Analysis done in ProVal

which included broader institutional investment portfolios. The expected return of SCERS' current policy is one of the portfolios at the higher end of the range, at 7.3%. Mix 2 is a tick below this level, with an expected return of 7.2%.

The forecasts also show a variety of expected standard deviations that range from a low of 9.8% for the Risk Diversified portfolio to a high of 11.4% for SCERS' current policy portfolio. Mix 2 falls in between with an expected standard deviation of 10.6%.

Overall, Mix 2 is forecast to earn a return at a very similar level to that of SCERS' current policy portfolio, but at a significantly reduced standard deviation.

This is demonstrated by comparing the expected return per unit of risk as measured by the Sharpe Ratio, where the higher the Sharpe Ratio the better. Mix 2 has a Sharpe Ratio of 0.54, which along with the Risk Diversified portfolio represents the second highest of the group. This compares to the Sharpe Ratio of SCERS' current policy of 0.51.

It should be noted that Mix 3 has the highest Sharpe Ratio of the portfolios presented, at 0.56, with an expected return of 7.3% and an expected standard deviation of 10.4%. However the allocations that comprise this portfolio make less sense from a qualitative and practical standpoint when compared to Mix 2. It includes an overall higher aggregate allocation to absolute return, particularly growth oriented absolute return strategies, which would increase SCERS' overall absolute return to a level that Staff and Verus are not comfortable with. It also reduces exposure to fixed income in aggregate and adds a significantly higher allocation to Real Return. The higher allocation to Real Return is not practical in Staff's view, as it would decrease the liquidity profile of SCERS' plan significantly, and Staff and Consultants do not foresee enough investment opportunities in real estate and private real assets to invest at these levels.

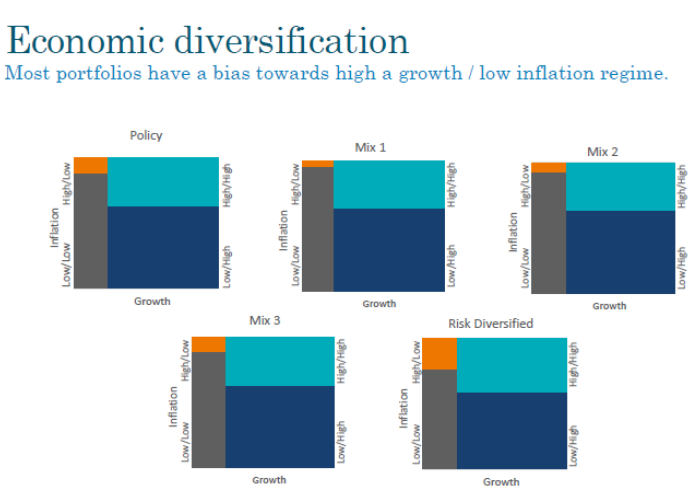
When analyzing the expected returns and standard deviations, it is important to keep in mind that the numbers presented are mean (average) numbers. They are one data point in a broader range of potential outcomes. A more effective way to analyze these numbers is by looking at the range of outcomes that each portfolio is potentially subjected to. Within the chart on the previous page, Verus also provided bar graphs on the range of expected outcomes for a one, two and three standard deviation event.

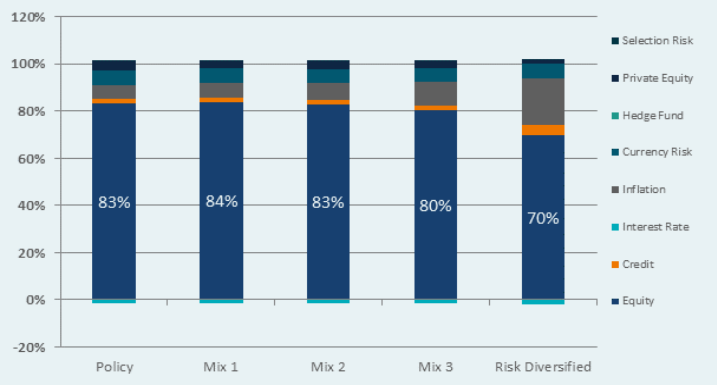
As you will recall, standard deviation is the primary measure of risk in the context of ALM studies. It measures how far from an average (or mean) a return is likely to range in any given period. The higher the standard deviation measured, the more accurate the measurement, as a higher standard deviation will cover a wider range of outcomes. For example 67% of outcomes will fall within one standard deviation, 95% of outcomes will fall within two standard deviations, and 99% of outcomes will fall within three standard deviations. A shortcoming of standard deviation is that it assumes a normal return distribution, and underestimates risk at the left tail of a distribution such as when market dislocation events occur. A left tail event is similar to the drawdowns that were experienced in 2008 during the GFC. SCERS' portfolio was down 28% in 2008, which is the type of drawdown that all of the asset mixes would mostly likely experience in a three

standard deviation downside event, to a greater or lesser extent. The probability of a left tail three standard deviation event would tell you that a portfolio should only be susceptible to this type of drawdown once every one hundred years. However, the lessons of the GFC and other market dislocations would tell you that the probability is higher than 1%, even if remote.

We can see that moving away from SCERS' current policy portfolio towards the Risk Diversified portfolio narrows the range of outcomes both to the downside, but also to the upside. The Risk Diversified portfolio would be expected to lose the least amount of capital in a three standard deviation event (-22.6%), but would also participate less to the upside in three standard deviation event (+36.2%). SCERS' current policy portfolio has the largest range of outcomes, and would be expected to lose the largest amount of capital in a three standard deviation event (-26.9%), but would also participate the most to the upside (+41.5%). Mix 2 shows a nice balance by limiting the downside compared to SCERS' current policy, while not giving up as much on the upside as the Risk Diversified portfolio. Mix 2 would be expected to generate a return of -24.6% in a three standard deviation downside event, and a return of +39.0% in a three standard deviation upside event.

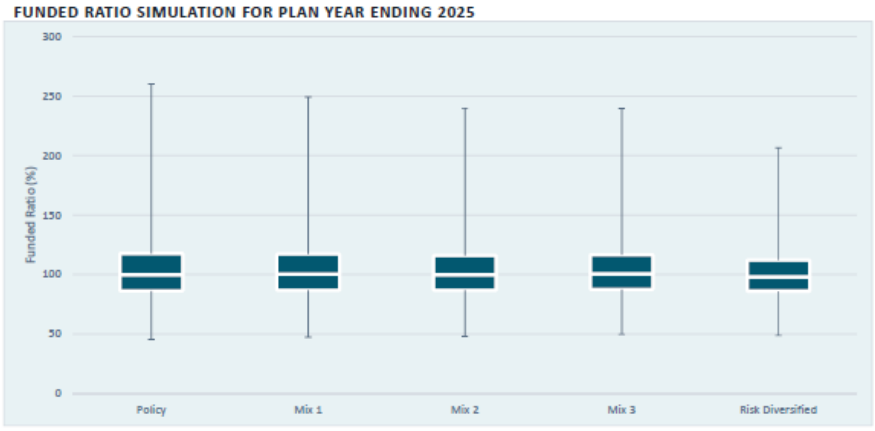
The recently conducted ERT survey identified that capital at risk is the most important risk for SCERS' portfolio. As mentioned previously, SCERS' current policy portfolio, similar to most public pension plans, is weighted toward performing well in a growth oriented environment, and equity risk is the primary risk factor with equity-like assets dominating the portfolio. This is a result of the fairly robust actuarial return assumptions that underlie most public plans. Equity-like assets typically include public and private equities, and as the chart below shows, the various asset mixes presented have equity-like exposure that ranges from 70% to 83%, and even more when adding in private equity. Higher equity-like and growth exposures leaves a portfolio more susceptible during dislocated market environments. The Risk Diversified portfolio has the lowest exposure to the equity risk factor, and therefore has the least amount of vulnerability to losing capital during dislocated markets, as shown in the three standard deviation range of outcomes on a previous chart. Mix 2 is more vulnerable



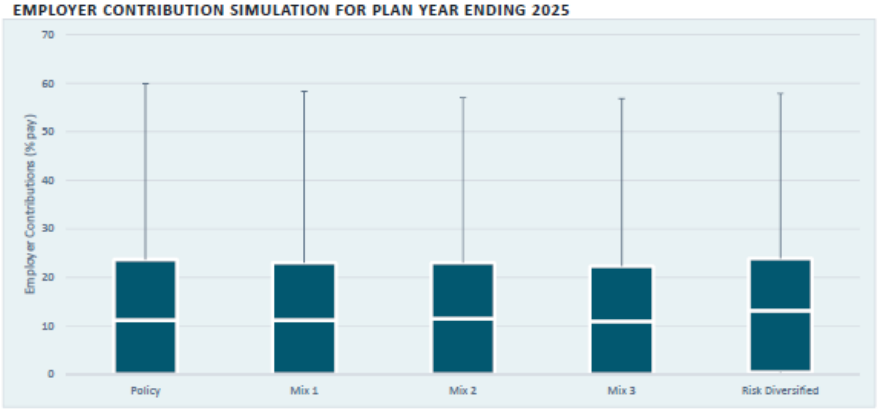


than the Risk Diversified portfolio, but less so than SCERS' current policy given the decreases to both public equity and private equity.

Verus also ran Monte Carlo simulations to determine the impact and range of outcomes that each of the asset allocation mixes would have on SCERS' funded ratio and the level of employer contributions. As the charts below show, there is a wide range of outcomes for each mix when we move away from the average expected return and risk measures. SCERS' current policy portfolio has the largest range of outcomes compared to the other asset mixes, while the Risk Diversified portfolio would have the narrowest range, and Mix 2 would fall somewhere in between. The expected employer contribution as a percentage of pay also shows a similar dynamic, where SCERS' current policy portfolio would subject the employer to higher contribution rates in a worst case type of scenario where the actuarial expected rate of return is not met, compared to the Risk Diversified portfolio and Mix 2.



	Policy	Mix 1	Mix 2	Mix 3	Risk Diversified
Best Case	260	249	240	240	207
Median	100	100	100	100	98
Worst Case	41	39	39	38	37



	Policy	Mix 1	Mix 2	Mix 3	Risk Diversified
Best Case	-	-	-	-	-
Median	11	11	11	11	13
Worst Case	60	58	57	57	58

LIQUDITY ANALYSIS:

An important consideration within the ALM study is the incorporation of a formal cash flow and liquidity analysis that analyzes the cash flow profile and needs of SCERS' plan, including an analysis of potential implications on SCERS' liquidity and cash flow needs related to private markets exposure, both at its current level and any potential increasing levels, given this segment's illiquid profile.

As part of the ALM modeling, Verus has conducted a liquidity analysis for SCERS' current policy portfolio as well as for Mix 2. An objective of the analysis is to identify SCERS' liquidity as it relates to the current policy portfolio by comparing SCERS' forecasted total plan cash flows to the asset value of SCERS' more liquid assets. The numerator, net cash flows, aggregates the following cash flow measures: (1) Total contributions from the employer and employee (cash inflow); (2) Benefit payments (cash outflow); (3) Investment income (cash inflow); (4) Plan expenses (cash outflow – management fees, etc.); and (5) Private equity cash flows (currently a cash outflow as the private equity portfolio continues to mature, but then transitioning to a cash inflow). The denominator, liquid assets, aggregates the value of SCERS' liquid assets, and includes the following: (1) Public Equities (U.S. and international); (2) Fixed Income; (3) Portions of Real Assets that are liquid (commodities); and (4) Cash. It should be noted that private real assets and real estate cash flows are excluded from the numerator and the real asset proxy is excluded as a liquid asset in the denominator, as these cash flows are funded by the Overlay Program real asset proxy (meaning cash has already been set aside for them).

The overall objective of the liquidity ratio is to gain an understanding of the plan's overall cash flow profile, and to understand how the plan is going to address future cash flow needs, both from the actuarial and investment sides. According to Verus, most public pension plans will have a negative net cash flow value in the numerator, which translates to a negative liquidity ratio. This is heavily a function of the maturity of public pension plans, where as we spoke about at the November Board meeting, most public plans are/have moved toward a negative cash flow profile (SCERS included) as a result of demographic trends where benefit payments outpace contributions and investment income. For SCERS, it is also a function of the negative cash flow profile of private market investments, where due to the 'J-curve effect' in the earlier stages of allocating toward a target allocation, cash outflows (capital calls) are greater than cash inflows (distributions). Once private market portfolios become more mature, cash inflows eventually outpace cash outflows to create a positive net cash flow profile.

Verus has indicated that a good gauge for the liquidity ratio is a ratio lower than -5% is a healthy ratio, a ratio between -5% and -10% is still within reason but requires greater attention, and a ratio greater than -10% is problematic.

It should be noted that a negative liquidity ratio represents the gap between a plan's income and expenses (cash inflows and outflows), but does not necessarily represent a requirement to cut or liquidate plans assets to cover the gap. If a plan's liquidity ratio is negative, there are ways to address the gap. For SCERS this could include: (1) Using

available cash (which is included as part of the liquid asset denominator); (2) Rebalancing portions of the portfolio that are overweight to their respective targets; (3) Through the maturation of private market investments, which as mentioned previously should become cash flow positive over time; (4) Increasing contributions toward the plan; or (5) Selling assets (which would be a last case scenario).

For SCERS, Verus ran the liquidity ratio using various actuarial rate of return and growth in plan assets assumptions under the following scenarios: (1) Using SCERS' current policy; (2); Using Mix 2; and (3) For 2017 using SCERS' current policy portfolio, but in various scenarios where SCERS' liquid assets lose varying amounts of value in a dislocated market (-10%; -20%; -30% and -40%).

Verus used two actuarial rate of return assumptions: (1) 7.5% (SCERS' current rate); and (2) 7.0% (a rate that SCERS could potentially move towards in the near future). The growth in plan assets assumptions that Verus used were: (1) 7.5% (SCERS' current actuarial rate); (2) 7.0% (the aforementioned potential future actuarial rate); and (3) 5.0% (which represents a conservative growth rate in a prolonged low growth environment).

Below are the projected liquidity ratios for the various scenarios:

Assumes a 7.5% actuarial rate of return and a 7.5% growth rate for plan assets:

SCERS Projected Liquidity Ratio — Current Portfolio

	2017	2018	2019	2020
Net Cash Flows	$ (165,881,529)	$ (122,504,913)	$ (100,105,504)	$ (91,069,984)
Liquid Assets (7.5% Growth)	$ 5,788,505,690	$ 6,038,026,483	$ 6,412,346,591	$ 6,886,661,443
Ratio	-2.87%	-2.03%	-1.56%	-1.32%

Mix 2

	2017	2018	2019	2020
Net Cash Flows	$ (181,027,187)	$ (194,925,224)	$ (191,511,219)	$ (153,017,975)
Liquid Assets (7.5% Growth)	$ 5,768,522,373	$ 5,930,580,607	$ 6,192,150,114	$ 6,582,795,625
Ratio	-3.14%	-3.29%	-3.09%	-2.32%

Decline in Liquid Assets Market Value

	2017	-10%	-20%	-30%	-40%
Net Cash Flows	$ (165,881,529)	$ (165,881,529)	$ (165,881,529)	$ (165,881,529)	$ (165,881,529)
Liquid Assets	$ 5,788,505,690	$ 5,209,655,121	$ 4,630,804,552	$ 4,051,953,983	$ 3,473,103,414
Ratio	-2.87%	-3.18%	-3.58%	-4.09%	-4.78%

SCERS' liquidity ratio for the current portfolio starts at -2.9% in 2017 and improves to -1.3% in 2020, as the private market investments turn cash flow positive. Verus and Staff believe that SCERS' current overall liquidity profile is reasonable given these metrics. In a market environment in which the value of SCERS' liquid assets were to decline without recovering, the liquidity ratio does get stressed, but still stays in a reasonable range, even in a down 40% type of market (-4.8%).

The liquidity ratio for Mix 2 starts at -3.1% in 2017 and improves to -2.3% in 2020. As you will recall, Mix 2 has increasing exposures to private markets overall, mostly through the addition of private credit. Private credit has the characteristic of generating positive cash flows earlier on, but also experiences faster drawdowns than private equity given its short fund life (5 years versus 10 years). Verus and Staff believe that SCERS' overall liquidity

profile remains reasonable with the modest increase to private market investments in Mix 2.

Assumes a 7.0% actuarial rate of return and a 7.0% growth rate for plan assets:

SCERS Projected Liquidity Ratio — Current Portfolio

	2017	2018	2019	2020
Net Cash Flows	$ (165,608,060)	$ (88,035,292)	$ (32,388,647)	$ (21,167,457)
Liquid Assets (7.0% Growth)	$ 5,761,427,347	$ 5,980,580,635	$ 6,320,623,866	$ 6,756,146,093
Ratio	-2.87%	-1.47%	-0.51%	-0.31%

Mix 2

	2017	2018	2019	2020
Net Cash Flows	$ (180,753,718)	$ (160,455,603)	$ (123,794,362)	$ (83,115,448)
Liquid Assets (7.0% Growth)	$ 5,741,466,531	$ 5,873,251,300	$ 6,100,743,831	$ 6,452,911,640
Ratio	-3.15%	-2.73%	-2.03%	-1.29%

Decline in Liquid Assets Market Value

	2017	-10%	-20%	-30%	-40%
Net Cash Flows	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)
Liquid Assets	$ 5,761,427,347	$ 5,185,284,613	$ 4,609,141,878	$ 4,032,999,143	$ 3,456,856,408
Ratio	-2.87%	-3.19%	-3.59%	-4.11%	-4.79%

A 7.0% actuarial rate of return in this scenario would increase the contribution rate for the employer and employee, which would increase cash flows and improve SCERS' projected liquidity ratio. A 7.0% growth rate for plan assets decreases the value of SCERS' liquid assets. The net impact to the liquidity ratio is an improvement over the 7.5% rates in the previous table.

Assumes a 7.0% actuarial rate of return and a 5.0% growth rate for plan assets:

SCERS Projected Liquidity Ratio — Current Portfolio

	2017	2018	2019	2020
Net Cash Flows	$ (165,608,060)	$ (88,035,292)	$ (32,388,647)	$ (21,167,457)
Liquid Assets (5% Growth)	$ 5,653,113,976	$ 5,753,505,079	$ 5,962,320,778	$ 6,252,274,166
Ratio	-2.93%	-1.53%	-0.54%	-0.34%

Mix 2

	2017	2018	2019	2020
Net Cash Flows	$ (180,753,718)	$ (160,455,603)	$ (123,794,362)	$ (83,115,448)
Liquid Assets (5% Growth)	$ 5,633,243,163	$ 5,646,639,655	$ 5,743,692,492	$ 5,951,518,813
Ratio	-3.21%	-2.84%	-2.16%	-1.40%

Decline in Liquid Assets Market Value

	2017	-10%	-20%	-30%	-40%
Net Cash Flows	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)
Liquid Assets	$ 5,653,113,976	$ 5,087,802,579	$ 4,522,491,181	$ 3,957,179,784	$ 3,391,868,386
Ratio	-2.93%	-3.26%	-3.66%	-4.19%	-4.88%

A 5.0% growth rate for plan assets scenario (while holding the actuarial rate constant at 7.0%) decreases the value of SCERS' liquid assets, and results in a slight deterioration in the liquidity ratio compared to the 7.0% rates in the previous table. Verus and Staff believe that SCERS' overall liquidity profile also remains reasonable in this scenario across the current portfolio, Mix 2 and in a stressed market environment.

Overall, the liquidity analysis shows that SCERS, like many public plans, is operating in a cash flow environment that has less of a margin for safety compared to past eras. This places greater emphasis on managing cash flows, and also creates limits on the level of illiquid asset exposures within a portfolio. At the same time, illiquid assets have demonstrated their ability to earn higher returns than liquid assets, as well as higher and

more consistent cash flows. As referenced previously, the modest increase in illiquid assets for SCERS within Mix 2 is a result of increases to private credit and private real assets, combined with private equity decreases. Both private credit and private real assets are expected to generate meaningful levels of cash flow, and in the case of private credit, earlier cash flows that should work faster to offset the near term cash flow pressures incurred by increasing illiquid assets.

CONCLUSION:

In reviewing the portfolio mixes in the presentation, it should be noted that the expected returns fall short of SCERS' 7.5% actuarial rate of return. Even though several of the asset allocation mixes in this presentation are close to SCERS' 7.5% expected return, we know that the actual range of outcomes can vary significantly from what is 'expected'.

In considering what might be a more reasonable and realistic investment return assumption, Staff and Verus continue to believe that the process should not be to identify a target rate of return and then construct a portfolio designed to reach that return. Instead, Staff and Verus believe that the analysis should begin by identifying a portfolio designed to meet SCERS' plan objectives, such as reducing volatility, improving funding status and better protecting against significant drawdowns, and then determining a reasonable and realistic expected investment return for such a portfolio. Staff and Verus expect that the result of such an approach will likely be an investment return assumption lower than the current 7.5% target. Staff and Verus also understand that a lower investment return assumption will result in increased contribution rates. While increased contribution rates would carry some 'pain', Staff and Verus believe that a portfolio designed to achieve the risk objectives identified by your Board, with a realistic investment return assumption for that portfolio, will result in less pain over time, and be more prudent from a fiduciary perspective.

As suggested at the outset, in analyzing the asset mixes in the presentation, Staff and Verus believe that Mix 2 represents an asset allocation that meets many of the objectives that have been identified during the ALM study. Mix 2 is a more risk balanced portfolio than the current policy portfolio with a reasonable return profile. It has a lower standard deviation, and narrower range of potential outcomes, making it less susceptible to negative returns during down markets. It also should produce greater cash flows for SCERS' plan, in an environment where cash flows are necessary to ensure plan sustainability. A risk to Mix 2 is that it is moderately less liquid than SCERS' current policy portfolio. However, Staff and Verus believe that, through the liquidity analysis, SCERS' overall liquidity profile would remain reasonable for a Mix 2.

Staff and Verus are not recommending an asset allocation to the Board at this meeting. Based on input and direction from the Board, Staff and Verus plan on providing a final asset iteration at the next Board meeting, which could look similar to Mix 2, but with some possible tweaks and adjustments. Following the approval of an asset allocation by the Board, the next steps that will need to be undertaken include: (1) The construction of sub-asset class structures; (2) The placement of existing strategies within the new asset

allocation structure; (3) A reassessment of portfolio and asset class benchmarks; and (4) The formulation of a revised Investment Policy Statement.

We would be happy to address any questions.

Respectfully submitted,

Steve Davis
Chief Investment Officer

Concur:

Richard Stensrud
Chief Executive Officer

Attachment

Verus

PERSPECTIVES THAT DRIVE ENTERPRISE SUCCESS

DECEMBER 2016

Asset / Liability Study

Sacramento County Employees' Retirement System

Table of contents

Verus

VERUSINVESTMENTS.COM

SEATTLE 206-622-3700
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I. Introduction

Session objectives

— Review risk and return characteristics of SCERS' refined asset mixes

— Discuss and prioritize risk and liquidity considerations

— Provide direction to Staff and Verus for further asset mix iterations, if needed

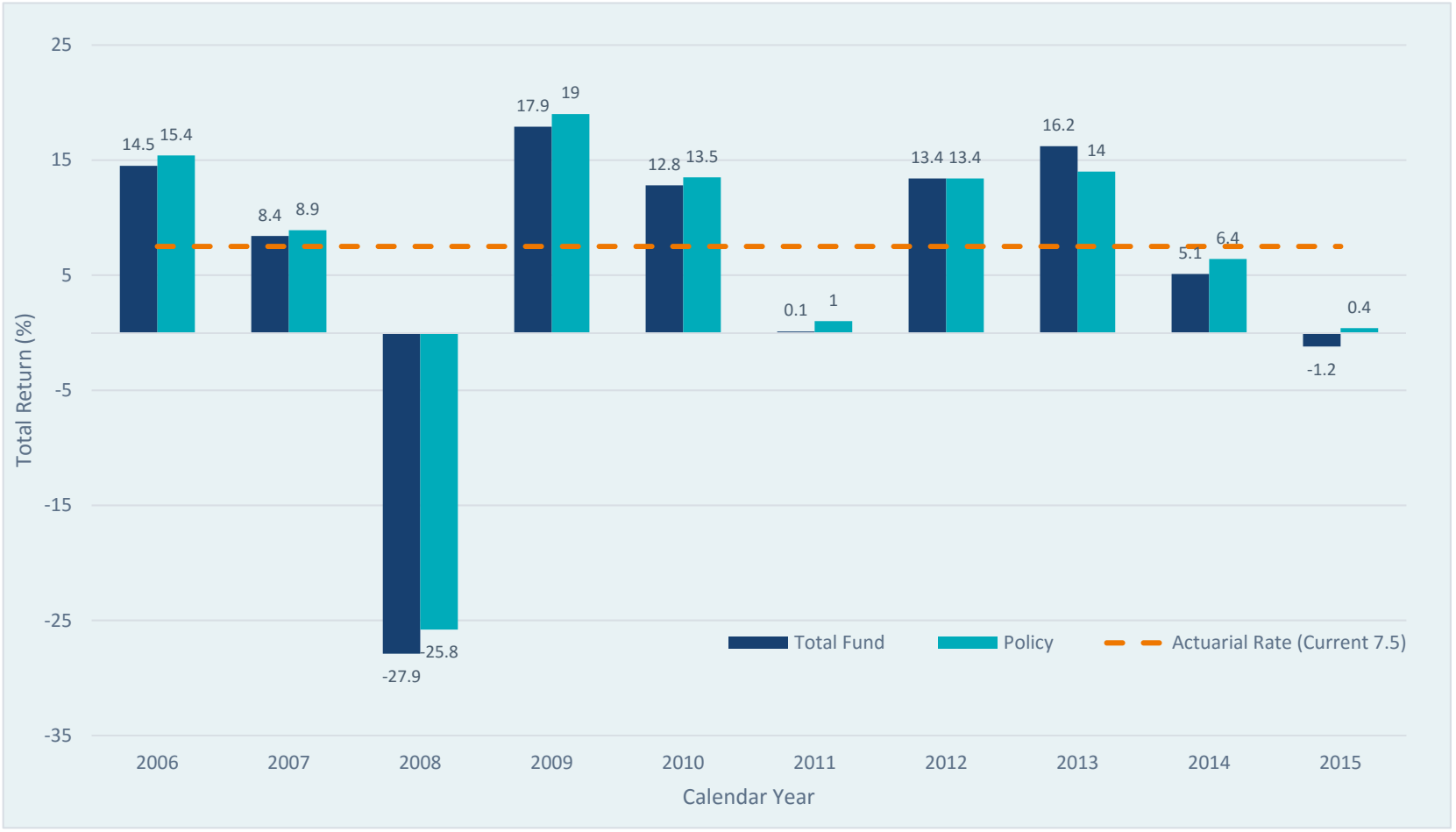
Summary Findings

- Based on our last A/L presentation, we narrowed the range of sample portfolios to mixes between SCERS' Policy and the Verus Risk Diversified portfolio
- Based on capital market assumptions:
  - Expected Returns range from 6.8%-7.3%
  - Equity Risk exposure ranges from 90% to 70%
  - All investment strategies will do best in a high growth/ low inflation economic environment
- The risk/return metrics from a mean/variance standpoint look substantially similar across all portfolios
- We plan to highlight the differences in risk exposures, liquidity and allocations to alternative investments

II. Historical experience

Total fund performance

	Trailing Returns for period ending 9/30/16				Calendar Years				
	1-Year	3-Year	5-Year	10-Year	2015	2014	2013	2012	2011
Total Fund	8.4%	5.0%	9.1%	4.8%	-1.2%	5.1%	16.2%	13.4%	0.1%
Policy Index	9.2%	6.2%	9.2%	5.7%	0.4%	6.4%	14.0%	13.4%	1.0%



III. Stochastic Projections

CMA Process

- **Asset Returns**:
  - Strategic Purpose - Horizon = 2 to 3 Market Cycles
  - Based on Capital Asset Pricing Model (CAPM)
    - Investor Must Be Compensated for Taking Higher Risk
  - Economic Growth Forecasts
  - Stay Within Long-Term Real Return Corridors, Combined with Mean Reversion
  - Qualitative Overlay
    - Expectations Must Produce Reasonable Portfolios and a "Stable Frontier"
  - Data Sources/Return
    - Complete Monthly Return History
    - Blue Chip Economic Forecast (Inflation, GDP Growth Estimates)
    - Wall Street Forecasts
    - Global Manager Forecasts
    - CAPM (For "Difficult" Asset Classes)
- **Asset Risks:**
  - Fairly Stable (Two Factor Model; Historical 1976 to present, Half-Life 1985 to Present)
- **Correlations**
  - Most Stable (90-Month Half-Life, 1985 to Present)

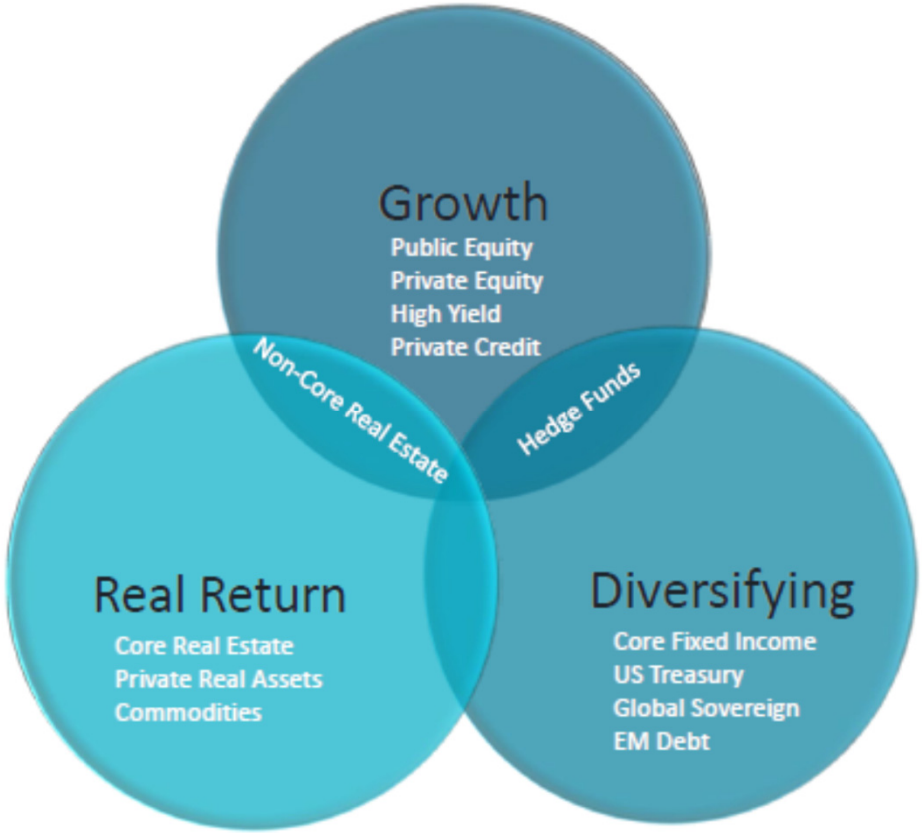
10 year return & risk assumptions

Asset Class	Ten Year Return Forecast		Standard Deviation Forecast
	Geometric	Arithmetic	
Equities			
US Large	5.9%	7.0%	15.1%
US Small	5.2%	7.0%	19.8%
International Developed	9.2%	10.8%	18.5%
International Small	8.6%	10.4%	19.7%
Emerging Markets	11.3%	13.6%	23.6%
Global Equity	7.7%	9.1%	16.9%
Private Equity	8.2%	11.0%	23.7%
Fixed Income			
Cash	2.0%	2.0%	0.6%
US TIPS	2.7%	2.9%	6.3%
US Treasury	2.3%	2.5%	6.5%
Global Sovereign ex US	2.6%	2.9%	7.8%
Core Fixed Income	3.2%	3.3%	3.2%
Core Plus Fixed Income	4.2%	4.4%	6.0%
Short-Term Gov't/Credit	2.5%	2.5%	1.3%
Short-Term Credit	2.9%	3.0%	2.2%
Long-Term Credit	4.2%	4.7%	10.5%
High Yield Corp. Credit	7.1%	7.6%	10.6%
Bank Loans	4.1%	4.5%	8.1%
Global Credit	2.4%	2.7%	6.9%
Emerging Markets Debt (Hard)	6.4%	6.8%	8.8%
Emerging Markets Debt (Local)	6.8%	7.6%	12.9%
Private Credit	9.1%	9.7%	10.9%
Other			
Commodities	4.0%	5.6%	18.2%
Hedge Funds	6.0%	6.4%	9.0%
Hedge Funds (Fund of Funds)	5.0%	5.4%	9.0%
Core Real Estate	4.7%	5.8%	13.2%
Value-Add Real Estate	6.7%	9.1%	23.3%
Opportunistic Real Estate	8.7%	13.3%	33.2%
REITs	4.7%	7.8%	26.4%
Risk Parity	7.0%	7.5%	10.0%
Inflation	2.0%	-	1.5%*
Cliffwater Growth Oriented HF	6.7%	7.0%	7.4%
Cliffwater Diversifying Oriented HF	4.9%	5.0%	5.3%
Cliffwater Private Real Assets	9.0%	10.1%	15.7%

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.

Functional Labels

- **Segments of the asset allocation re-grouped and re-classified**
  - Assists in improving diversification across risk factors and exposure to economic environments
  - Better identifies the roles that various segments play in SCERS' portfolio
- **Blends traditional and alternative asset classes**
- **Simplified approach at asset class level**
  - Growth
  - Diversifying
  - Real Return



Investment models

	Policy	Mix 1	Mix 2	Mix 3	Risk Diversified
Asset Class					
US Equity	22.5%	21.0%	21.0%	19.0%	17.5%
International Equity	17.5%	17.0%	16.0%	15.0%	13.5%
Emerging Equity	5.0%	5.0%	4.0%	4.0%	4.0%
Private Equity	10.0%	9.0%	9.0%	8.0%	5.0%
Public Credit	2.0%	2.0%	2.0%		5.0%
Private Credit		2.0%	4.0%	4.0%	5.0%
CW-Growth Oriented Absolute Return/HF*	6.0%	6.0%	3.0%	6.0%	
Growth	**63.0%**	**62.0%**	**59.0%**	**56.0%**	**50.0%**
Core/Core Plus Fixed Income	15.0%	10.0%	10.0%	8.0%	
US Treasury		5.0%	5.0%	5.0%	15.0%
Global Sovereign ex US	2.0%		2.0%		
EM Debt	1.0%	2.0%	1.0%	3.0%	5.0%
CW-Diversifying Absolute Return/HF*	4.0%	6.0%	7.0%	7.0%	
Absolute Return/HF					5.0%
Diversifying	**22.0%**	**23.0%**	**25.0%**	**23.0%**	**25.0%**
Real Estate	7.0%	7.0%	7.0%	9.0%	20.0%
CW-Private Real Assets*	6.0%	6.0%	7.0%	9.0%	
Commodities	2.0%	2.0%	2.0%	3.0%	5.0%
Real Return	**15.0%**	**15.0%**	**16.0%**	**21.0%**	**25.0%**
Opportunities**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Cliffwater assumptions were used for Real Assets and Hedge Funds

****Opportunities has a target of 0%, but can range between 0% and 5%, and is sourced from the asset class with the closest risk and return profile***

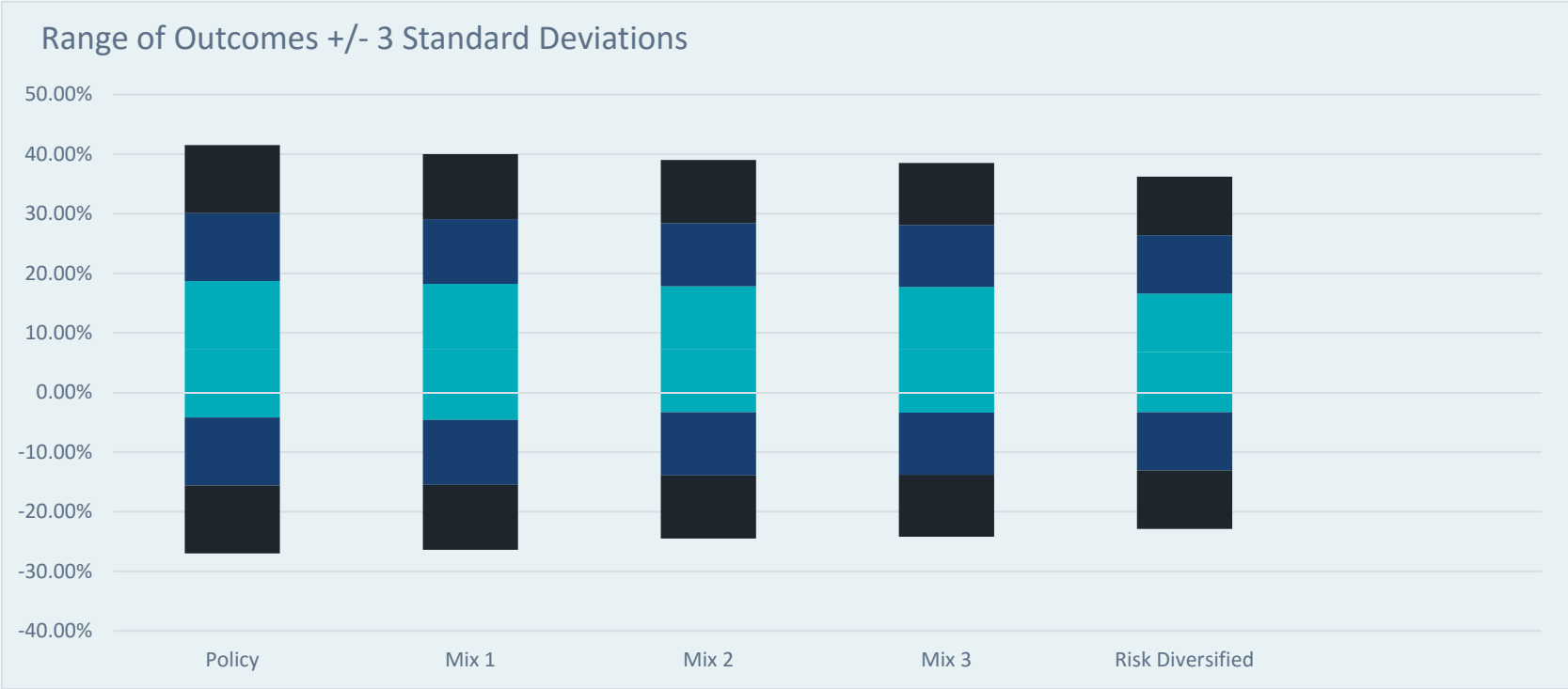
Comparison of Current Policy and Mix 2

- **Mix 2 is not a recommended portfolio, however:**
  - It demonstrates many of the objectives identified during the ALM study
    - More risk balanced; lower standard deviation; narrower range of outcomes; and greater potential cash flows
  - It falls between SCERS' current policy and the Verus Risk Diversified portfolios
  - The recommended portfolio could be similar to Mix 2, depending on feedback from the Board

Asset Class	SCERS' Current Policy	Mix 2	Changes
Growth	**63.0%**	**59.0%**	**-4.0%**
Public Equities	45.0%	41.0%	-4.0%
Private Equity	10.0%	9.0%	-1.0%
Public Credit	2.0%	2.0%	0.0%
Private Credit	0.0%	4.0%	4.0%
Growth Oriented Absolute Return	6.0%	3.0%	-3.0%
Diversifying	**22.0%**	**25.0%**	**3.0%**
Core/Core Plus Fixed Income	15.0%	10.0%	-5.0%
U.S. Treasury	0.0%	5.0%	5.0%
Global Fixed Income	3.0%	3.0%	0.0%
Diversifying Absolute Return	4.0%	7.0%	3.0%
Real Return	**15.0%**	**16.0%**	**1.0%**
Real Estate	7.0%	7.0%	0.0%
Private Real Assets	6.0%	7.0%	1.0%
Commodities	2.0%	2.0%	0.0%
Opportunities	**0.0%**	**0.0%**	**0.0%**
	100.0%	100.0%	

Investment model forecasts

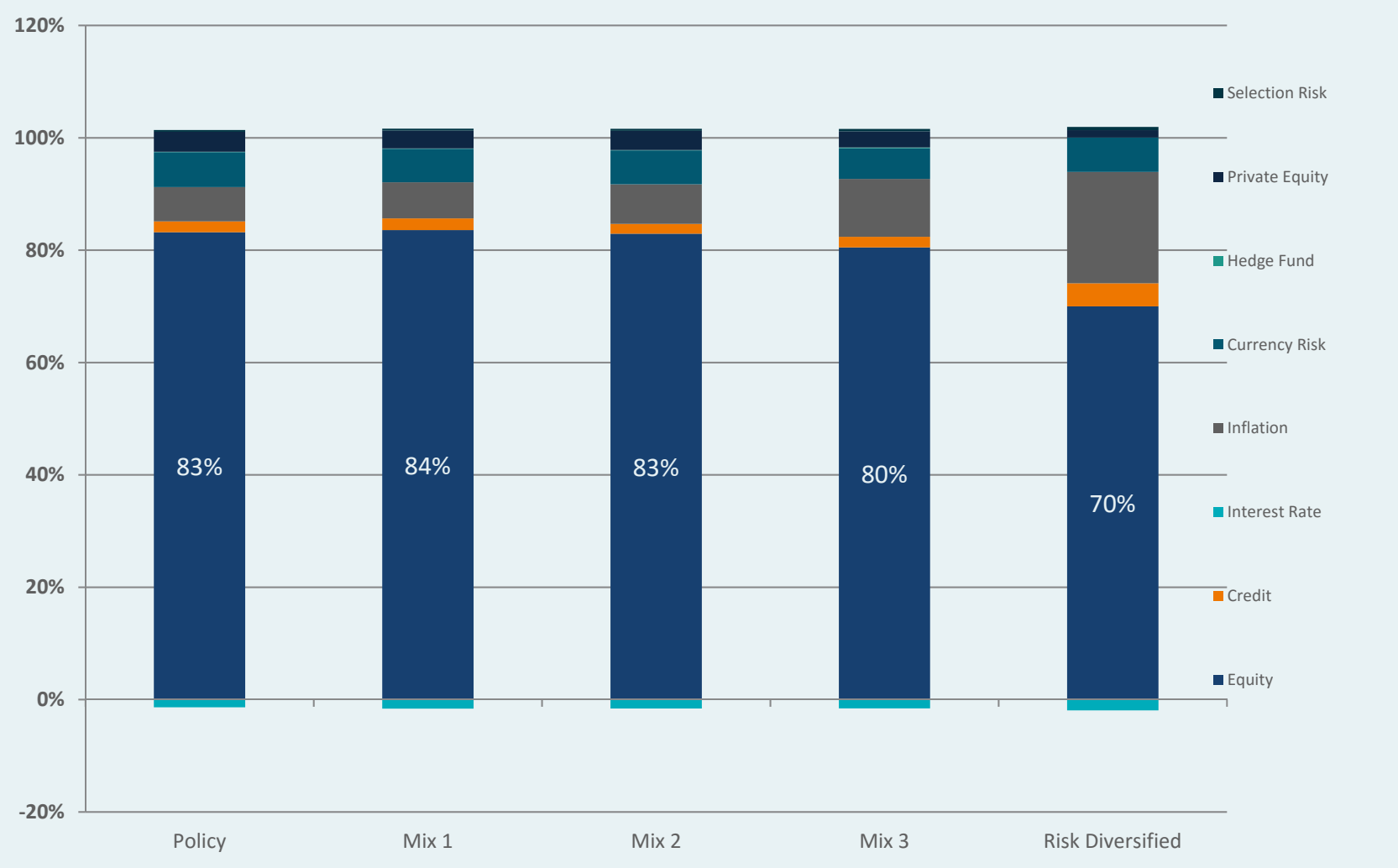
	Policy	Mix 1	Mix 2	Mix 3	Risk Diversified
Mean Variance Analysis					
Forecast 10 Year Return	**7.3%**	**7.3%**	**7.2%**	**7.3%**	**6.8%**
Standard Deviation	11.4%	10.9%	10.6%	10.4%	9.8%
Return/Std. Deviation	0.64	0.67	0.68	0.70	0.70
Sharpe Ratio	0.51	0.53	0.54	0.56	0.54



Cliffwater assumptions were used for Real Assets and Hedge Funds

Risk/Return Analysis done in ProVal

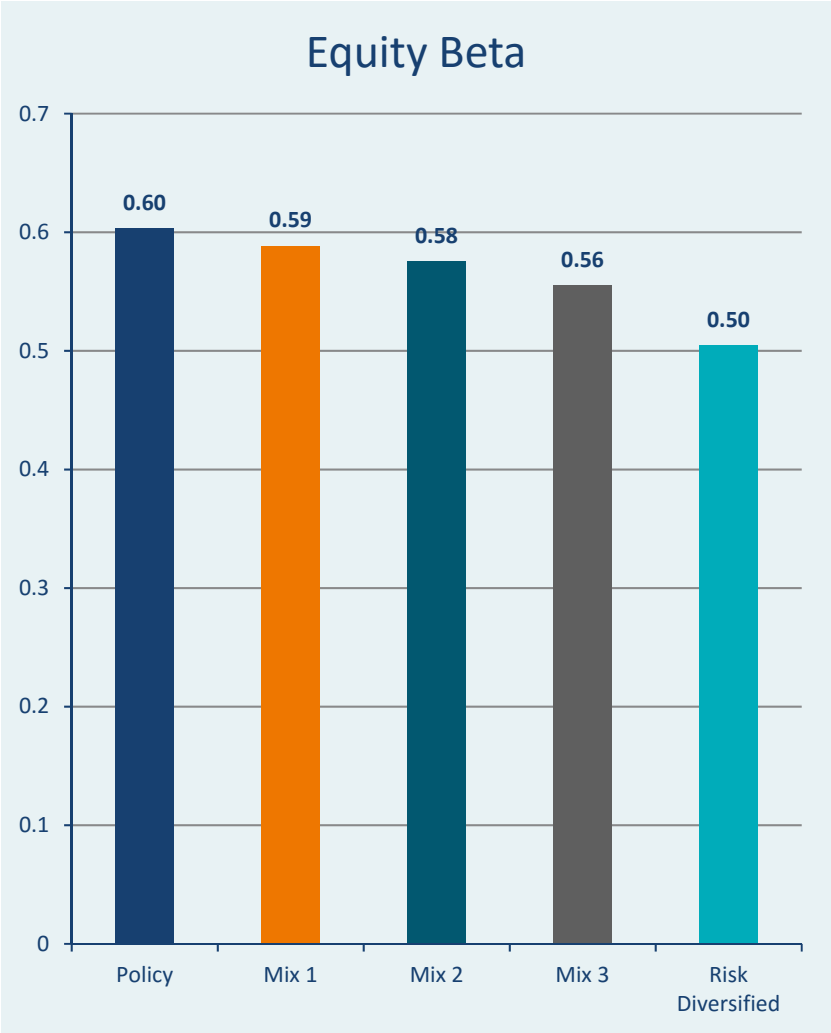
Risk decomposition

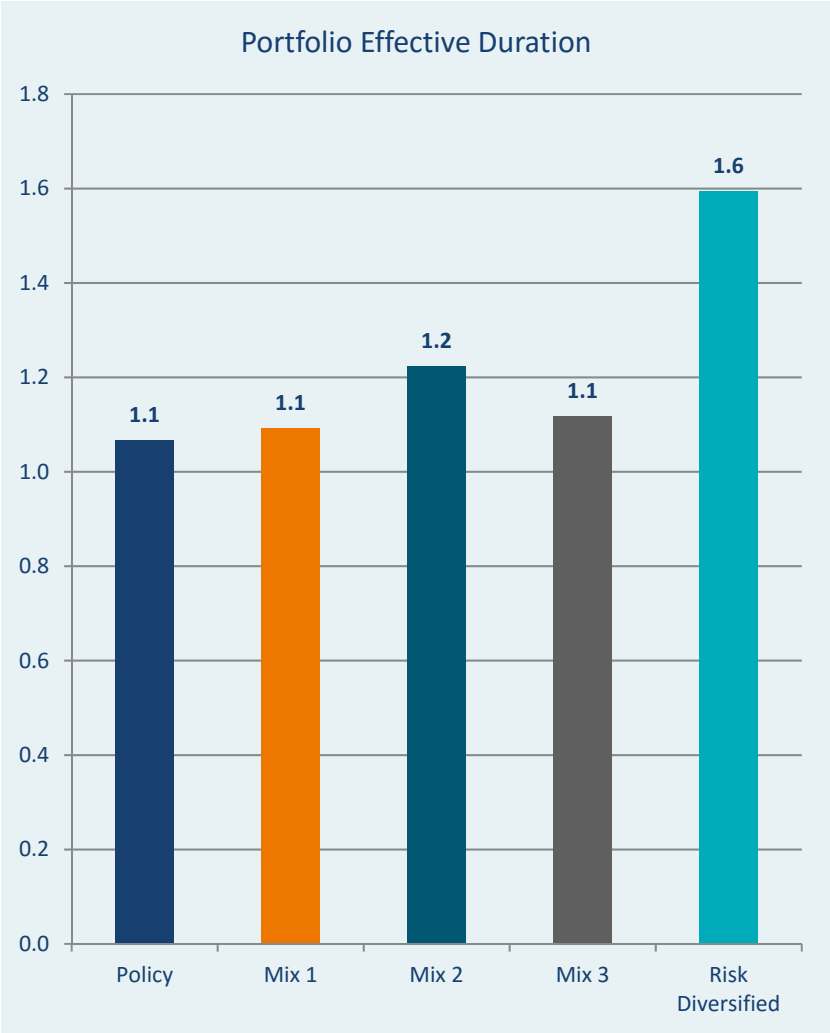


Source: MSCI BARRA

Note: Selection Risk is the risk attributable to unassigned factors

Sources of risk





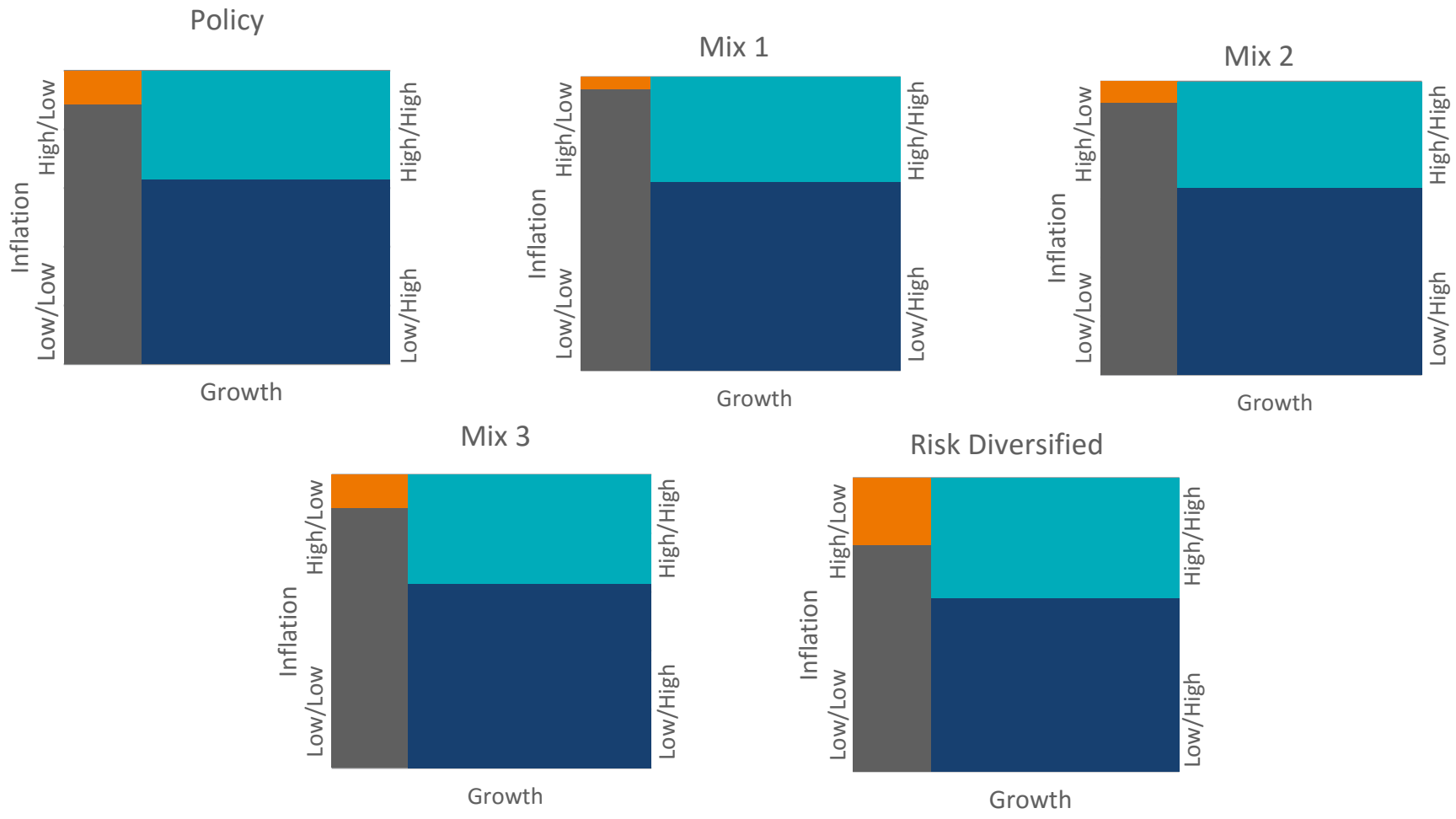
Equity beta measures the sensitivity to the risks of the broad equity market.

Duration measures the sensitivity of the portfolio to a change in interest rates.

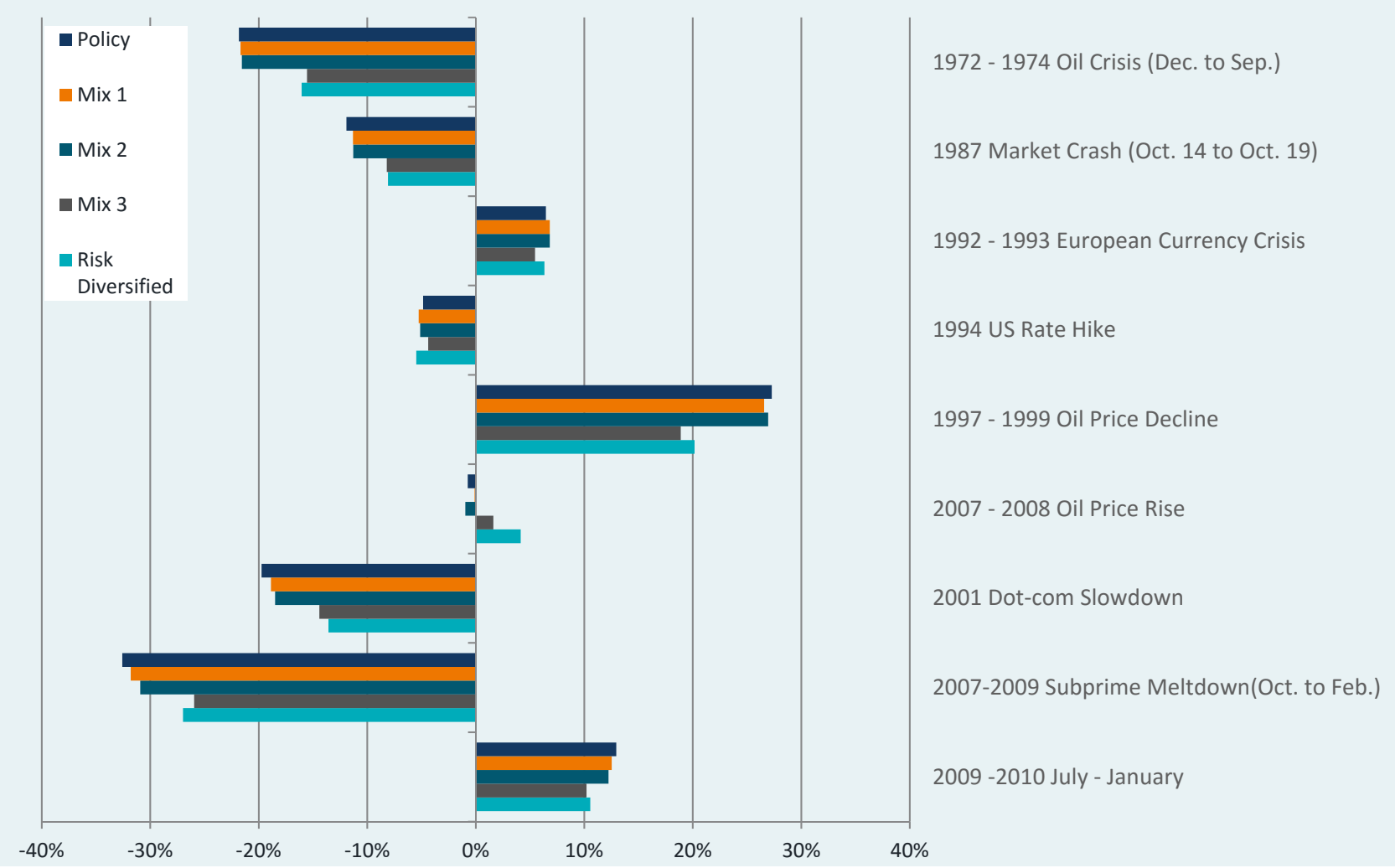
Source: MSCI BARRA

Economic diversification

Most portfolios have a bias towards high a growth / low inflation regime.

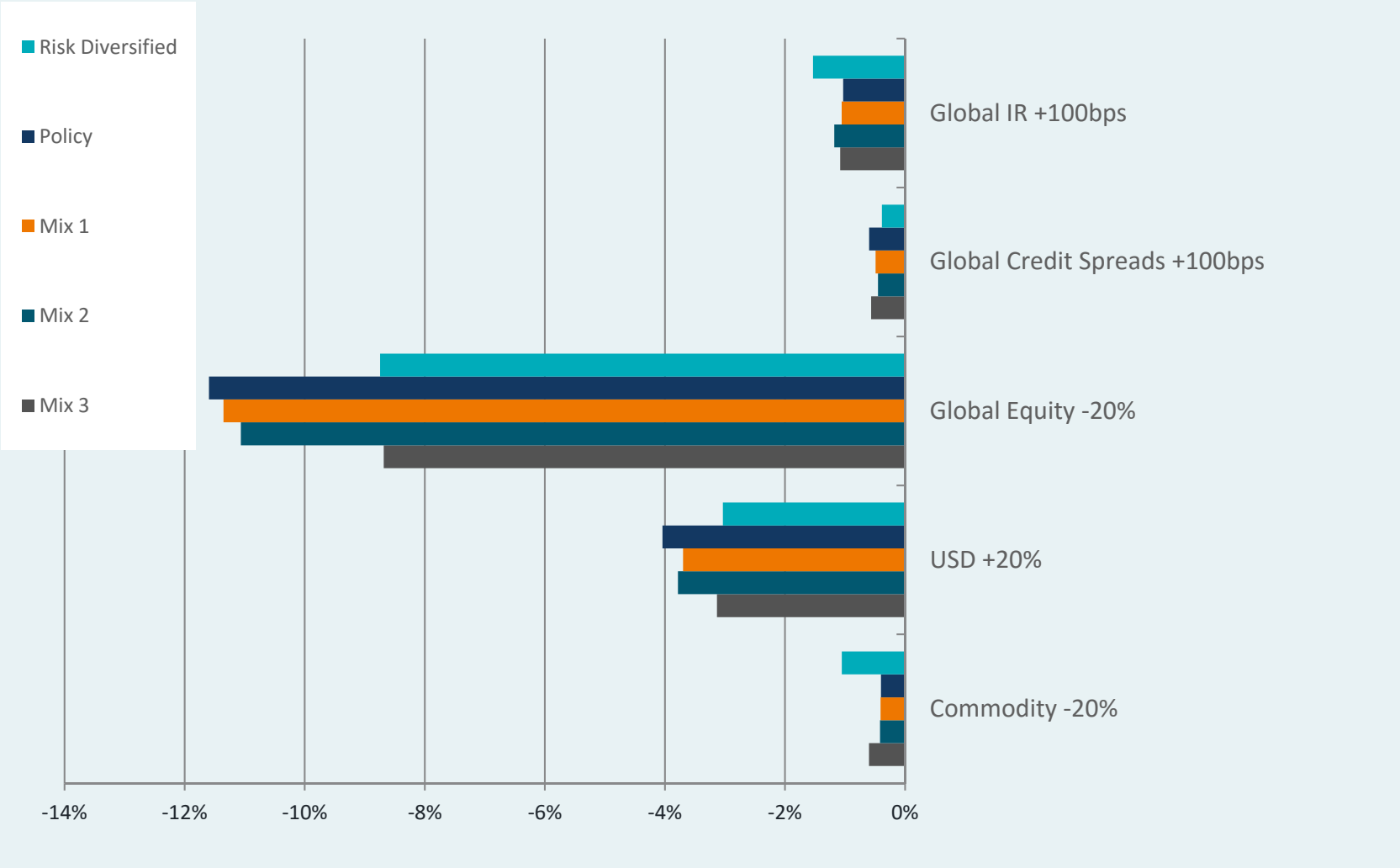


Scenario Analysis



Source: MSCI BARRA

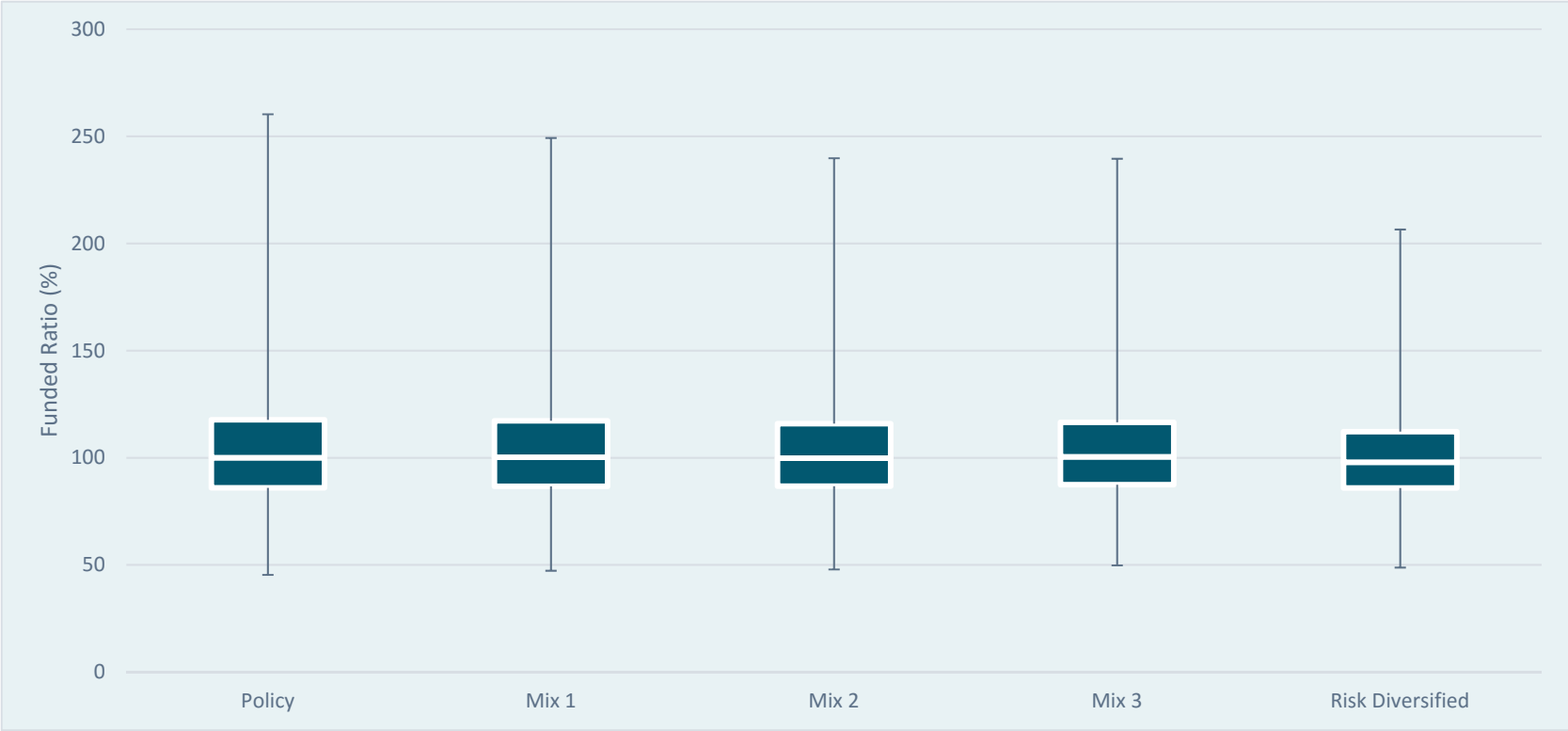
Stress tests



Source: MSCI BARRA

Expected funded ratio

FUNDED RATIO SIMULATION FOR PLAN YEAR ENDING 2025

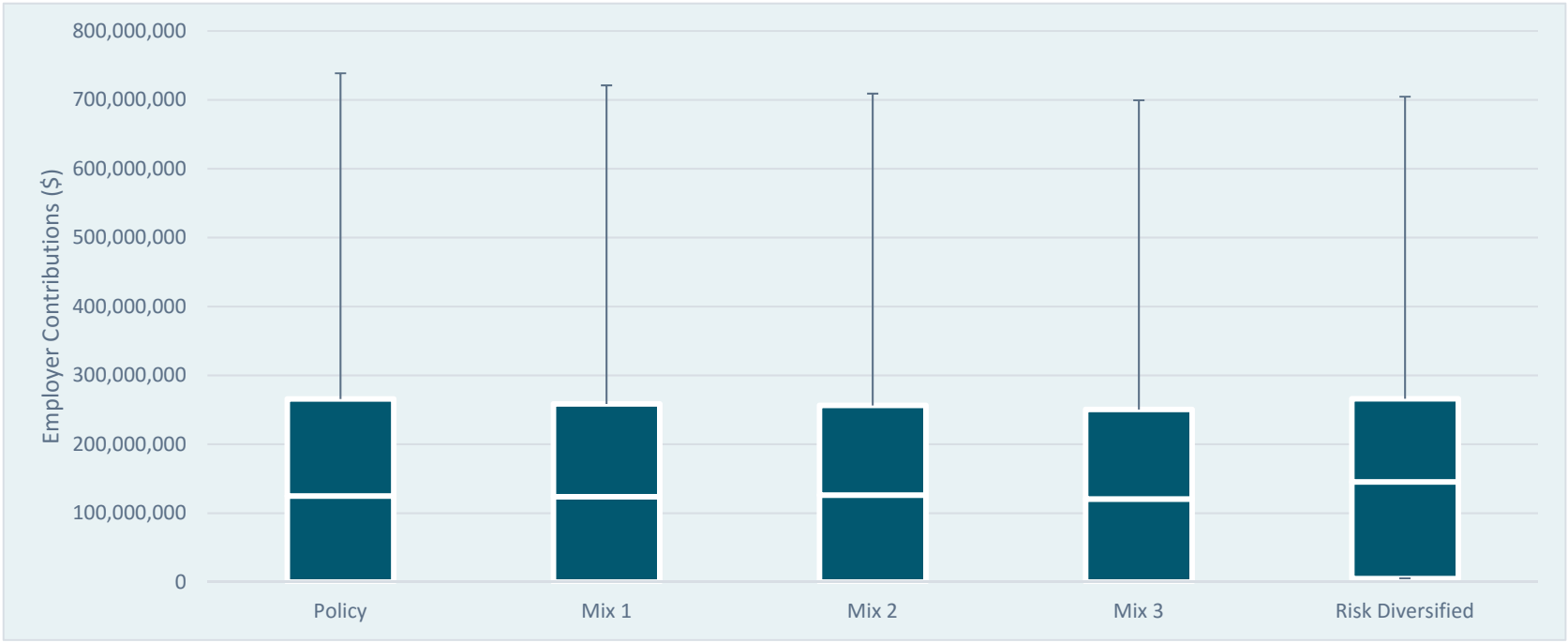


	Policy	Mix 1	Mix 2	Mix 3	Risk Diversified
Best Case	260	249	240	240	207
Median	100	100	100	100	98
Worst Case	41	39	39	38	37

Based on 5,000 independent simulations. Best case defined as 100th percentile. Worst case defined as 0th percentile. Median outcome is the 50th percentile.

Expected employer contributions

EMPLOYER CONTRIBUTION SIMULATION FOR PLAN YEAR ENDING 2025

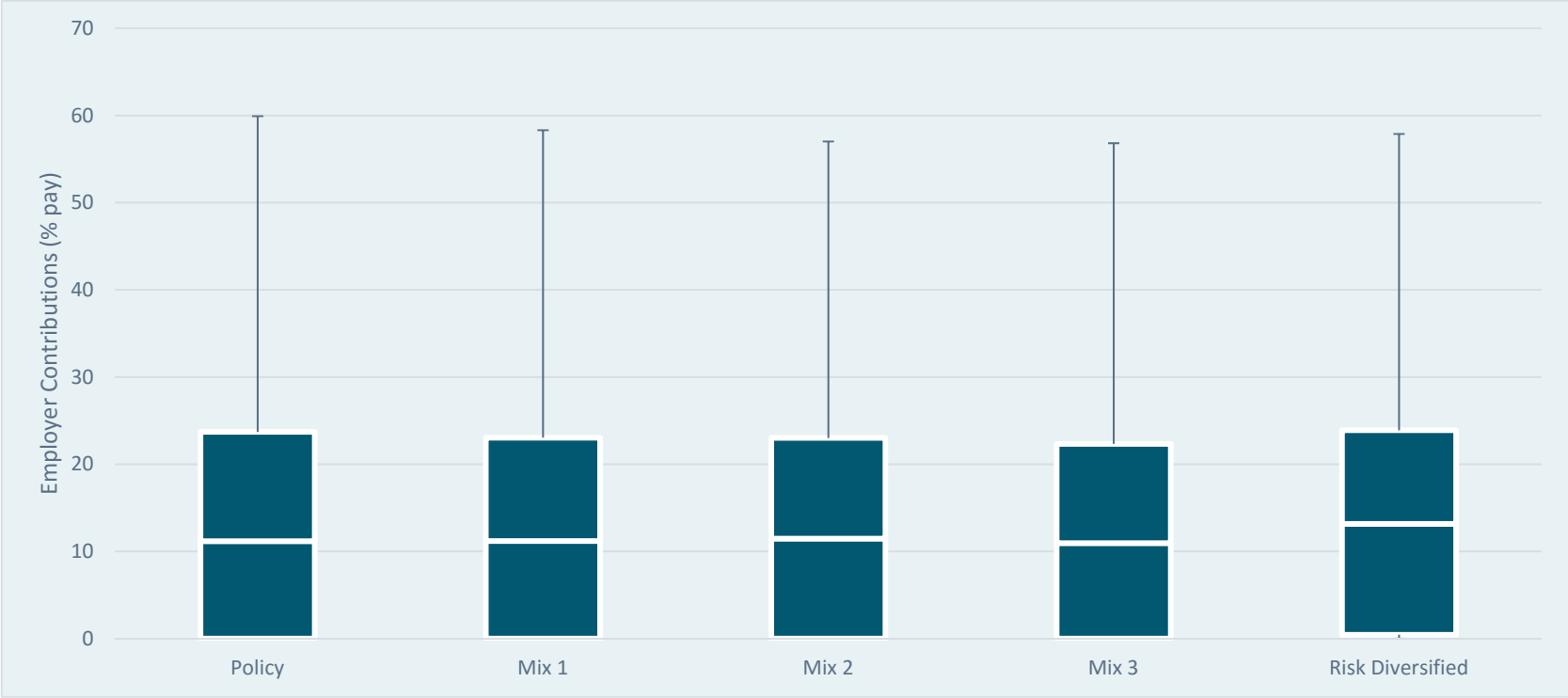


	Policy	Mix 1	Mix 2	Mix 3	Risk Diversified
Best Case	-	-	-	-	-
Median	125,056,000	123,864,000	126,310,000	120,658,000	120,649,000
Worst Case	738,548,000	721,062,000	709,075,000	699,371,000	704,682,118

Based on 5,000 independent simulations. Best case defined as 0th percentile. Worst case defined as 100th percentile. Median outcome is the 50th percentile.

Expected employer contributions as % of pay

EMPLOYER CONTRIBUTION SIMULATION FOR PLAN YEAR ENDING 2025



	Policy	Mix 1	Mix 2	Mix 3	Risk Diversified
Best Case	-	-	-	-	-
Median	11	11	11	11	13
Worst Case	60	58	57	57	58

Based on 5,000 independent simulations. Best case defined as 0th percentile. Worst case defined as 100th percentile. Median outcome is the 50th percentile.

Liquidity Ratio

Used to gauge a Plan's cash flow and liquidity profile

$$\text{Liquidity Ratio (LR)} = \frac{\text{Liquidity Needs}}{\text{Liquidity Available}}$$

$$\text{Liquidity Ratio (LR)} = \frac{\begin{array}{l}\text{Contributions – Benefit Payments}\\ \text{Plan Expenses}\\ \text{Investment Income (dividends and interest)}\\ \text{Net Cash Flows Private Equity}\\ \text{Net Cash Flows Real Estate}\\ \text{Net Cash Flows Private Real Assets}\end{array}}{\text{Daily Valued Financial Assets (Public Equity, Bonds, etc)}}$$

- LR < than -5% is a healthy ratio
- LR from -5% to -10% still acceptable for well-funded Public Plans
- LR > -10% generally associated with endowment-style portfolios

Liquidity Ratio

- Common for LR to be negative – cash outflows exceed cash inflows
- We use the Liquidity Ratio to establish a baseline of SCERS' liquidity risk
- When choosing between investment portfolios you can gauge how much illiquidity you are comfortable accepting
- SCERS' current Policy has a LR below -5% which is a healthy ratio
- Additionally, we assumed SCERS adopted Mix 2 which has a higher percentage allocated to illiquid assets and the ratio was still below -5%

Projected Liquidity Ratio

- Net cash flows includes Contributions, Investment Income, Plan Expenses, Benefits Paid and Private Equity net cash flows. Private Real Estate and Private Real Assets net cash flows are funded via the liquid Real Asset Proxy.
- Assumes a 7.5% growth rate on plan assets
- Mix 2 utilizes the asset allocation changes proposed in the ALM study (Cliffwater provided new net cash flows for assumptions)

SCERS Projected Liquidity Ratio

	2017	2018	2019	2020
Net Cash Flows	$ (165,881,529)	$ (122,504,913)	$ (100,105,504)	$ (91,069,984)
Liquid Assets (7.5% Growth)	$ 5,788,505,690	$ 6,038,026,483	$ 6,412,346,591	$ 6,886,661,443
Ratio	-2.87%	-2.03%	-1.56%	-1.32%

Mix 2

	2017	2018	2019	2020
Net Cash Flows	$ (181,027,187)	$ (194,925,224)	$ (191,511,219)	$ (153,017,975)
Liquid Assets (7.5% Growth)	$ 5,768,522,373	$ 5,930,580,607	$ 6,192,150,114	$ 6,582,795,625
Ratio	-3.14%	-3.29%	-3.09%	-2.32%

Decline in Liquid Assets Market Value

	2017	-10%	-20%	-30%	-40%
Net Cash Flows	$ (165,881,529)	$ (165,881,529)	$ (165,881,529)	$ (165,881,529)	$ (165,881,529)
Liquid Assets	$ 5,788,505,690	$ 5,209,655,121	$ 4,630,804,552	$ 4,051,953,983	$ 3,473,103,414
Ratio	-2.87%	-3.18%	-3.58%	-4.09%	-4.78%

**assets growth at Actuarial Rate*

*** Real Assets and private equity data provided by Cliffwater, Real Estate data provided by Townsend, and Benefit/contribution data provided by Segal*

**** Real Assets and Real Estate being funded by Liquid Real Assets/ Private Equity and Private Credit funded by cash*

Projected Liquidity Ratio

- Net cash flows includes Contributions, Investment Income, Plan Expenses, Benefits Paid and Private Equity net cash flows. Private Real Estate and Private Real Assets net cash flows are funded via the liquid Real Asset Proxy.
- Assumes a 7.0% growth rate on plan assets (Segal provided contribution & benefit estimates for 7% actuarial rate)
- Mix 2 utilizes the asset allocation changes proposed in the ALM study (Cliffwater provided new net cash flows for assumptions)

SCERS Projected Liquidity Ratio

	2017	2018	2019	2020
Net Cash Flows	$ (165,608,060)	$ (88,035,292)	$ (32,388,647)	$ (21,167,457)
Liquid Assets (7.0% Growth)	$ 5,761,427,347	$ 5,980,580,635	$ 6,320,623,866	$ 6,756,146,093
Ratio	-2.87%	-1.47%	-0.51%	-0.31%

Mix 2

	2017	2018	2019	2020
Net Cash Flows	$ (180,753,718)	$ (160,455,603)	$ (123,794,362)	$ (83,115,448)
Liquid Assets (7.0% Growth)	$ 5,741,466,531	$ 5,873,251,300	$ 6,100,743,831	$ 6,452,911,640
Ratio	-3.15%	-2.73%	-2.03%	-1.29%

Decline in Liquid Assets Market Value

	2017	-10%	-20%	-30%	-40%
Net Cash Flows	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)
Liquid Assets	$ 5,761,427,347	$ 5,185,284,613	$ 4,609,141,878	$ 4,032,999,143	$ 3,456,856,408
Ratio	-2.87%	-3.19%	-3.59%	-4.11%	-4.79%

**assets growth at Actuarial Rate*

*** Real Assets and private equity data provided by Cliffwater, Real Estate data provided by Townsend, and Benefit/contribution data provided by Segal*

**** Real Assets and Real Estate being funded by Liquid Real Assets/ Private Equity and Private Credit funded by cash*

Projected Liquidity Ratio

- Net cash flows includes Contributions, Investment Income, Plan Expenses, Benefits Paid and Private Equity net cash flows. Private Real Estate and Private Real Assets net cash flows are funded via the liquid Real Asset Proxy.
- Assumes a 5.0% growth rate on plan assets (Segal provided contribution & benefit estimates for 7% actuarial rate)
- Mix 2 utilizes the asset allocation changes proposed in the ALM study (Cliffwater provided new net cash flows for assumptions)

SCERS Projected Liquidity Ratio

	2017	2018	2019	2020
Net Cash Flows	$ (165,608,060)	$ (88,035,292)	$ (32,388,647)	$ (21,167,457)
Liquid Assets (5% Growth)	$ 5,653,113,976	$ 5,753,505,079	$ 5,962,320,778	$ 6,252,274,166
Ratio	-2.93%	-1.53%	-0.54%	-0.34%

Mix 2

	2017	2018	2019	2020
Net Cash Flows	$ (180,753,718)	$ (160,455,603)	$ (123,794,362)	$ (83,115,448)
Liquid Assets (5% Growth)	$ 5,633,243,163	$ 5,646,639,655	$ 5,743,692,492	$ 5,951,518,813
Ratio	-3.21%	-2.84%	-2.16%	-1.40%

Decline in Liquid Assets Market Value

	2017	-10%	-20%	-30%	-40%
Net Cash Flows	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)	$ (165,608,060)
Liquid Assets	$ 5,653,113,976	$ 5,087,802,579	$ 4,522,491,181	$ 3,957,179,784	$ 3,391,868,386
Ratio	-2.93%	-3.26%	-3.66%	-4.19%	-4.88%

**assets growth at Actuarial Rate*

*** Real Assets and private equity data provided by Cliffwater, Real Estate data provided by Townsend, and Benefit/contribution data provided by Segal*

**** Real Assets and Real Estate being funded by Liquid Real Assets/ Private Equity and Private Credit funded by cash*

Conclusions

- We note that the outcomes from the mean/variance study show little contrast between Policy and Mixes 1, 2 and 3
- Mix 2 moves the SCERS portfolio more towards the risk diversified approach without giving up substantial liquidity, a concern for both Staff and Verus
- Risk/return assumptions for private real assets is a key contributor to Mix 3's superior results
- Mix 2's growth portfolio includes a meaningful allocation to private credit which we believe reduces the overall risk to the Plan while still providing exposure to the upside of economic growth
- Overall investment cash flows potentially increase with the addition of private credit and the slight increase to private real assets.

- Recommendation: With Board direction, we plan to provide a final revised iteration next month.

IV. Appendices

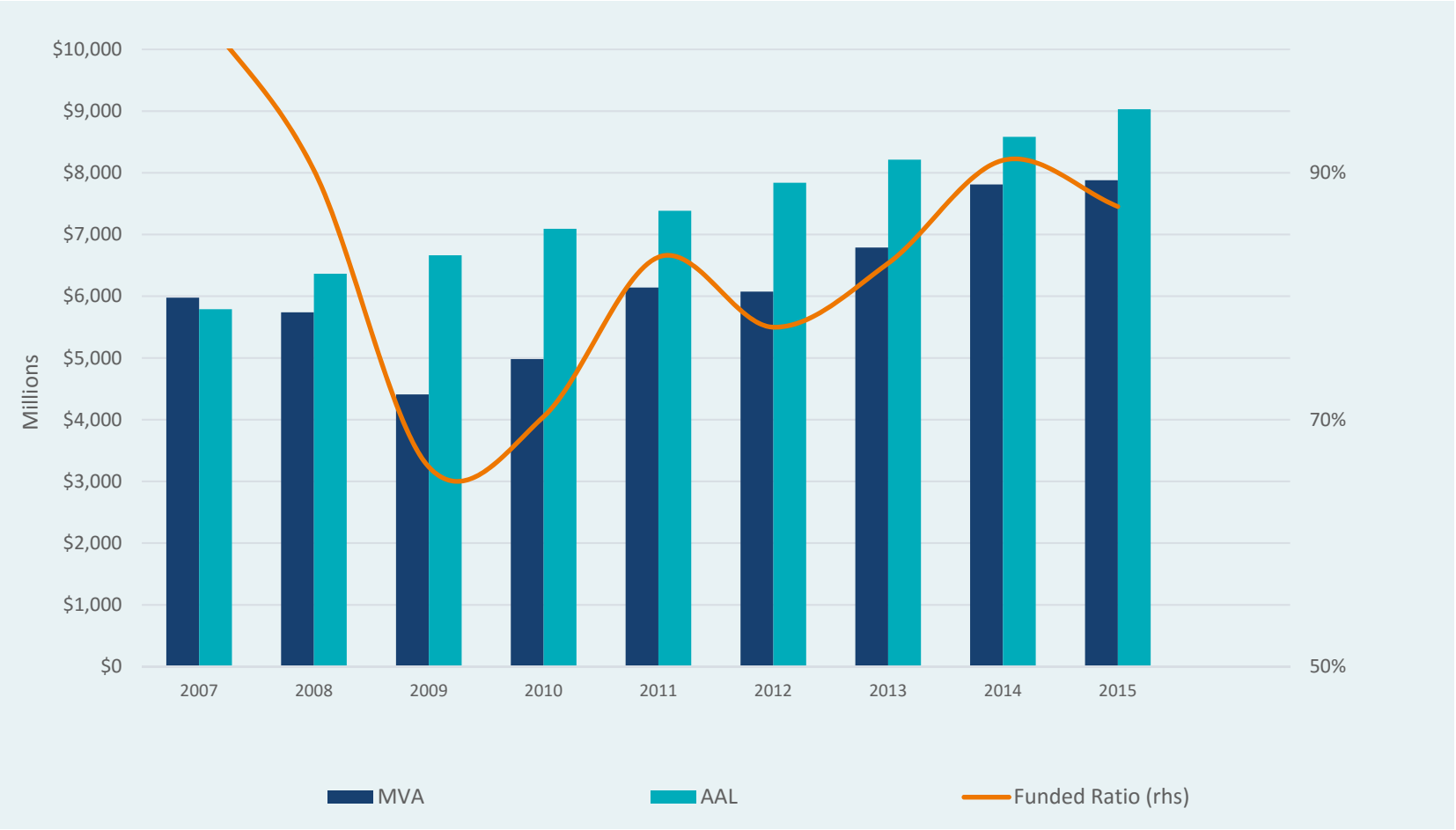
Key actuarial assumptions

Asset valuation method	Assets are valued using a five-year smoothed method based on the difference between the expected market value and the actual market value of the assets as of the valuation date. The expected market value is the prior year's market value increased with the net increase in the cash flow of funds, all increased with interest during the past fiscal year at the expected investment return rate assumption.
Actuarial cost method	Valuation uses the entry age actuarial cost method. Actuarial present value of the projected benefits of each individual included in the valuation is allocated as a level percentage of the individual's projected compensation between entry age and assumed exit.
Amortization period	The UAAL rate reflects a layered 15-year amortization beginning with the June 30, 2008 valuation. Gains and losses after that date are reflected over new 15-year periods starting with the valuation date. A one-year deferral in the implementation of the new rate is reflected.
Investment rate of return	7.5%
Inflation rate	3.25%
Cost of living adjustments	Cost-of-living increases are applied based on changes in the Consumer Price Index (CPI) from the previous January 1 to the current January 1, to the nearest ½ of 1%.

Source: Milliman Actuarial Valuation as of 6/30/2015

Actuarial valuations & market value funded status

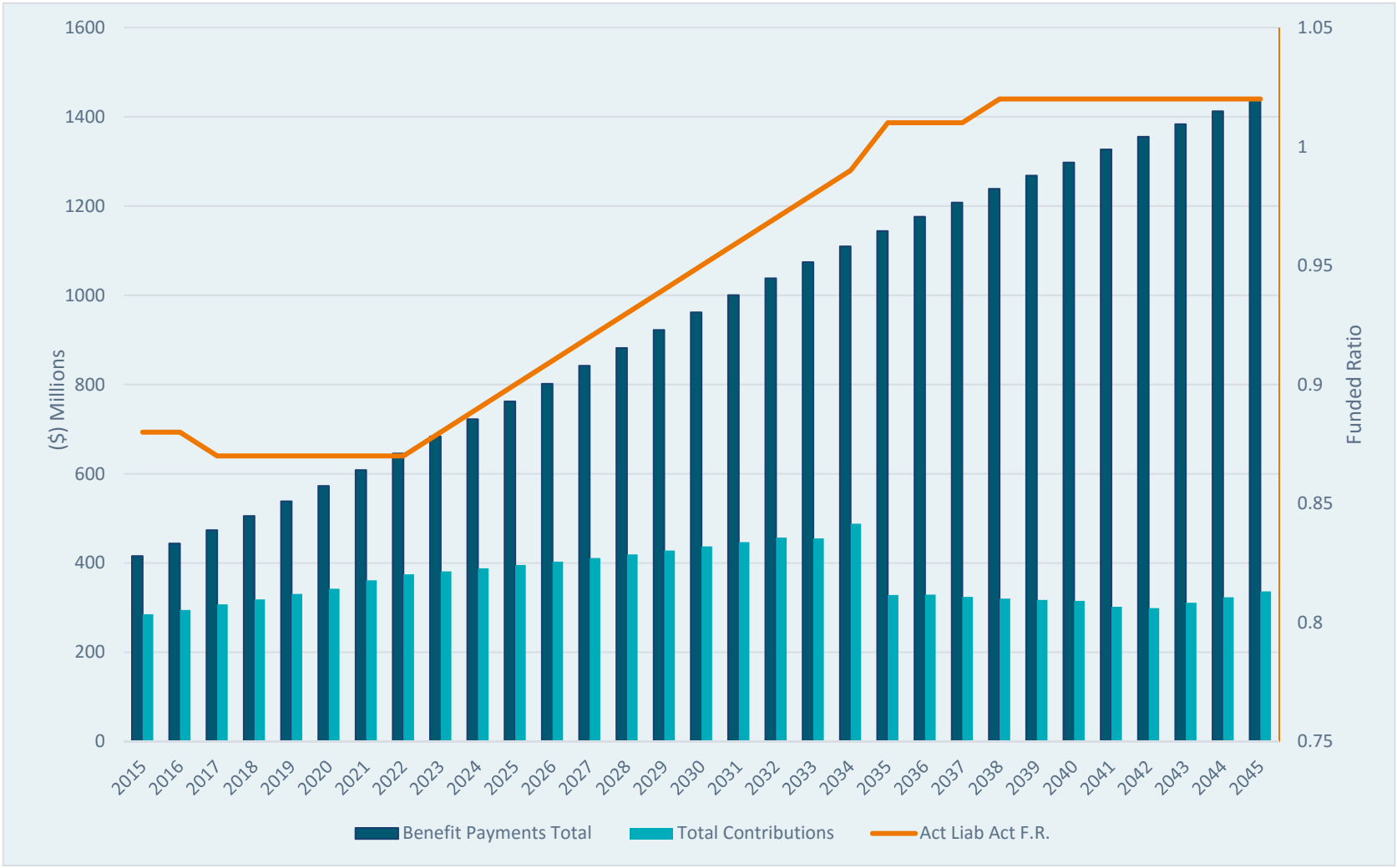
HISTORICAL FUNDED STATUS



Source: SCERS Performance Reports, Segal Actuarial Valuation Reports

Contributions & benefit payments

Base case: the plan earns 7.5% every year for next 20 years



The Plan achieves fully funded status during 2035 if the base case were to hold true.

Notes: Contributions consist of employer and employee contributions. Funded status for all deterministic projections is based on the actuarial value of assets.

Funded status outcomes

Annual Returns

	5.50%	5.75%	6.00%	6.25%	6.50%	6.75%	7.00%	7.25%	7.50%
2015	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
2016	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
2017	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
2018	0.86	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
2019	0.86	0.86	0.86	0.86	0.86	0.87	0.87	0.87	0.87
2020	0.85	0.85	0.85	0.86	0.86	0.86	0.87	0.87	0.87
2021	0.83	0.83	0.84	0.84	0.85	0.85	0.86	0.86	0.87
2022	0.82	0.82	0.83	0.84	0.84	0.85	0.85	0.86	0.87
2023	0.81	0.82	0.83	0.84	0.84	0.85	0.86	0.87	0.88
2024	0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89
2025	0.8	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.9

These deterministic forecasts assume a 7.5% discount rate.

Employer Contributions as a percent of Pay

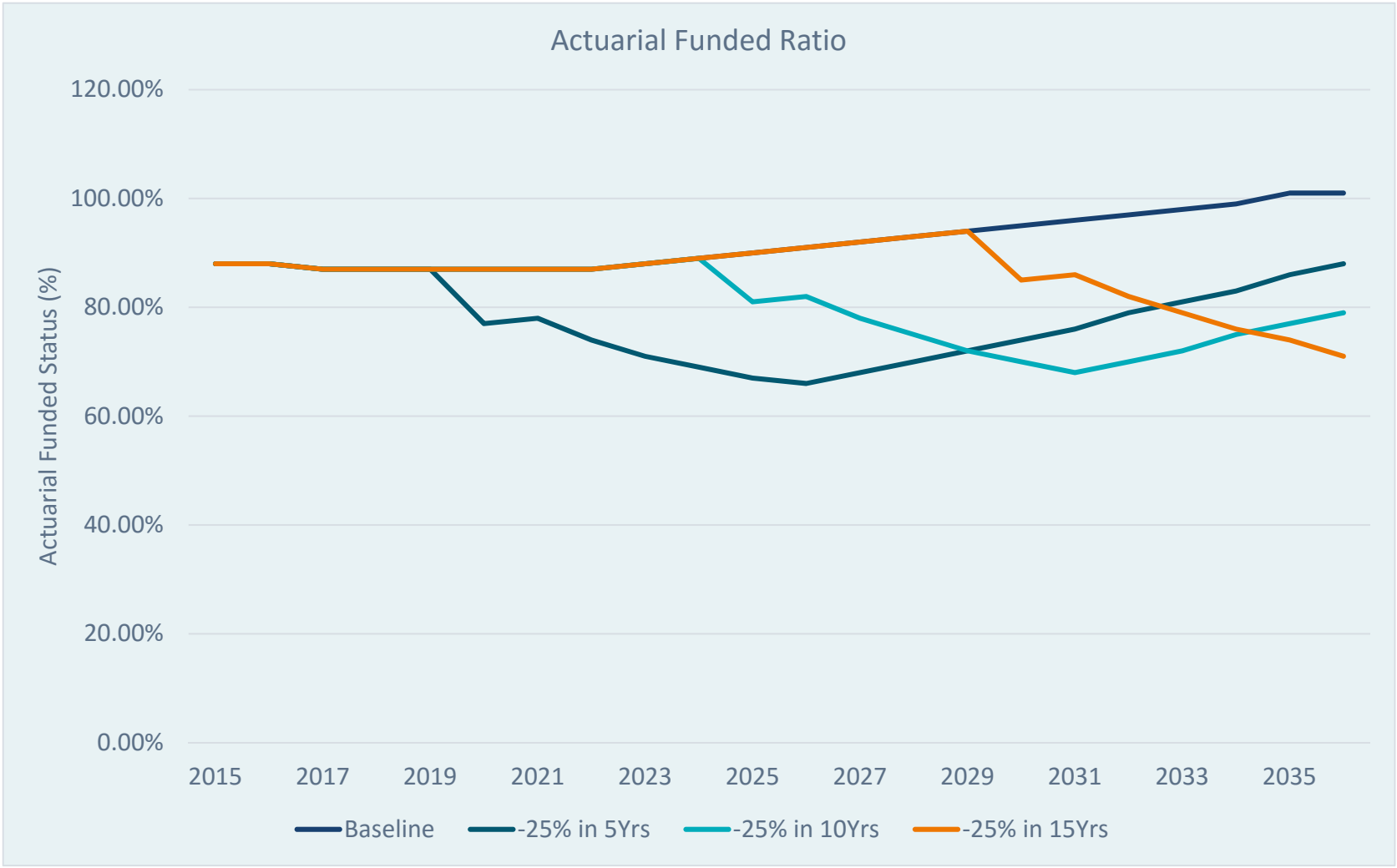
Annual Returns

	5.50%	5.75%	6.00%	6.25%	6.50%	6.75%	7.00%	7.25%	7.50%
2015	22.81	22.81	22.81	22.81	22.81	22.81	22.81	22.81	22.81
2016	22.69	22.69	22.69	22.69	22.69	22.69	22.69	22.69	22.69
2017	23.01	22.99	22.97	22.95	22.93	22.91	22.88	22.86	22.84
2018	23.35	23.28	23.21	23.14	23.07	23.00	22.93	22.86	22.79
2019	24.01	23.86	23.72	23.57	23.42	23.28	23.13	22.98	22.83
2020	24.73	24.49	24.24	24.00	23.75	23.5	23.25	23	22.75
2021	26.22	25.85	25.49	25.12	24.75	24.38	24.01	23.63	23.25
2022	27.35	26.85	26.35	25.84	25.33	24.82	24.3	23.77	23.25
2023	28	27.35	26.69	26.03	25.36	24.69	24	23.31	22.62
2024	28.68	27.88	27.07	26.26	25.43	24.59	23.75	22.89	22.02
2025	29.37	28.43	27.47	26.5	25.52	24.52	23.51	22.49	21.45

These deterministic forecasts assume a 7.5% discount rate.

Funded status & drawdowns

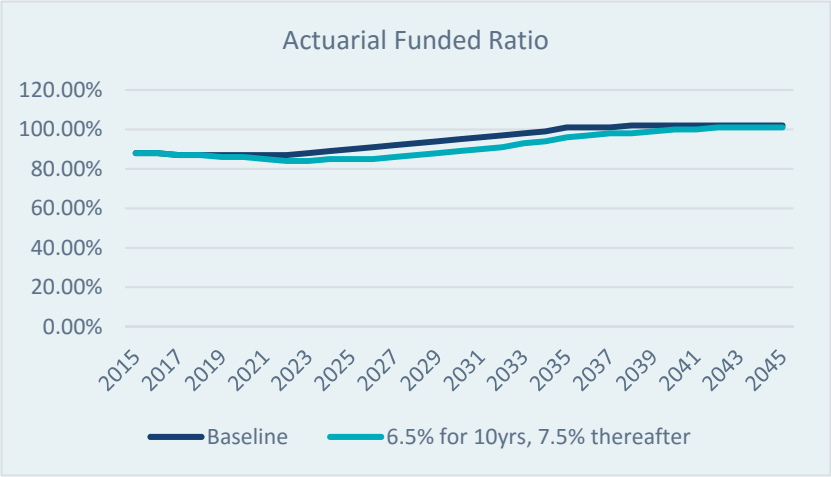
ACTUARIAL FUNDED RATIO

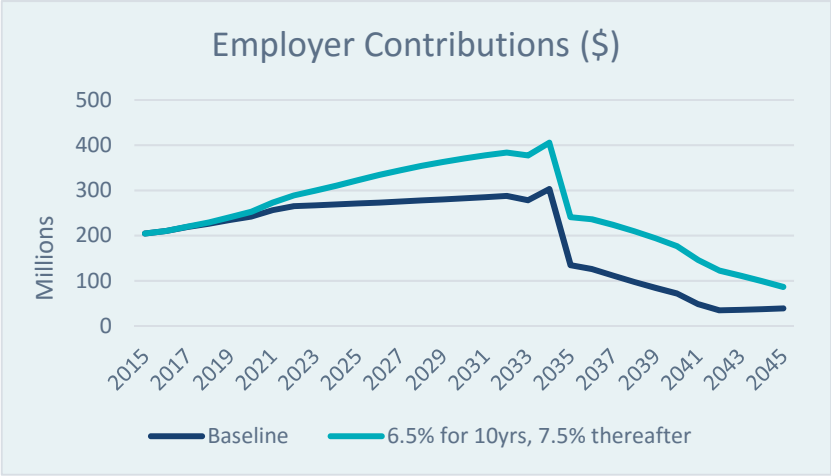


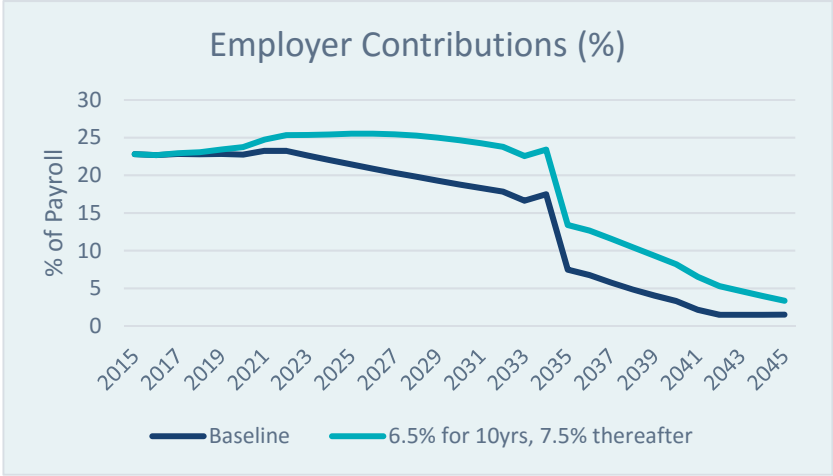
Experiencing "2008 type" drawdown event would set the plan back on its path to recovery

Assumes 7.0% in all non-drawdown years. Assumes no increases in contributions or benefit changes beyond what has been assumed. Also assumes all other actuarial assumptions are met.

Impact of 10-Year Performance Below Assumed Rate







Note: 6.5% is the expected rate of return for the current policy investment strategy over the next 10 years.

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