ITEM 17

SCERS
SACRAMENTO COUNTY
EMPLOYEES' RETIREMENT SYSTEM

For Agenda of:
November 7, 2016

November 3, 2016

TO: President and Members
Board of Retirement

FROM: Steve Davis
Chief Investment Officer

SUBJECT: Education on Asset Class Construction and its 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. As you will recall, at the May Board meeting Verus provided an initial introduction to the ALM process, and the approach that Verus takes to conducting an ALM study. The process includes: (1) The identification of the objectives of an ALM study; (2) An Enterprise Risk Tolerance analysis and discussion with the Board, which helps to identify and prioritize investment-related objectives, principles and risks; (3) The development of a liability model; (4) The modeling of asset allocation portfolios; and (5) The review of the ALM study results that will lead to a recommended asset allocation.

At the July Board meeting, Verus and Staff led a discussion with your Board around the topic of Enterprise Risk Tolerance ('ERT'). To assist in the ERT analysis and discussion, Staff and Verus developed a survey which your Board completed, the results of which will play a part in designing and recommending SCERS' ultimate strategic asset allocation.

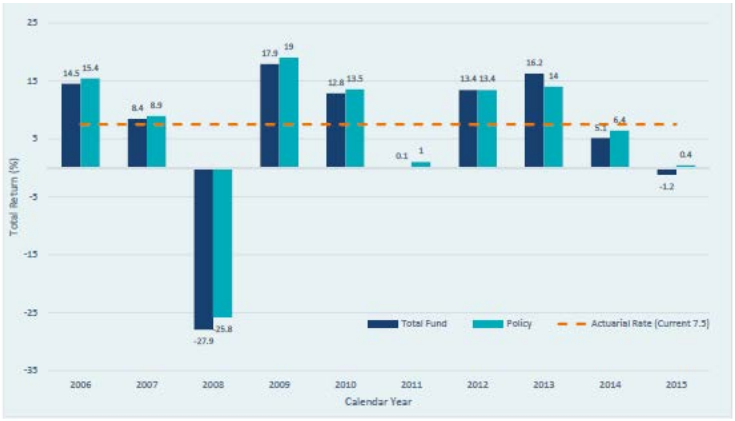
At the September Board meeting, Staff and Verus provided education related to various risk based approaches to asset allocation, in order the better identify risk within a portfolio. These approaches have been incorporated into the modeling of assets and liabilities, the results of which are being presented at the November Board meeting.

The presentation at the November Board meeting will cover the following areas: (1) An evaluation of SCERS' historical experience over the past ten years, which includes 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 take 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 provide a variety of metrics across SCERS' current asset allocation and a range of common institutional portfolios, including risk/return forecasts, risk decomposition, sources of risk, economic regime diversification, scenario analysis, stress tests, and impact on SCERS' funded ratio and contribution rates

SCERS' HISTORICAL EXPERIENCE:

SCERS' plan is driven by the following equation: C + I = B + E. On the left hand side of the equation are the inflows to SCERS' plan (contributions and investments) that fund SCERS' outflows (benefit payments and plan expenditures) on the right hand side of the equation.

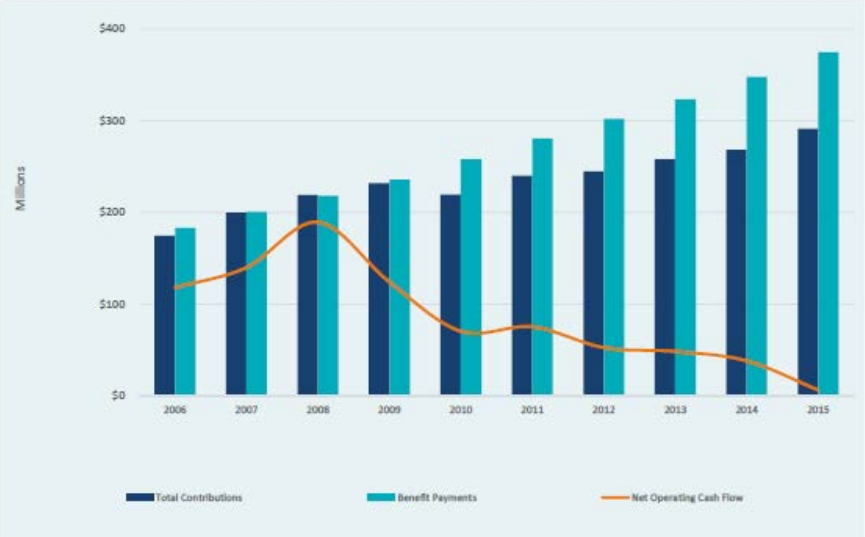


Related to investments, over the past ten years, SCERS has generated an annual return of 4.9%, which is below SCERS' assumed rate of return of 7.5%, and below the policy index return of 5.7%. Over this period, SCERS' total fund has been subjected to a variety of market environments, highlighted by the dramatic selloff during the global financial crisis ('GFC') in 2008, followed by several years of meaningful market returns. Sprinkled within this have been a few years of muted returns, including that of the past two years.

This experience has resulted in significant volatility in the value of SCERS' assets, especially when measured on a market value basis. The value of SCERS' assets is also measured on an actuarial basis. As you will recall, the actuarial valuation of SCERS' assets are recognized over a seven-year period in order to smooth out the episodic returns that are often generated on an annual basis. Investment gains and losses are calculated by comparing SCERS' actual market returns against SCERS' assumed rated of return, which is 7.5%.

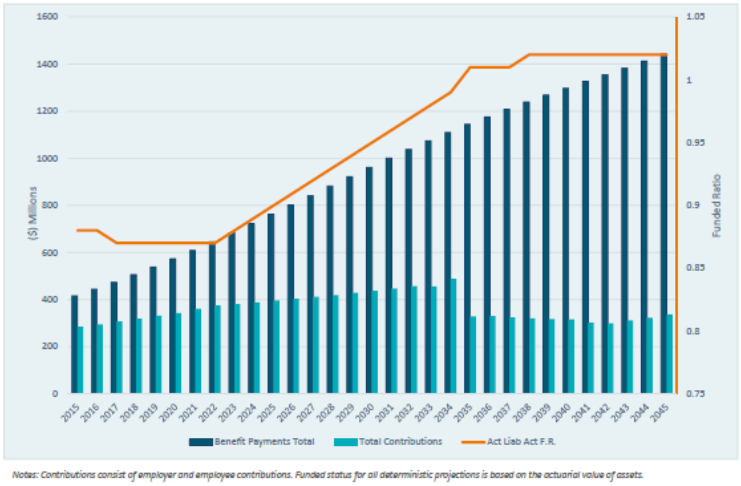
SCERS' funded ratio, which compares the value of SCERS' assets (both on a market value and actuarial basis) to the actuarial accrued liabilities of SCERS' plan, can also experience volatility. The chart above shows SCERS' funded ratio measured by market value, which follows the volatile annual path of the market value of assets. However, on an actuarial basis, the funded ratio is less volatile, and as of the actuarial valuation at June 30, 2016, stands at 87.1%.

A major outflow for SCERS' plan is the benefit payments paid out to SCERS' retirees and beneficiaries of retirees. Benefit payments are on a consistent upward trajectory, mostly due to demographic changes within the plan. Similar to many public pension plans, the ratio of active to retired members has transitioned from a level greater than one, to a number less than one, meaning there are more retired than active workers in the plan now. This is due to acceleration in the number of active workers who have retired combined with a slowdown in the hiring of new workers, especially in the aftermath of the GFC. The increase in benefit payments puts more pressure on SCERS' investment program to generate long-term returns at or above SCERS' assumed rate of return, and/or to produce more cash income.



However, it also puts pressure on plan contributions, which combined with investment returns, are the primary inflows that fund SCERS' liabilities. As the chart above shows, contributions have increased over time on a dollar basis, but at a slower rate than the increase in benefit payments. Over longer periods of time, any shortfall in SCERS' investment return will result in an increase in contributions as a percentage of pay; conversely, a surplus will result in a decrease in contributions as a percentage of pay. Historically, the employer has paid for any shortfall in investment returns through a special contribution to pay off the unfunded actuarial accrued liability (UAAL) that results from failure to meet the investment return assumption.

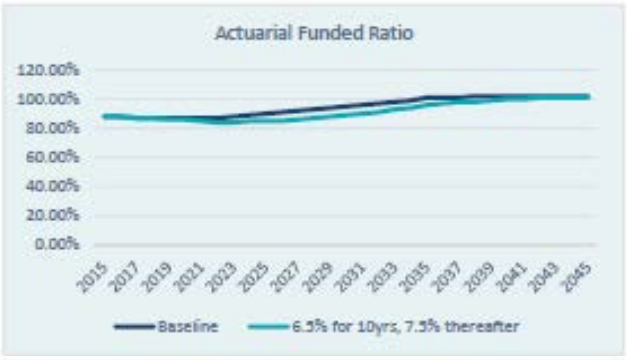
DETERMINISTIC PROJECTIONS:

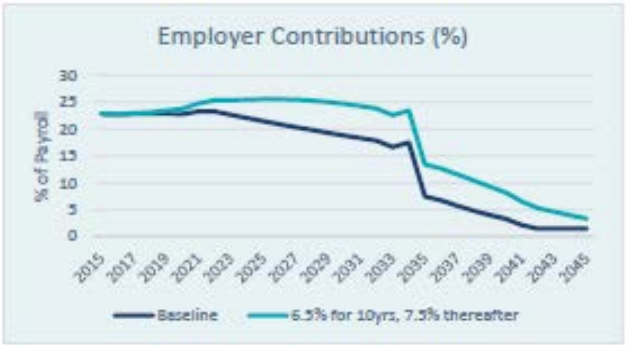


Notes: Contributions consist of employer and employee contributions. Funded status for all deterministic projections is based on the actuarial value of assets.

As part of the ALM process, Verus runs deterministic projections, by using actuarial assumptions to determine funded status outcomes. While the last section looked at SCERS' historical experience, this section takes a forward view to determine the impact on SCERS' funded status, contributions and benefit payments under the assumption that SCERS earns its assumed rate of return of 7.5% 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 were to earn its assumed rate of return of 7.5% over the next twenty years, then SCERS' plan would be fully funded by 2035. However, shortfalls in earning the assumed rate of return slows down the progress in getting the plan fully funded.

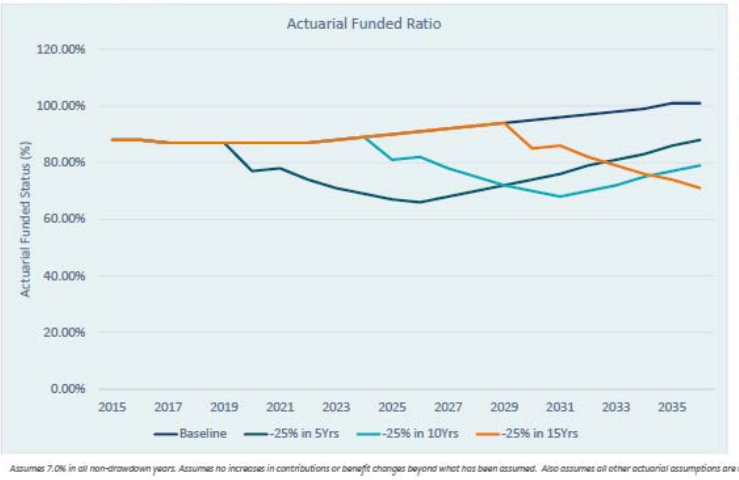




If SCERS were to fall short of its annual assumed rate of return of 7.5% over the next ten years, both the funded status and contribution rates would be impacted. For example, if SCERS' were to earn its annual 7.5% assumed rate of return over the next ten years, SCERS' funded ratio would be 90%, and over the next twenty years it would be 100%. However, if the actual annual returns were to come in at 6.5%, the funded ratio would be 85% after ten years, setting SCERS back on a path toward becoming fully funded. Any shortfall in investment returns would need to be made up by an increase in the contribution rate to get SCERS' plan on the path toward becoming fully funded. For example, in the example above, if SCERS' annual return came in at 6.5% rather than 7.5% over the next ten years, then the employer contribution rate as a percentage of pay would increase from 21.45% to 25.52%.

Significant investment drawdowns such as that experienced in 2008, where SCERS' plan returned -28%, are especially troublesome. The chart below shows the change in trajectory that significant drawdowns have on the path toward becoming fully funded. Granted, a 25% drawdown is an extreme 'tail event' in a normal distribution, but the aftermath of 2008 demonstrated that growth oriented institutional investment portfolios are vulnerable in these types of environments.

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.

CAPITAL MARKET ASSUMPTIONS AND ASSET CLASS MIXES:

This section of the presentation looks at outcomes associated with analyzing various asset mixes against SCERS' current asset allocation policy. As part of the asset modeling process, 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 as well. Verus develops these assumptions for nearly all segments of SCERS' investable universe.

However, there were a couple of portfolio segments that required more specific capital market assumptions. These included Absolute Return (hedge funds) and Real Assets. Related to Absolute Return, you will recall during recent presentations around ALM modeling that SCERS' Absolute Return exposure was separated between equity correlated absolute return strategies that fall within a 'Growth' asset class and diversifying absolute return strategies that fall within a 'Diversifying' asset class. This requires different capital market assumptions for each, as these two absolute return segments have different risk and return profiles, as well as varying correlations with other asset class segments. For absolute return, Verus develops one capital market assumption for the broad segment, so Staff reached out to Cliffwater for assistance, as Cliffwater develops separate capital market assumptions for both the growth and diversifying segments of absolute return.

A similar dynamic played out in Real Assets, where SCERS breaks this portfolio out among real estate, commodities and private real assets. The private real assets sub-asset class includes segments such as energy, infrastructure, agriculture and timber. Verus' capital market assumptions for Real Assets include various real estate assumptions and commodities, but do not include the individual segments of private real assets. Cliffwater does develop dedicated capital market assumptions for private energy, infrastructure and timber, so Staff had Cliffwater provide these capital market assumptions to Verus for the segments of private real assets. You will see Cliffwater's capital market assumptions for absolute return and private real assets at the bottom of the Verus return and risk assumptions on page 19 of the presentation.

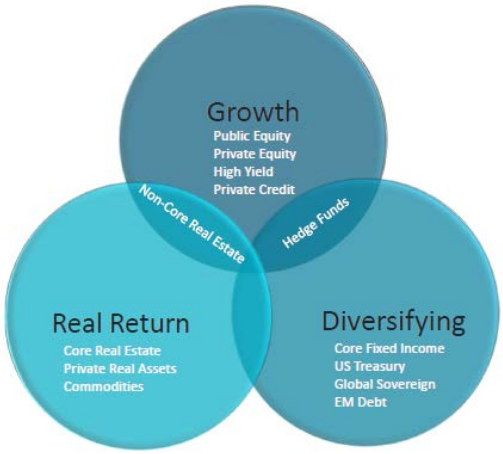
Related to the asset class mixes that are provided in the presentation, and which are compared to SCERS' current asset allocation, Verus and Staff provided a variety of asset class portfolios that are commonly used by institutional investors. These include: (1) A 60/40 portfolio which exclusively includes public equities (60%) and traditional fixed income (40%); (2) An 'Endowment Model', also called the Yale Model, which is the well-known portfolio used by the Yale Investment office, and which substitutes the majority of public markets equity and fixed income exposures for alternative assets exposures such as absolute return (20%), private equity (31%) and real estate (19%); (3) An 'Endowment Peer' portfolio, which represents the broader universe of endowments, and which has high levels of alternative assets exposures, but not quite to the level of the 'Endowment Model'; (4) A 'Public Pension Peer' portfolio, which maintains some level of alternative assets (8.5% absolute return, 4% private equity, 13% real estate), but less than an endowment peer, but also maintains a high level of publicly traded equities and fixed income, but less than a 60/40 model; and (5) a Verus developed 'Risk Diversified' portfolio, which includes less exposure to public equities than a typical public peer, and rotates this exposure to the fixed income markets, particularly U.S. Treasuries and private credit, to create more balanced exposures across risk factors other than the equity risk premium. SCERS' current asset allocation is best classified as an 'endowment light' model, with marginally higher exposure to alternative assets (35% combined) than that of a public peer (30%), but less than that of the Endowment Peer (36% - significantly less in private equity) and the Endowment Model (78%), but also a meaningful level of exposure to publicly traded equity and fixed income.

These presented asset mixes are not intended to represent potential and/or recommended asset allocations for SCERS that your Board will be asked to choose from. Such options will be presented at an upcoming Board meeting. The mixes being presented at this Board meeting are being presented to demonstrate a broad range of asset allocations that typically represent the broader institutional investment community.

As you will notice, 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.

You will also recall that to better understand the concepts around different approaches to identifying risk, 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 blended traditional and alternative asset classes, and relabeled 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 took 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 included: (1) Growth; (2) Diversifying; and (3) Real Returns.



The Growth segment inlcudes 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. It 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. The Growth segment also includes the return oriented segments of fixed income, including high yield credit and private credit. You will recall that Growth assets tend to comprise the dominant allocation within most institutional investment portfolios.

The Diversifying segment includes those segments of the portfolio which are expected to protect capital during dislocated market environments. 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. For SCERS' portfolio, diversifying assets include diversifying

absolute return strategies that 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). It also includes the diversifying fixed income strategies, which inlcudes 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 and government agency bonds, and exposure to high quality corporate credits, as well as some currency exposure.

Related to the asset allocation mixes presened by Verus, it should be noted that the level of Diversifying expsosure is a bit deceiving. This is due to the fact that SCERS' Absolute Return expsoure is broken up between growth oriented, which is allocated to the Growth asset class, and diversifying, which is allocated to the Diversifying asset class. For the other institutional asset allocation mixes outside of the 60/40 portfolio, the entire Absolute Return exposure is aggregated to together and placed in the Diversifying asset class for modeling purposes. This overestimates the other portfolios' expsoure to Diversifying assets and underestimates their exposure to Growth assets. Creating an apples to apples comparison would lead to Diversifying exposures of 13%, 22%, 23% and 22% for the Endowment Model, Endowment Peer, Public Peer and Risk Diversified portfolios, versus SCERS' allocation of 22%. Similarly, creating an apples to apples comparison would lead to Growth exposures of 60%, 73%, 60% and 53% for the Endowment Model, Endowment Peer, Public Peer and Risk Diversified portfolios, versus SCERS' allocation of 63%.

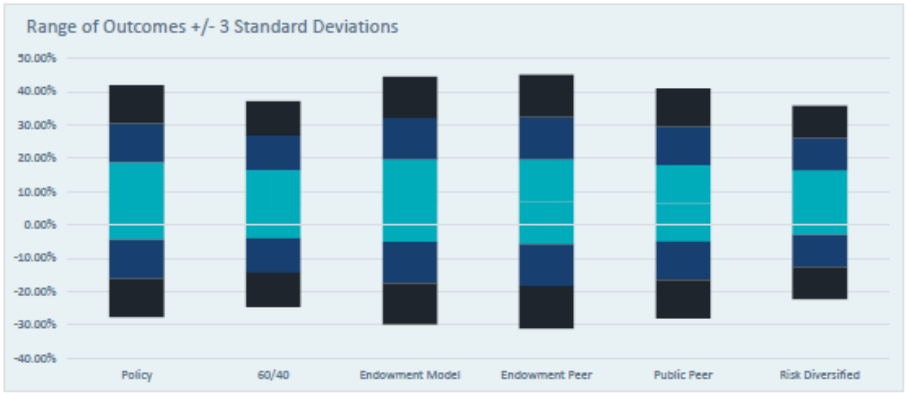
The Real Return segment provides a combination of objectives for SCERS' overall portfolio, including: (1) Inflation hedge; (2) Moderate generator of cash flows; and (3) Diversifier to other segments of SCERS' portfolio. The segment includes a combination of real estate exposure, private real assets exposure (energy; infrastructure; natural resources), and commodities.

As referenced previously, SCERS' portfolio, similar to most institutional portfolios, 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. Breaking the portfolio up between functional asset classes helps to demonstrate this point, and to identify those portions of the portfolio that provide diversification across risk factors and economic environments. An objective of the ALM study is to formulate an asset allocation that helps to achieve the outcomes and objectives identified in the recent ERT survey. This includes a proper level of diversification, and constructing a portfolio that is able to achieve SCERS' actuarial return assumption, but which also has enough diversifying assets that can to some level, protect capital during down market environments.

STOCHASTIC PROJECTIONS:

Within the stochastic projections section of the presentation, Verus provides a variety of metrics across the various institutional investment portfolio mixes. These 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. 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 provides forecasted 10-year returns and standard deviation for each asset allocation mix. The asset allocation mixes provide a range of expected returns that range from a low of 6.3% for the 60/40 portfolio to 7.3% for the Endowment Model. SCERS' expected return is at the higher end of the range at 7.2%. It also shows a variety of expected standard deviations that range from a low of 9.7% for the Risk Diversified portfolio to a high of 12.7% for the Endowment Peer portfolio. SCERS' expected standard deviation is in the middle of the range at 11.6%. Comparing the expected return per unit of risk produces a Sharpe Ratio. The higher the Sharpe Ratio the better, and the Risk Diversified portfolio has the highest Sharpe Ratio, with the Endowment Peer and Public Peer portfolios producing the lowest. SCERS has the second highest Sharpe Ratio at 0.49.

	Policy	60/40	Endowment Model	Endowment Peer	Public Peer	Risk Diversified
Mean Variance Analysis						
Forecast 10 Year Return	7.2%	6.3%	7.3%	7.0%	6.5%	6.8%
Standard Deviation	11.6%	10.3%	12.4%	12.7%	11.5%	9.7%
Return/Std. Deviation	0.62	0.61	0.59	0.55	0.56	0.70
Sharpe Ratio	0.49	0.46	0.47	0.43	0.43	0.54



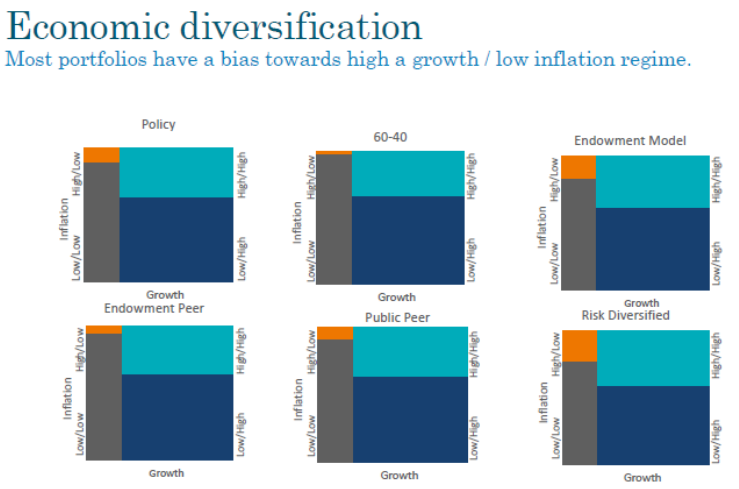
*Cliffwater assumptions were used for Real Assets and Hedge Funds
Risk/Return Analysis done in ProVal

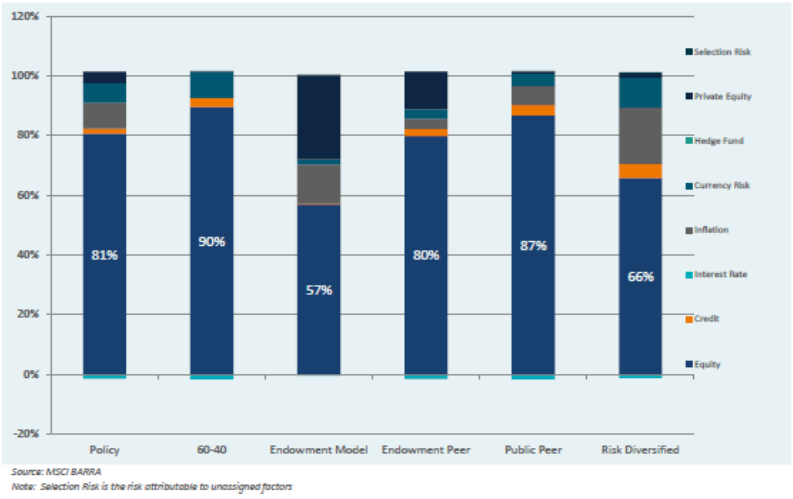
However, it is important to keep in mind that the numbers presented are mean (average) numbers. They are one data point in a broader range of potential outcomes. A more effective way to analyze these numbers is by looking at the range of outcomes that each portfolio is potentially subjected to. Within the chart above, 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

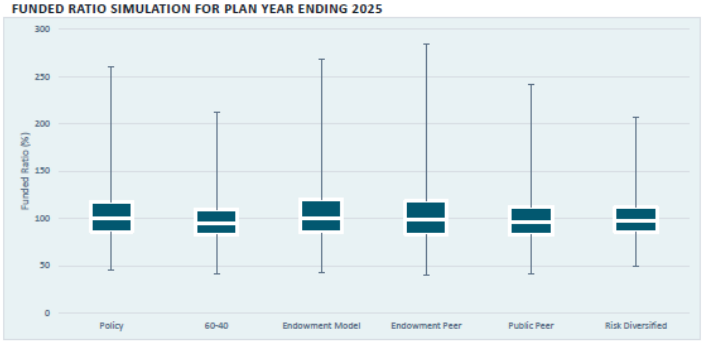
deviations. A shortcoming of standard deviation is that it assumes a normal return distribution, and underestimates risk at the left tail of a distribution such as when market dislocation events occur. A left tail event is similar to the drawdowns that were experienced in 2008 during the GFC. As mentioned previously, SCERS' portfolio was down 28% in 2008, which is in the range of where most of the displayed asset mix returns would fall in a three standard deviation downside event. 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.

SCERS' recently conducted ERT survey identified that capital at risk is the most important risk for SCERS' portfolio. As mentioned previously, SCERS' 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 plans. Equity like assets typically include public and private equities, and as the chart below shows, most institutional portfolios have equity-like exposure that ranges in the 70% to 90% range. 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. SCERS' portfolio is more vulnerable than the Risk Diversified portfolio, but less so than the Endowment portfolios, and in the same range as the Public Peer portfolio. The Endowment portfolios also have a lot more illiquidity risk than most public pension plans can afford to tolerate, given the heavy exposure to private market assets.



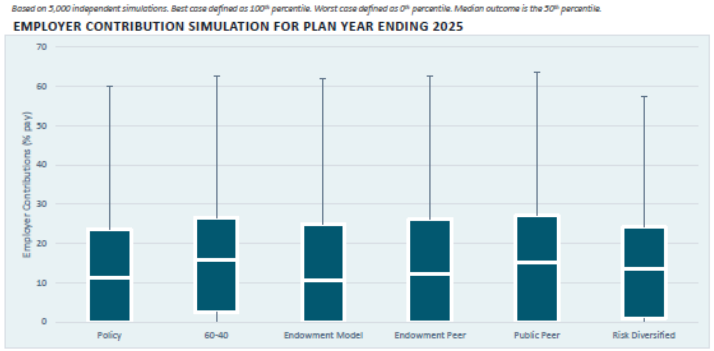


Verus also ran Monte Carlo simulations to determine the impact and range of outcomes that each of the asset allocation mixes would have on SCERS' funded ratio and the level of employer contributions. As the charts below show, there is a wide range of outcomes for each when we move away from the average expected return and risk measures. The more growth oriented portfolios will have greater upside in the funded ratio, but will also be subject to greater deterioration in an extended (10 year) dislocated market environment. The expected employer contribution as a percentage of pay also shows a similar dynamic, where the more growth oriented portfolios would subject the employer to higher contribution rates in an environment where the actuarial expected rate of return is not met.



	Policy	60-40	Endowment	Endowment Peer	Public Peer	Risk Diversified
Best Case	260	212	268	285	241	241
Median	100	95	101	99	96	97
Worst Case	41	41	42	43	41	49

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



	Policy	60-40	Endowment	Endowment Peer	Public Peer	Risk Diversified
Best Case	-	-	-	-	-	-
Median	11	16	11	14	14	14
Worst Case	60	63	62	63	64	57

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

CONCLUSION:

In analyzing the range of outputs in the presentation, none of the asset allocation mixes are expected to earn a rate of return that meets SCERS' expected return assumption of 7.5%. In order to construct a portfolio that accomplishes this would require an increase in the risk profile of the plan. Even though several of the asset allocation mixes 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 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 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.

When looking at the asset class mixes in this presentation, a natural conclusion would be that the Verus Risk Diversified portfolio makes some sense. The risk and return characteristics of this portfolio certainly do point toward a more risk balanced portfolio with a reasonable return profile and less susceptibility to negative returns during down markets, as well as lower volatility. However, it should be understood that the Risk Diversified portfolio requires an asset allocation that more heavily weights bond-like assets, particularly Treasuries, and relies less on growth-like assets. The consequence of this is a lower expected return profile, and significantly lower upside potential. In addition, this portfolio with a 15% allocation to Treasuries leaves the portfolio vulnerable to a rising interest rate environment, given the extremely low levels of global developed market interest rates. This is demonstrated by the high portfolio effective duration of the Risk Diversified portfolio (as well as the 60/40 portfolio), compared to the other portfolios. As you will recall, duration measures the sensitivity of a portfolio to a change in interest rates.

Another conclusion from the presentation is that SCERS' current target portfolio is a fairly attractive portfolio. It has the second highest expected return and Sharpe Ratio, and is less susceptible to extreme drawdowns compared to the Endowment portfolios. While it has a similar downside profile as the Public Peer portfolio, it has a greater expected return (7.2% versus 6.5%), which translates to a higher expected Sharpe Ratio. However, because it is a more growth oriented portfolio given its level of Growth assets, it is susceptible to significant drawdowns in a dislocated market environment.

Staff and Verus anticipate that the recommended portfolio at the conclusion of the ALM study will have a growth oriented bias similar to SCERS' current portfolio, but will seek to increase exposure to diversifying assets across the portfolio. This could include increasing SCERS' exposure to diversifying assets within a Diversifying asset class, as well as adjusting some of SCERS' exposure to equity-like assets and the equity risk premium. The former can be accomplished by reducing SCERS' exposure to growth oriented absolute return strategies in favor of diversifying absolute return strategies. The latter can be accomplished by exchanging equity growth assets for alternative growth assets that give SCERS exposure to other risk factors outside of equity risk. An example would be adding

a dedicated allocation to private credit (still considered a growth investment, but with greater consistency of return and lower downside) by reducing SCERS' exposure to public equities and or private equity.

At an upcoming Board meeting, the next phase of the ALM study will be to present asset class mixes that are more in-line with the asset allocation portfolio that will ultimately be recommended to your Board. Staff and Verus anticipate that these mixes and the recommended portfolio will lie somewhere between SCERS' current portfolio and the Risk Diversified portfolio. Another important note is that Staff and Verus anticipate that the upcoming presentation of asset mixes and the recommended portfolio will be presented in a functional and outcome based asset class format as shown in this presentation and previous education, versus conventional asset classes, in order to better account for portfolio risk and the true level of diversification within the various asset mixes.

It is expected that the changes made out of the ALM study will not lead to significant changes relative to SCERS' current exposures, but we do expect to make adjustments within the portfolio to increase diversification across risk factors and economic environments. However, the more significant changes are expected to occur through the re-distribution and re-balancing of existing exposures in the transition from conventional asset class labels to functional/outcome based asset classes.

Another important consideration that will need to come out of the ALM study is the incorporation of a formal cash flow and liquidity analysis that will cover two areas: (1) Analyzing the cash flow needs of SCERS' plan, and maintaining a sufficient level of cash flow generating investments that will be sufficient to meet increasing benefit payments; and (2) Analyzing any 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.

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

NOVEMBER 2016

Asset / Liability Study

Sacramento County Employees' Retirement System

Table of contents

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I. Introduction

Session objectives

— Develop intuitive sense of how different investment strategies impact the Plan's key metrics, including:
  - Funded ratio
  - $ Contributions
  - Contributions as % of pay
— Understand impact of range of possible market outcomes
— Provide information to assist Board in meeting its Enterprise Risk Tolerance goals
  - **Ensure Sustainability of Plan**
  - **Achieve True Portfolio Diversification**
  - **Minimize Loss of Capital**
— Provide meaningful insight into the investment strategy selection decision

Asset / liability analysis is best used to evaluate the impact of broad strategic shifts, rather than small asset allocation adjustments

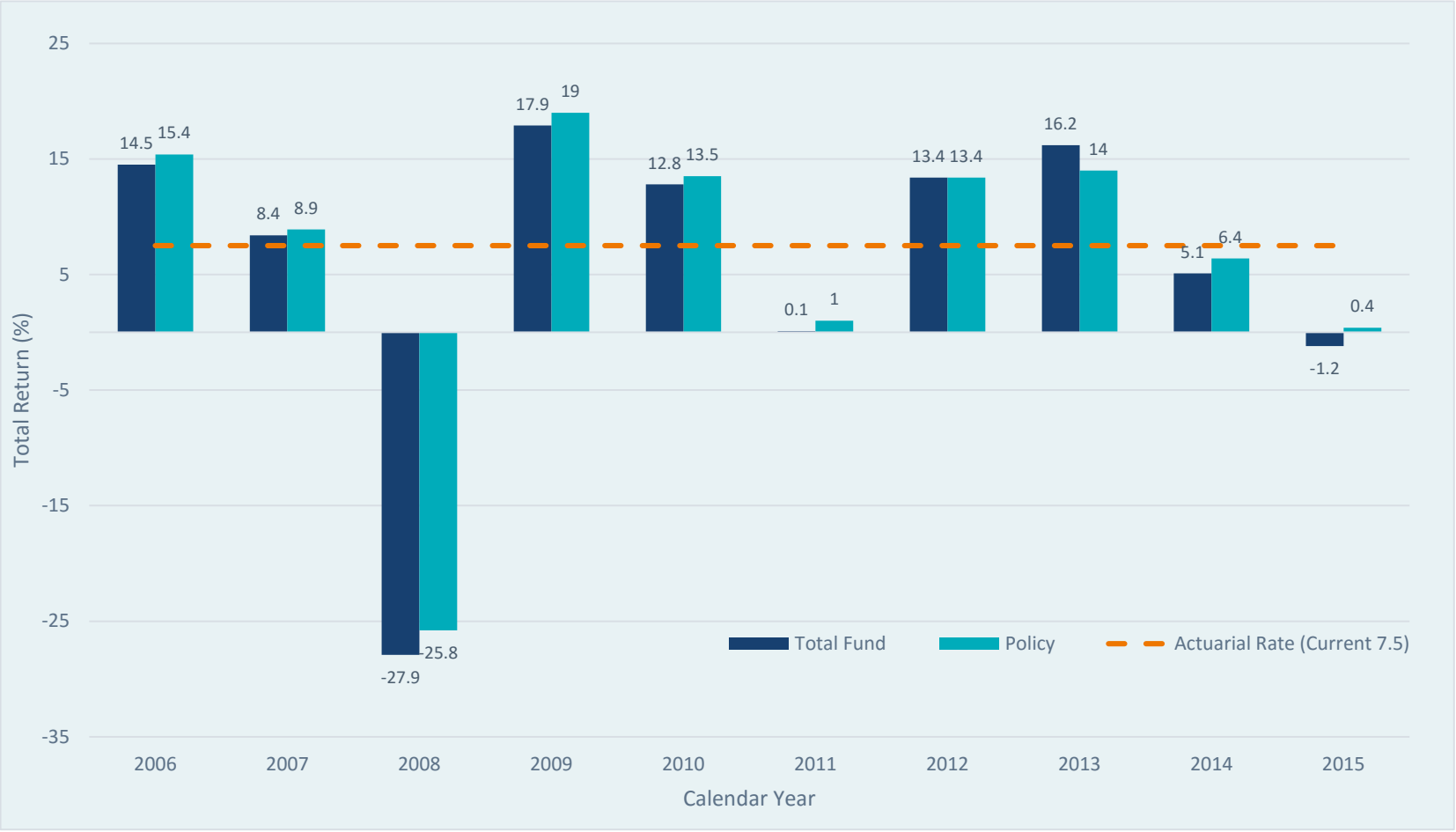
Summary Findings

- Assuming the Plan meets its current actuarial rate of return of 7.5%, the Plan will be fully funded by 2035
- Cash flows show a declining trend over the last 8 years
- Based on capital market assumptions:
  - Expected Returns range from 6.3%-7.3%
  - Equity Risk exposure ranges from 90% to 57%
  - All investment strategies will do best in a high growth/ low inflation economic environment

II. Historical experience

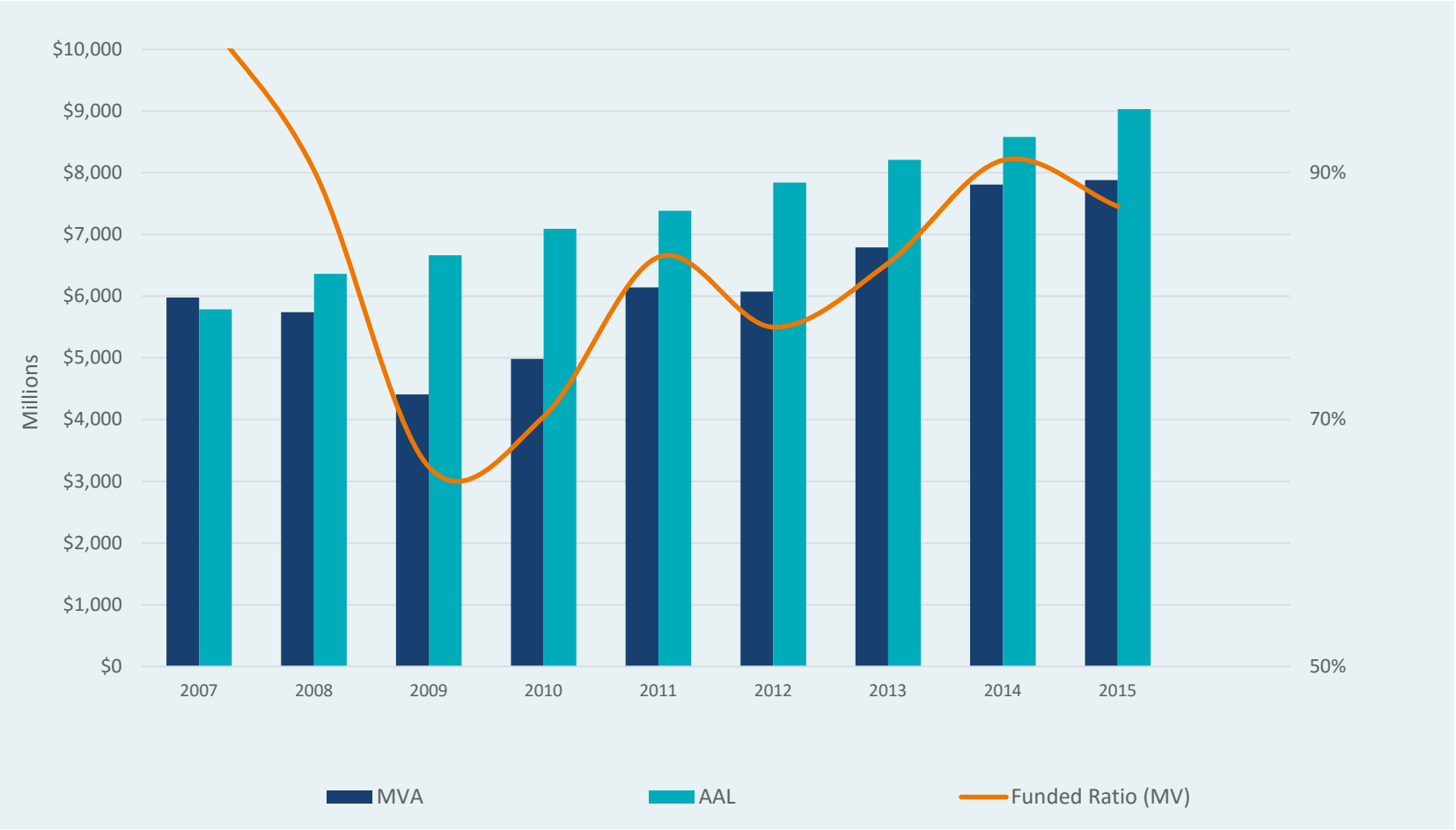
Total fund performance

	Trailing Returns for period ending 6/30/16				Calendar Years				
	1-Year	3-Year	5-Year	10-Year	2015	2014	2013	2012	2011
Total Fund	-0.9%	5.6%	5.9%	4.9%	-1.2%	5.1%	16.2%	13.4%	0.1%
Policy Index	1.5%	6.6%	6.6%	5.7%	0.4%	6.4%	14.0%	13.4%	1.0%



Actuarial valuations & market value funded status

HISTORICAL FUNDED STATUS



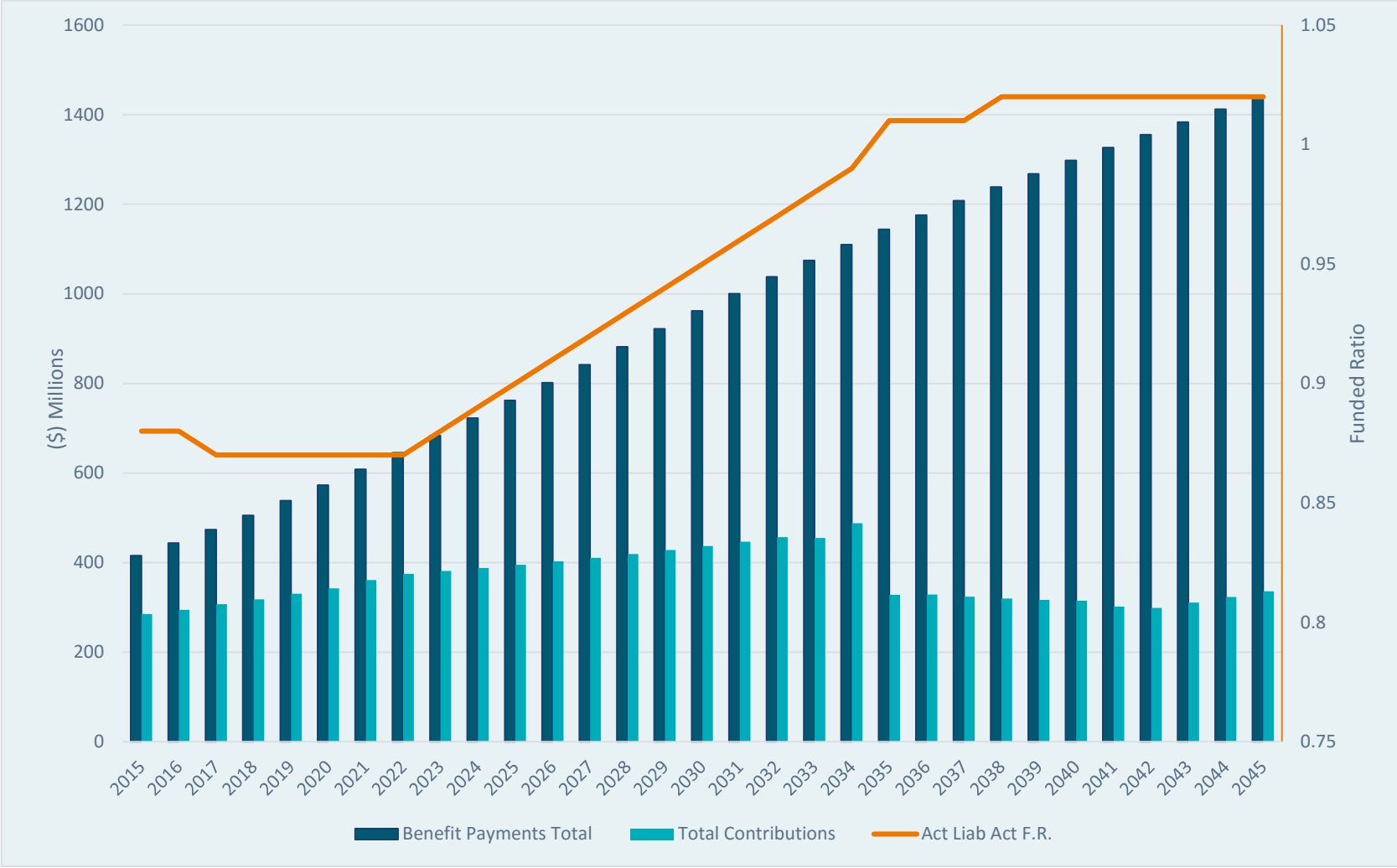
Source: SCERS Performance Reports, Segal Actuarial Valuation Reports

Contributions & benefit payments

Net Operating Cash Flow

III. Deterministic Projections

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.

Actuarial 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

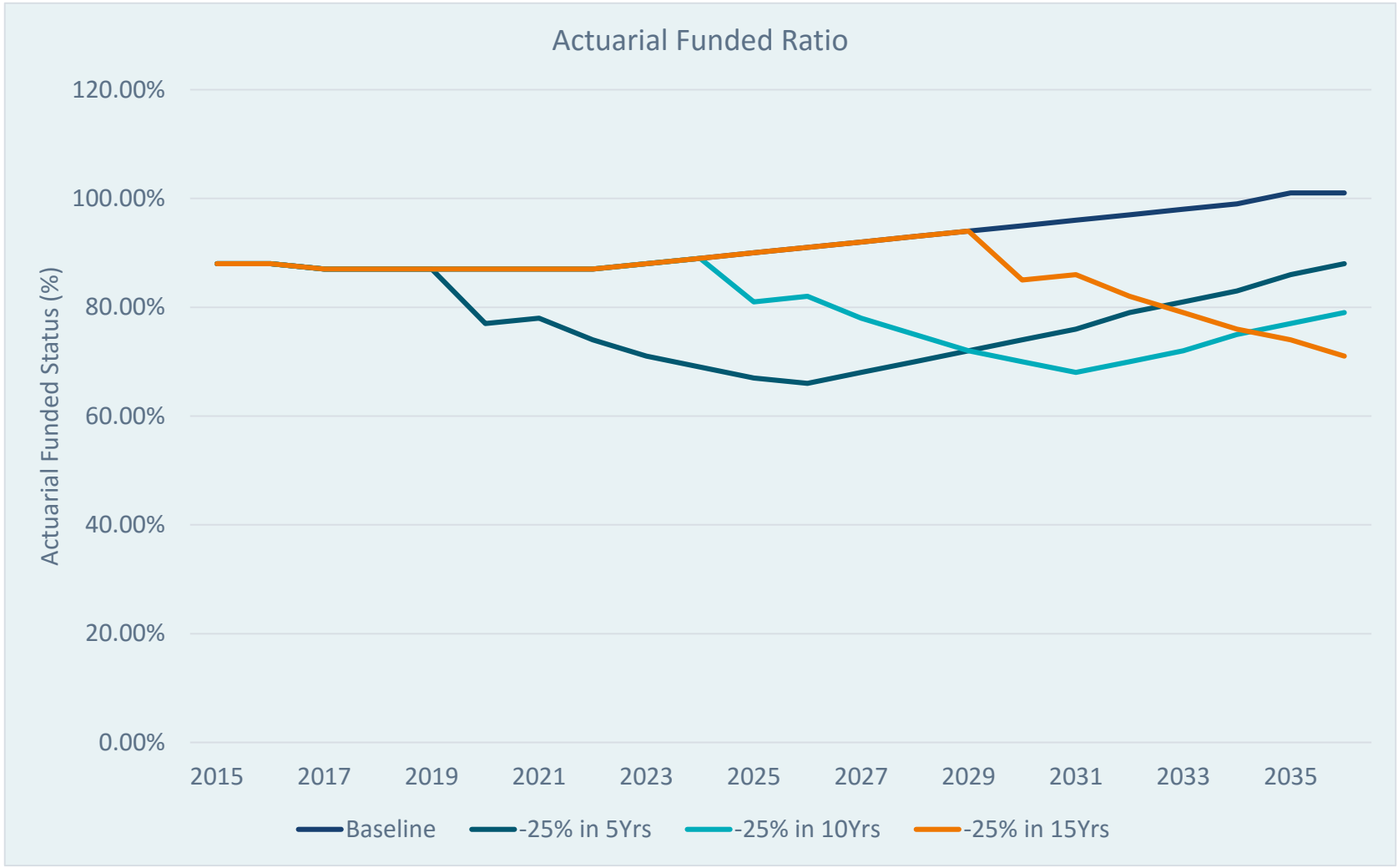
Annual Returns

	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

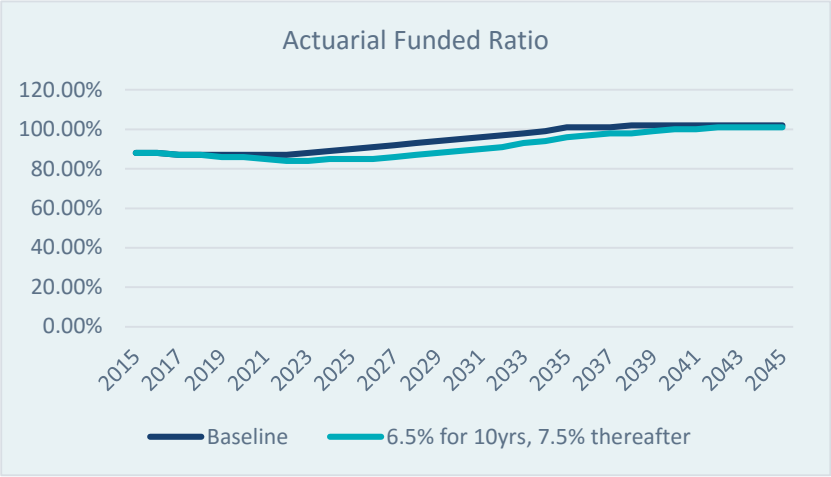
ACTUARIAL FUNDED RATIO

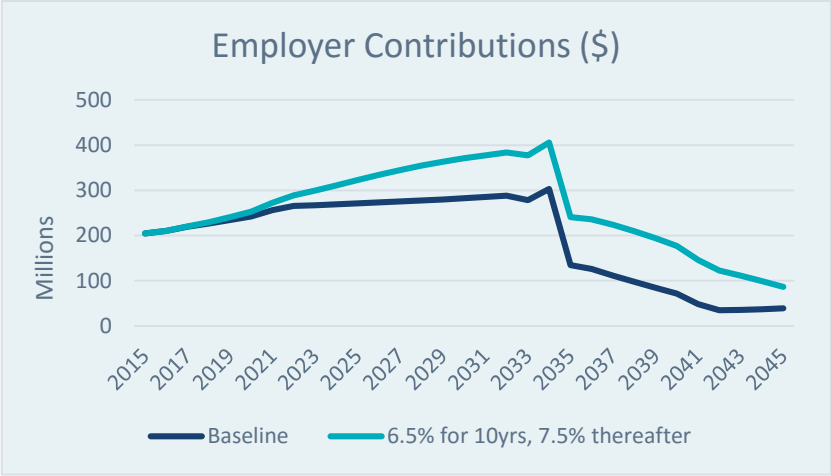


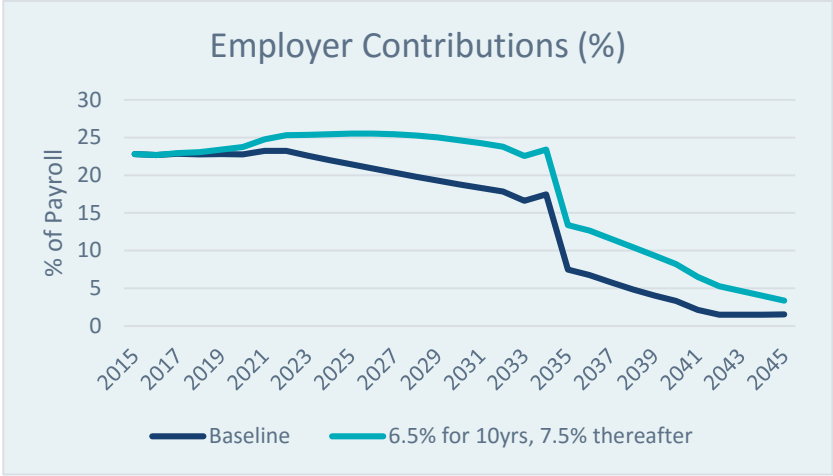
Experiencing "2008 type" drawdown event would set the plan back on its path to recovery

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.

IV. Stochastic Projections

Overview of asset allocation

- A dynamic process designed to enhance the long-term return and manage risk of a multiple asset class portfolio
- Portfolio management at its highest level
- Risk management at its most fundamental level
- Greatly impacts the long-term level and variability of total fund returns
  - 90+% of fund return and variability are determined by ones asset allocation target
- Dependent upon a rational interpretation of capital markets' risk and return characteristics
- Evaluate risks through multiple lenses

Goal: To identify a portfolio that maximizes the plan's expected return and objectives for the appropriate level of risk

Capital market assumption process

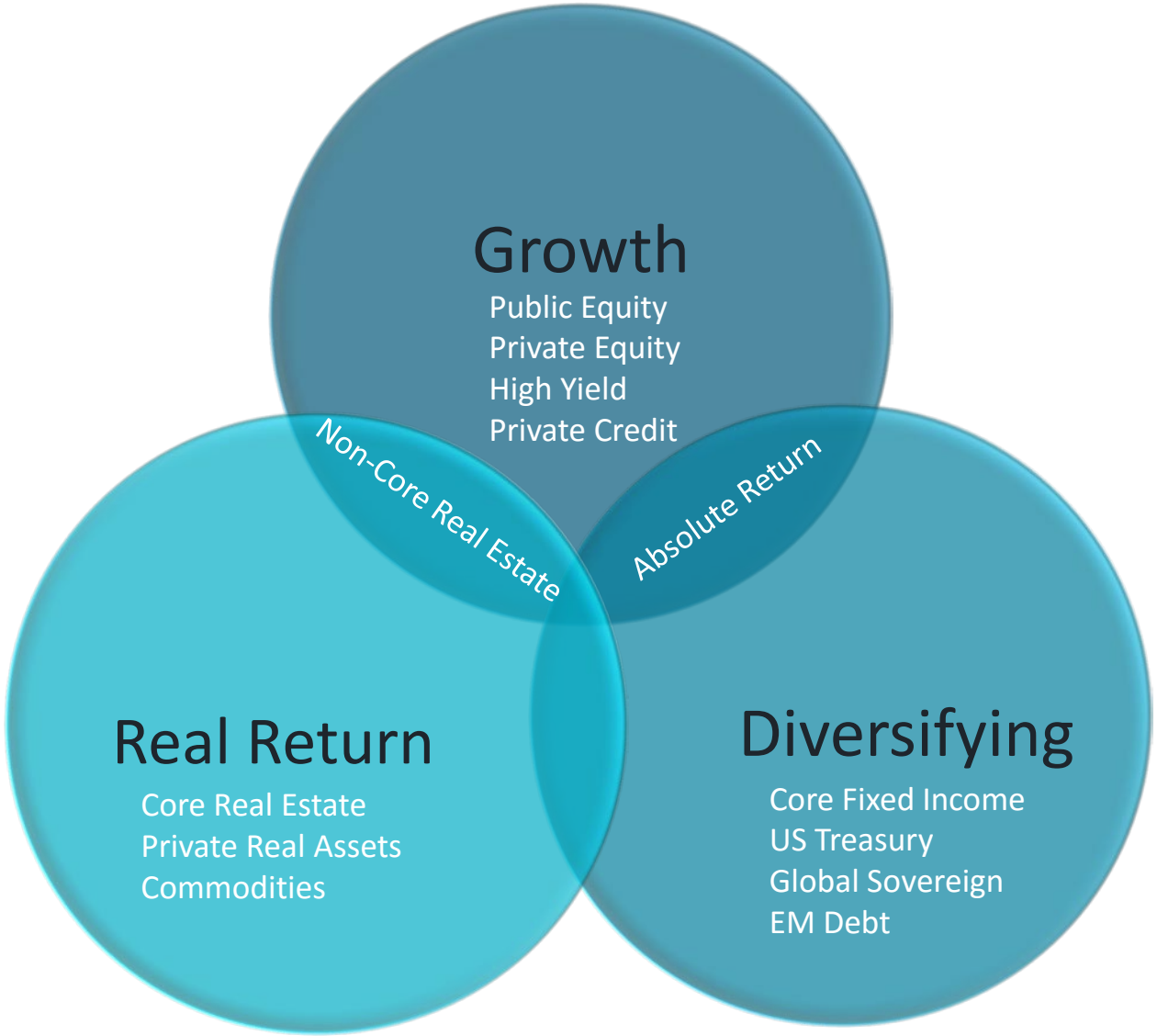
- Verus independently develops and publishes our Capital Market Assumptions each January.
- Assumptions are rooted in extensive research and vetted by the firm's Investment Committee following a comprehensive review process.
- Predicated on a widely accepted "building block" methodology.
- Utilize historical risk and correlation.
- CMAs take a long term outlook and are meant for strategic decision-making.
- While we employ a robust process, they represent "educated guesses" on what the future holds.

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



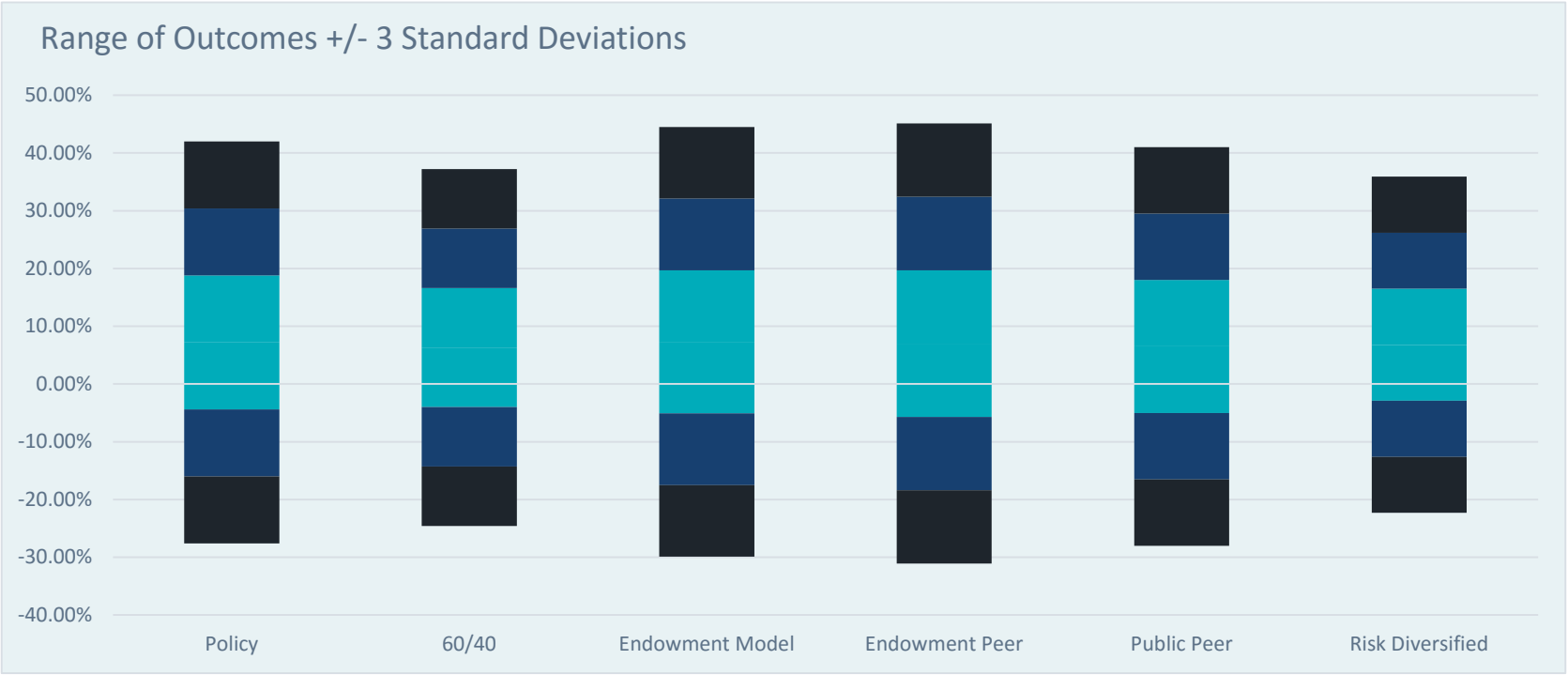
Investment models

Asset Class	Policy	60/40	Endowment Model	Endowment Peer	Public Peer	Verus Risk Diversified
Global Equity (MSCI ACWI IMI)		60.0%				
US Equity	22.5%		6.0%	29.0%	31.0%	17.5%
International Equity	17.5%		11.0%	6.0%	10.0%	13.5%
Emerging Equity	5.0%			7.0%	5.0%	4.0%
Private Equity	10.0%		31.0%	21.0%	4.0%	5.0%
High Yield	1.0%			2.0%	2.5%	5.0%
Bank Loans	1.0%			2.0%	2.5%	
Private Credit						5.0%
CW- Growth Oriented Absolute Return/HF*	6.0%					
Growth	**63.0%**	**60.0%**	**48.0%**	**67.0%**	**55.0%**	**50.0%**
Core Fixed Income	10.0%	40.0%	5.0%	15.0%	16.0%	
Core Plus Fixed Income	5.0%					
US Treasury				1.0%	1.0%	15.0%
Global Sovereign ex US	2.0%					
EM Debt	1.0%			2.0%	2.5%	5.0%
CW-Diversifying Absolute Return/HF*	4.0%					
Absolute Return/HF			20.0%	10.0%	8.5%	5.0%
Diversifying	**22.0%**	**40.0%**	**25.0%**	**28.0%**	**28.0%**	**25.0%**
Real Estate	7.0%		19.0%		13.0%	20.0%
CW-Private Real Assets*	6.0%					
Commodities	2.0%		8.0%	5.0%	4.0%	5.0%
Real Return	**15.0%**	**0.0%**	**27.0%**	**5.0%**	**17.0%**	**25.0%**
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Cliffwater assumptions were used for Real Assets and Hedge Funds

Investment model forecasts

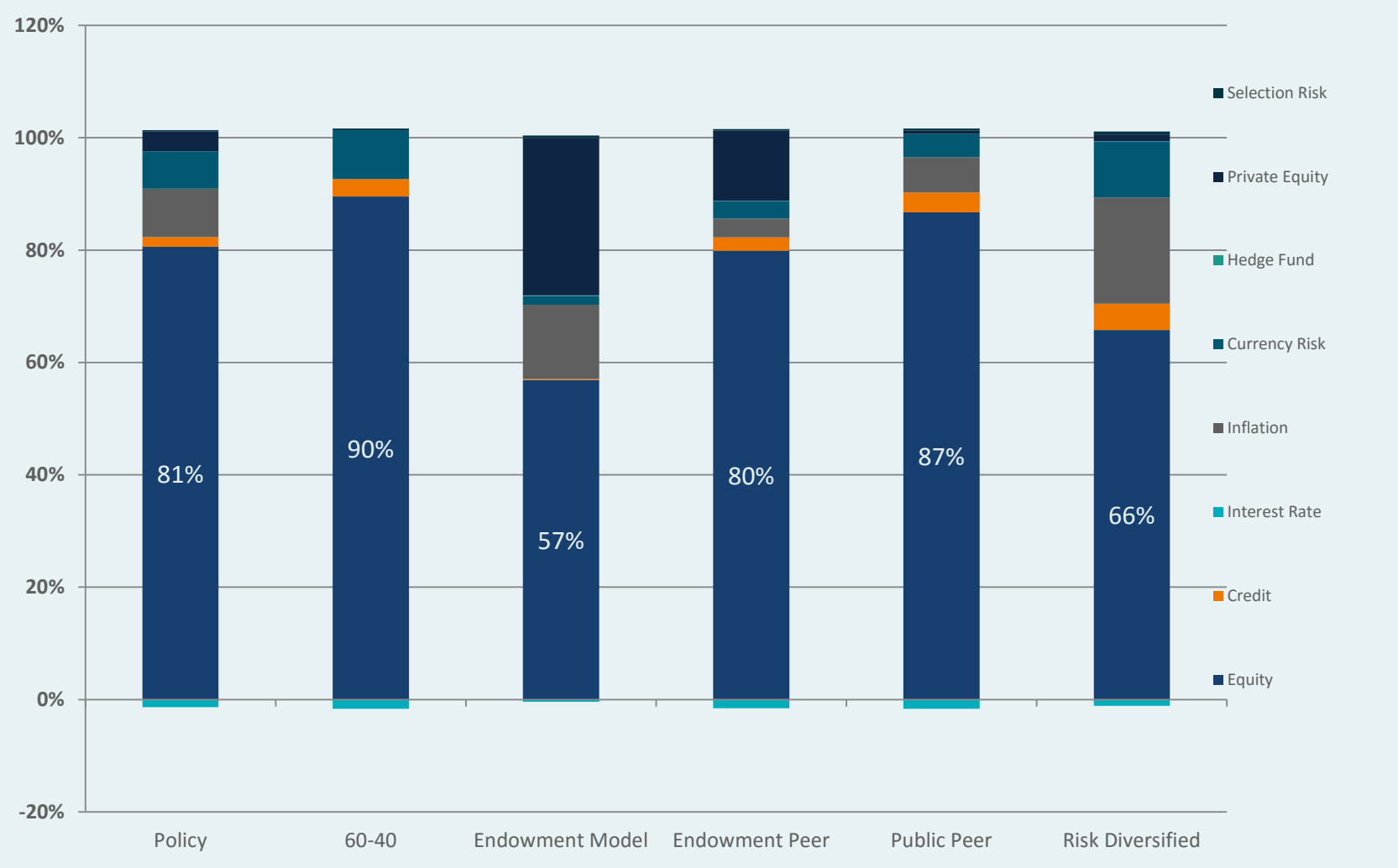
	Policy	60/40	Endowment Model	Endowment Peer	Public Peer	Risk Diversified
Mean Variance Analysis						
Forecast 10 Year Return	**7.2%**	**6.3%**	**7.3%**	**7.0%**	**6.5%**	**6.8%**
Standard Deviation	11.6%	10.3%	12.4%	12.7%	11.5%	9.7%
Return/Std. Deviation	0.62	0.61	0.59	0.55	0.56	0.70
Sharpe Ratio	0.49	0.46	0.47	0.43	0.43	0.54



**Cliffwater assumptions were used for Real Assets and Hedge Funds*

Risk/Return Analysis done in ProVal

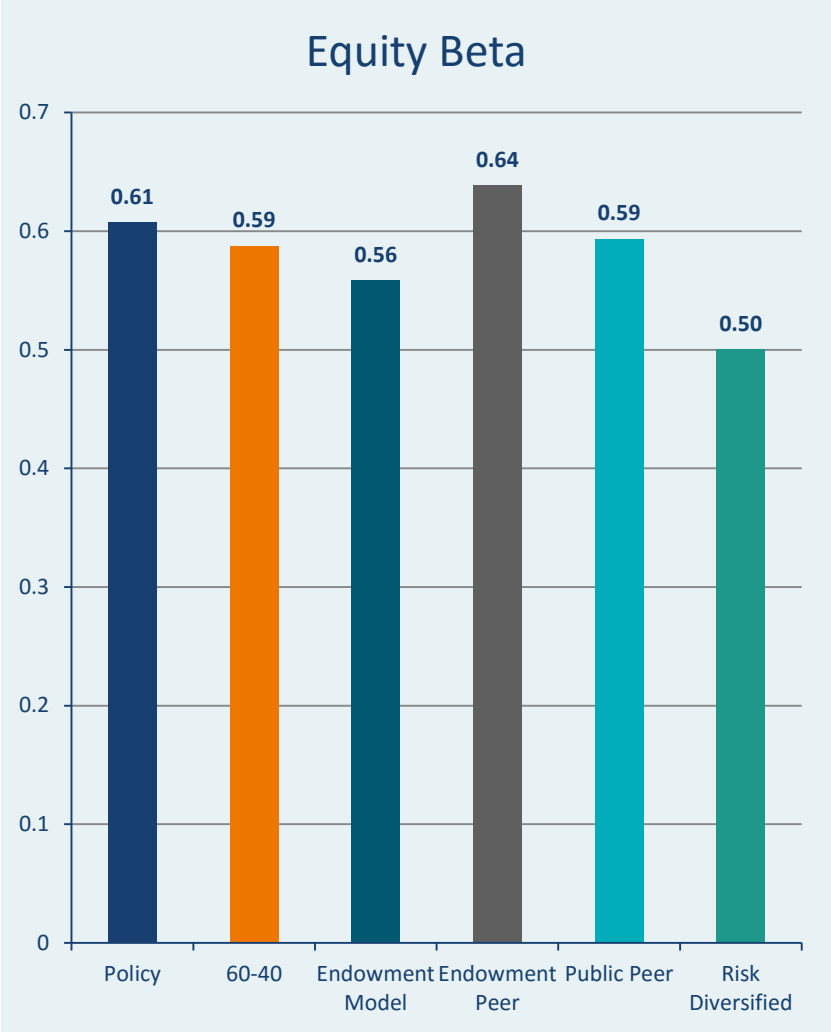
Risk decomposition

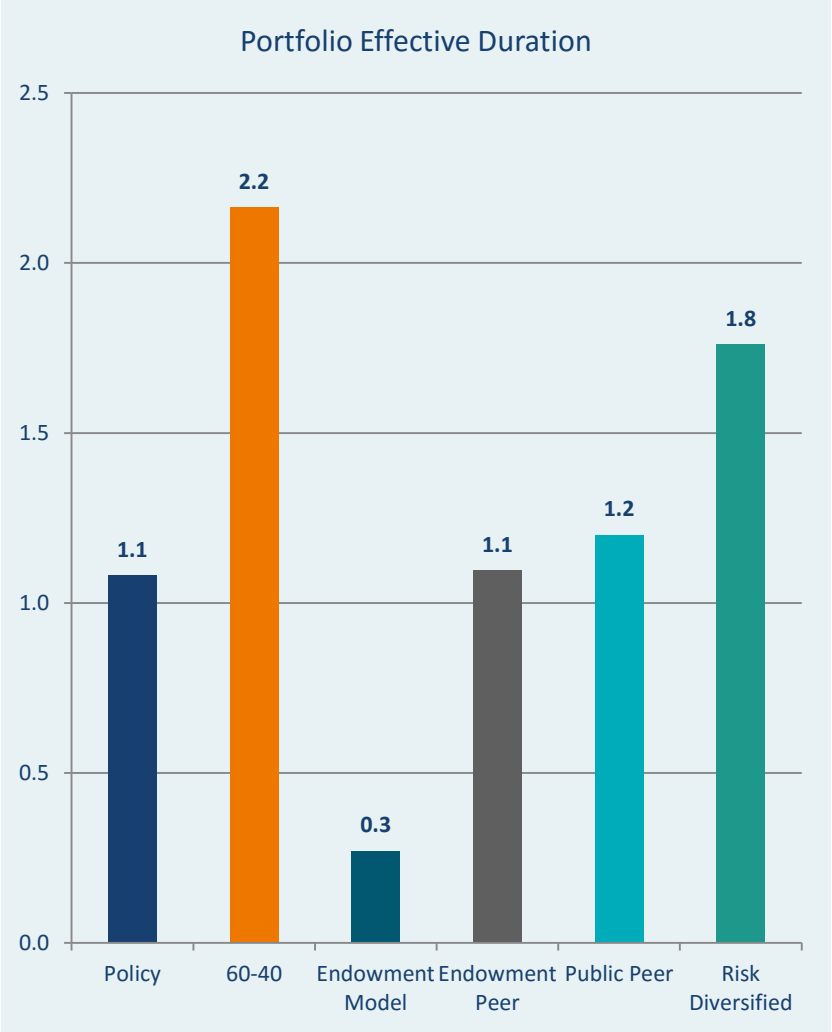


Source: MSCI BARRA

Note: Selection Risk is the risk attributable to unassigned factors

Sources of risk



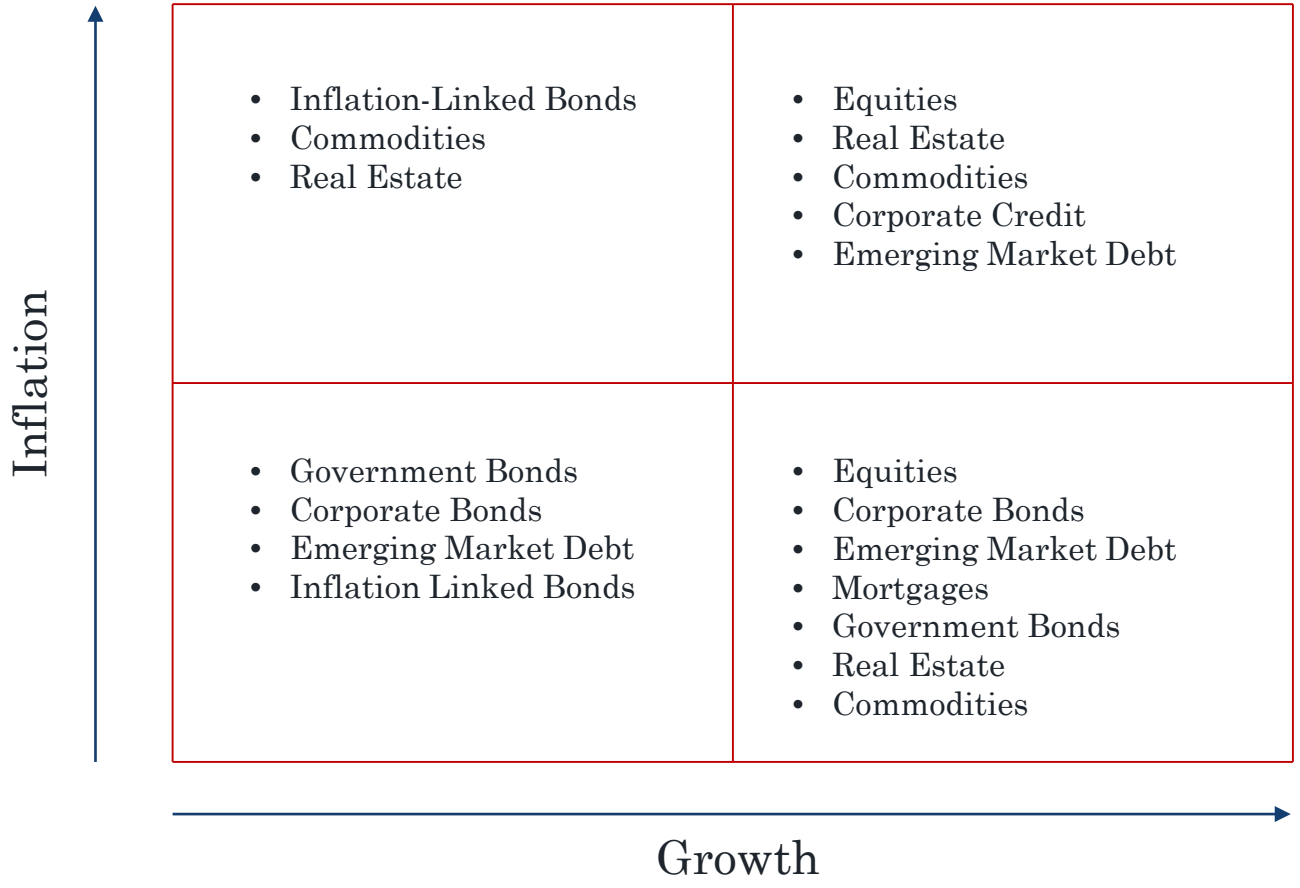


Equity beta measures the sensitivity to the risks of the broad equity market.

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

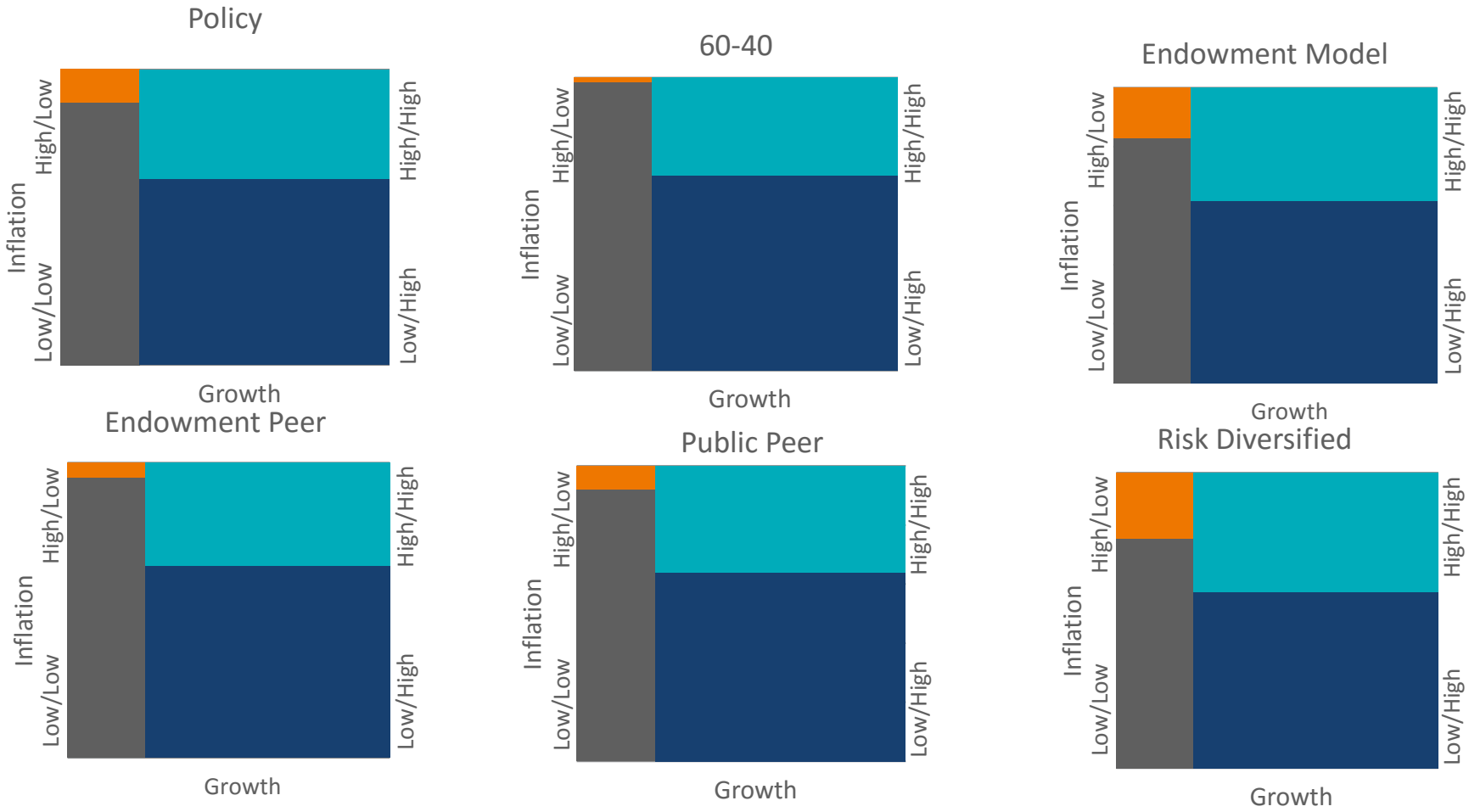
Source: MSCI BARRA

Economic diversification and the role of asset classes

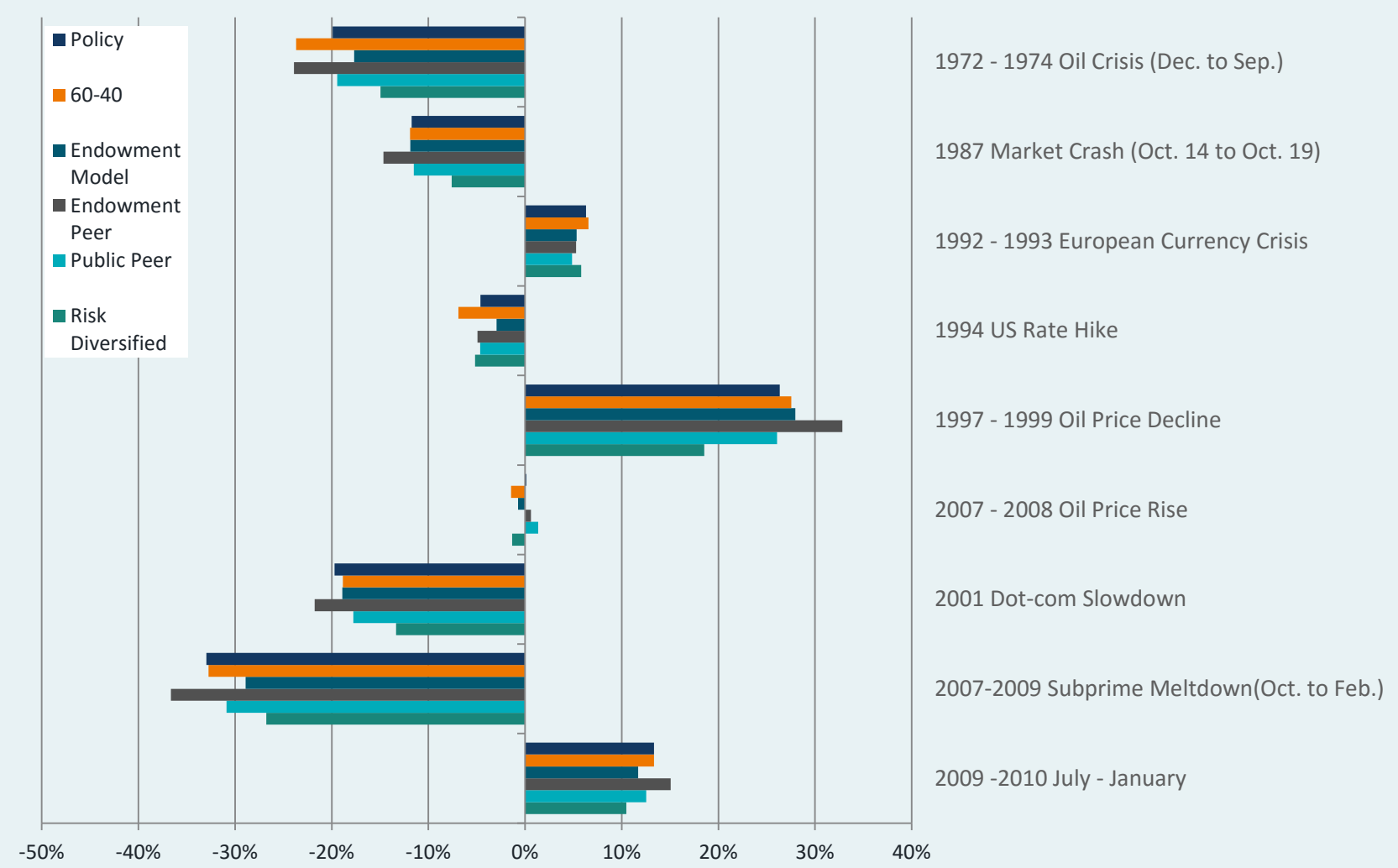


Economic diversification

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

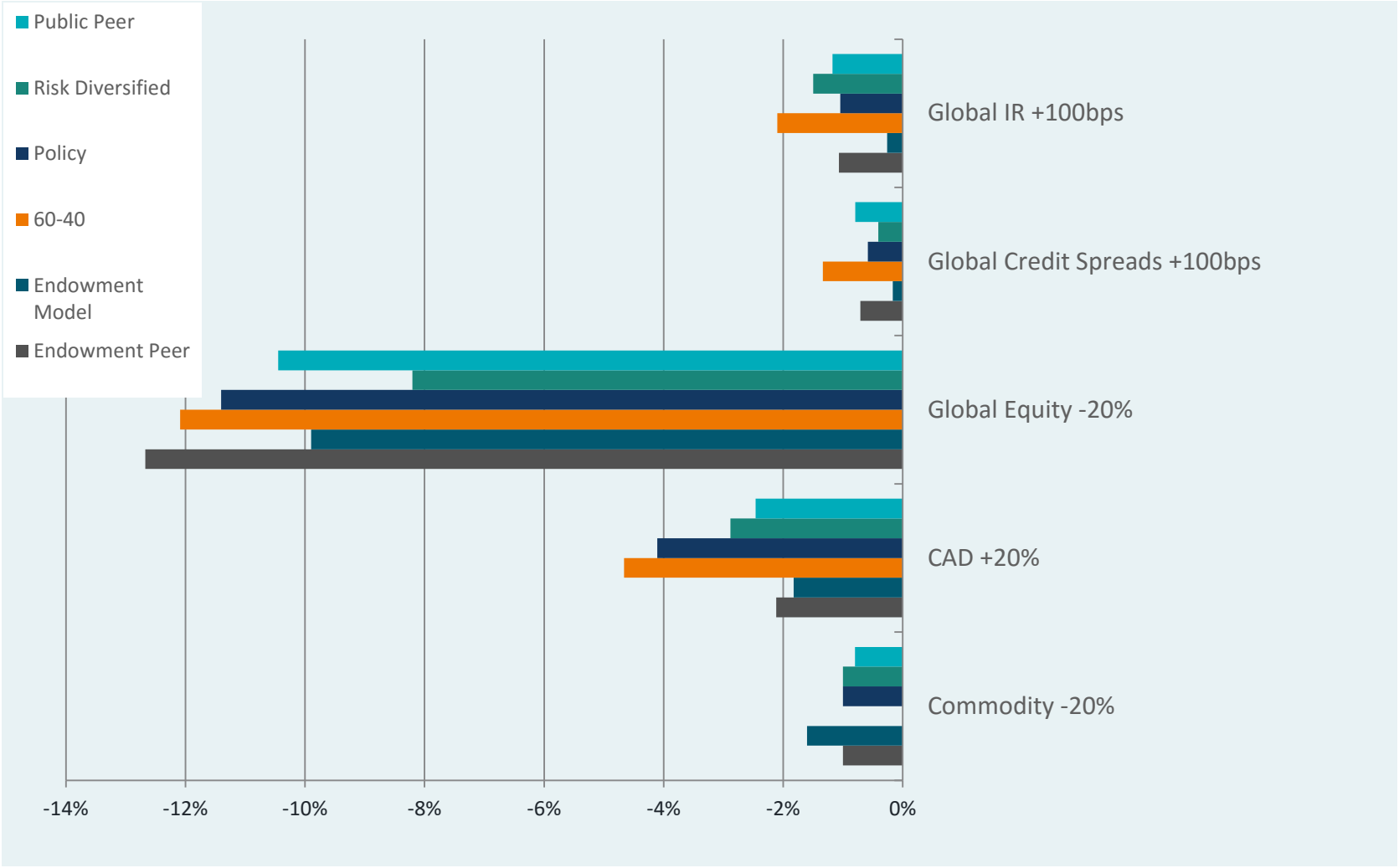


Scenario Analysis



Source: MSCI BARRA

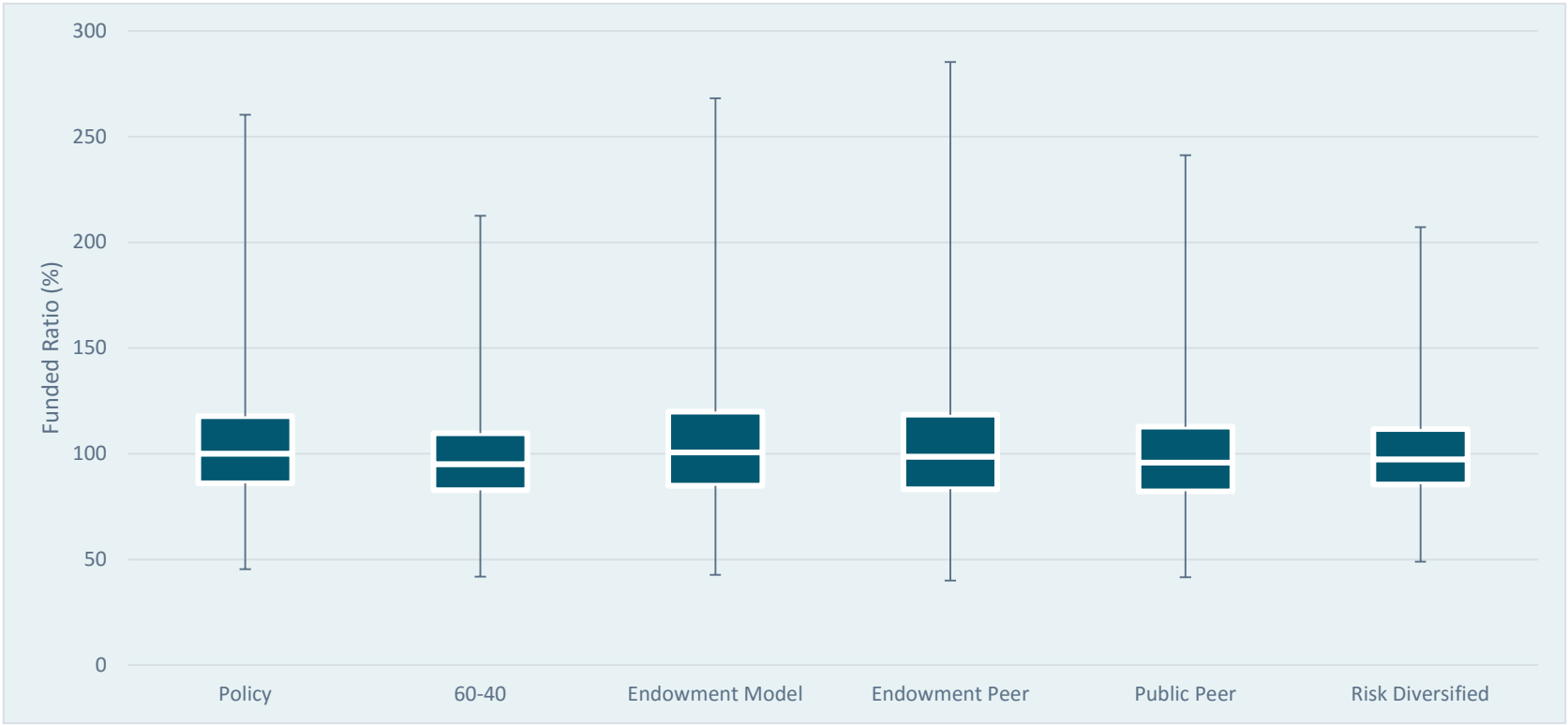
Stress tests



Source: MSCI BARRA

Expected funded ratio

FUNDED RATIO SIMULATION FOR PLAN YEAR ENDING 2025

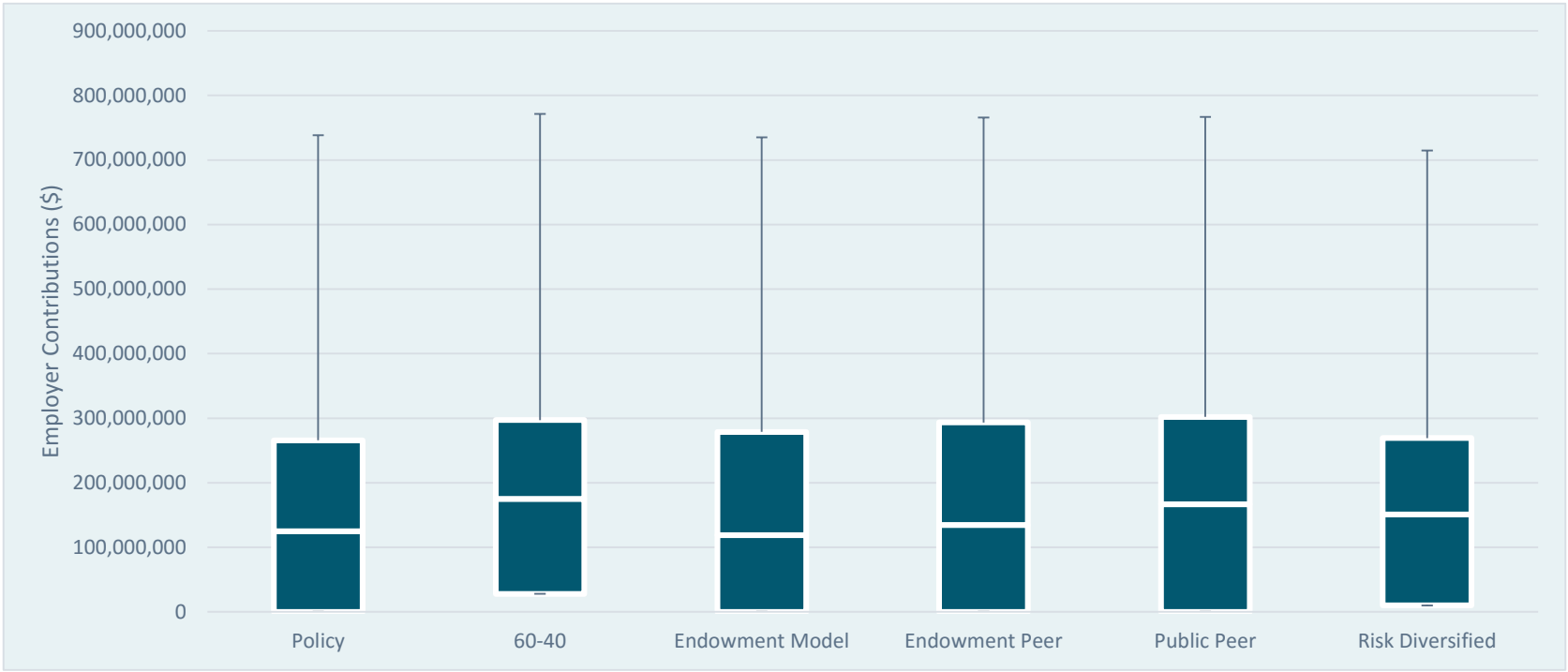


	Policy	60-40	Endowment	Endowment Peer	Public Peer	Risk Diversified
Best Case	260	212	268	285	241	241
Median	100	95	101	99	96	97
Worst Case	41	41	42	43	41	49

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

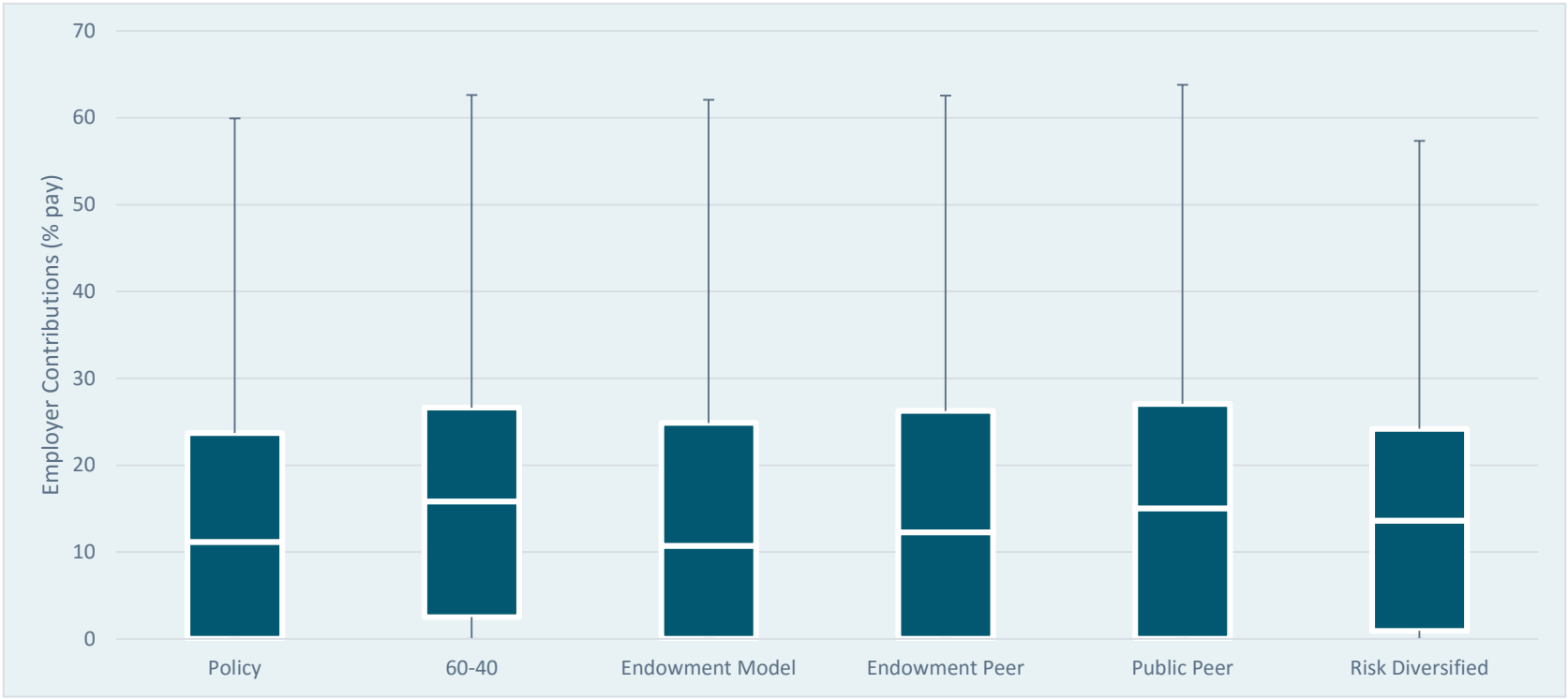


	Policy	60-40	Endowment	Endowment Peer	Public Peer	Risk Diversified
Best Case	-	-	-	-	-	-
Median	125,056,000	175,193,000	119,003,000	134,450,000	166,475,000	118,445,000
Worst Case	738,548,000	771,535,000	735,157,000	765,607,000	766,613,000	714,498,000

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	60-40	Endowment	Endowment Peer	Public Peer	Risk Diversified
Best Case	-	-	-	-	-	-
Median	11	16	11	14	14	14
Worst Case	60	63	62	63	64	57

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

Conclusions

- SCERS Policy and Risk Diversified provide the most attractive range of possible asset allocations
  - Both provide attractive risk/return exposures relative to alternatives with similar liquidity
  - Both provide minimal exposure to credit spread widening; SCERS Policy slightly better than Risk Diversified if interest rates rise
  - Great Financial Crisis scenario would hurt all asset mixes
- Reduction in equity risk correlates to reduction in expected return for similar liquidity; additional illiquidity risk raises expected return
- Expected funded ratio and employer contributions for median and worst case scenarios similar for SCERS Policy and Risk Diversified
- **Recommendation: Refine asset mixes with additional risk alternatives between current SCERS Policy and Risk Diversified risk levels**

V. Appendices

A. Key Actuarial Assumptions

Appendix A. Key Actuarial Assumptions

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

Notices & disclosures

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