Callan

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Mendocino County Employees' Retirement Association

2016 Asset/Liability Study

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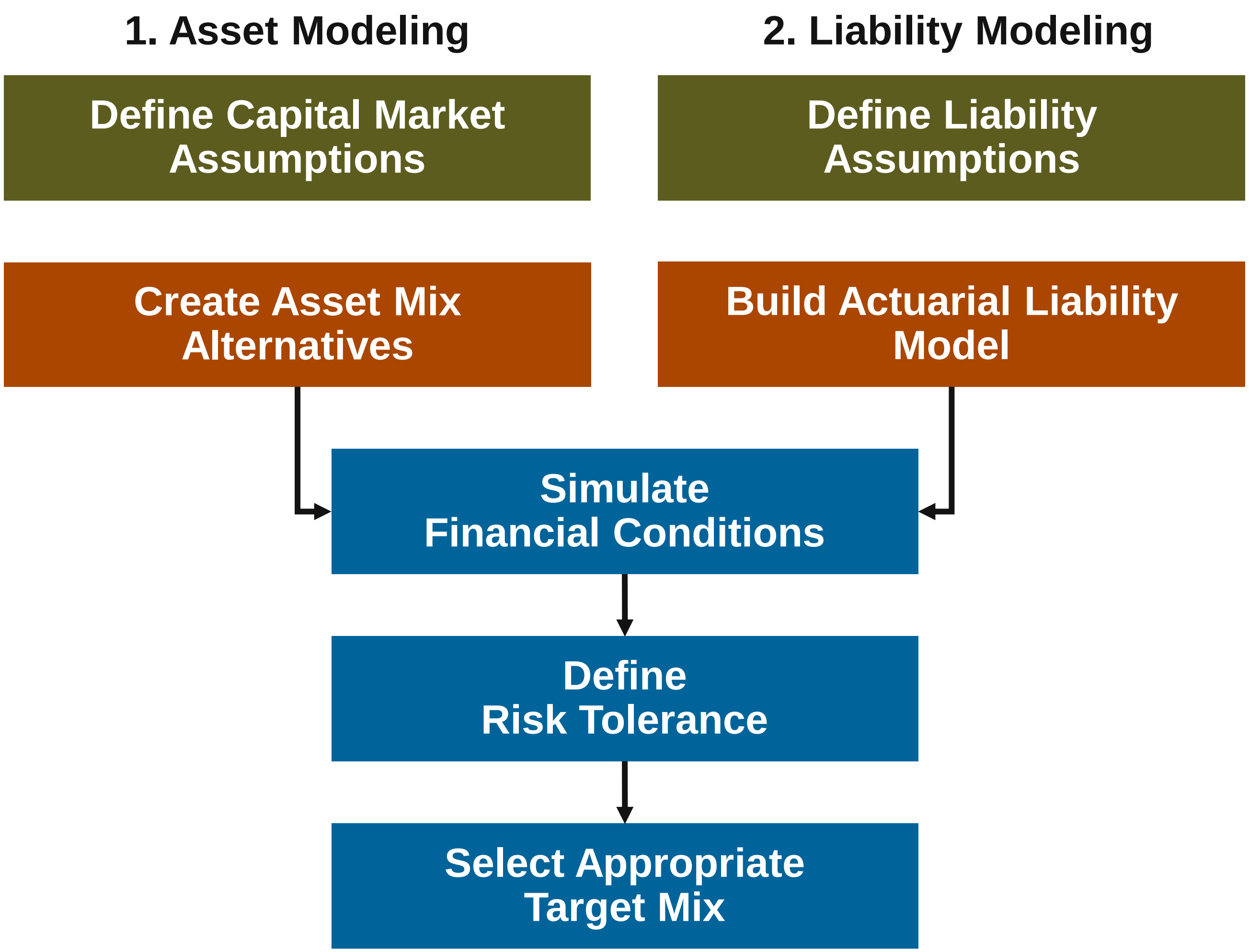
Project Schedule

- Phase 1: Introductory Meeting
  - Overview of asset/liability framework
  - Survey of additional asset classes to considered for study
  - Completed: **April 20, 2016**
- Phase 2: Asset Class Education
  - In depth assessment of private equity and multi-asset class strategies
  - Board decided to incorporate private equity into the asset/liability study
  - Completed: **May 18, 2016**
- Phase 3: Asset/liability results
  - Review modeling
  - Select appropriate asset allocation
  - Scheduled completion: **June 15, 2016**

Goal of the Asset/Liability Study

- The goal of an asset/liability study is to establish a long-term strategic asset allocation target
- An appropriate asset allocation will depend on the Plan Sponsor's investment objectives:
  - Minimize costs over the long run (long-term goal)
    - *How much return generation (from beta and alpha) is necessary to lower contributions and/or improve funded status?*
  - Minimize funded status volatility (short-term goal)
    - *How much risk reduction to reduce contribution/funded status volatility?*
- The strategic asset allocation target should be an optimal balance between sustainable funded status volatility and minimization of contributions over the long run
- The strategic asset allocation will vary by the unique circumstances of the Plan Sponsor
  - No "one-size-fits-all" solution exists

Callan Asset Allocation and Liability Process



1. Asset Modeling

Expected return and risk characteristics

MCERA's current asset allocation policy

Asset Class	Target
US Broad Equity	38%
Global Ex-US Equity	25%
Domestic Fixed	28%
Real Estate	9%
Cash Equivalents	0%
Total	100%

Arithmetic Expected Return	7.3%
Geometric Expected Return*	**6.6%**
Risk (Standard Deviation)	13.1%
Inflation (CPI)	2.25%

*Annualized return over 10 year horizon

Role of Asset Classes in Different Scenarios

Growth (63%)

Equities
- **Global equity (63%)**
- Private equity

Credit Sensitive
- High yield
- Emerging debt
- Bank loans
- Long credit
- Private debt

Risk Mitigation (28%)

Income Producing
- Short duration
- **US fixed income (28%)**
- Non-US fixed income

Rising Rate Protection
- Cash equivalents
- Short duration
- Floating rate securities

Flight to Quality
- Long Treasury

Real Assets (9%)

Short/Intermediate Hedge
- Inflation-linked debt
- Commodities

Growth-Oriented
- REITs
- MLPs
- Nat. res. equities
- **Private real estate (9%)**
- Timber
- Agriculture
- Infrastructure

- Percentages in parentheses and bolded represent MCERA’s current target allocation
- Private equity added as additional candidate asset class

2016 Capital Market Expectations—Return and Risk

Summary of Callan's 10 year Capital Market Projections

Asset Class	Benchmark	Expected Return*	Standard Deviation
US Broad Equity	Russell 3000	7.35%	18.70%
Global Ex-US Equity	MSCI ACWI Ex-US	7.55%	21.30%
Private Equity	TR Post Venture Cap	8.15%	32.80%
US Broad Fixed Income	BC Aggregate	3.00%	3.75%
Private Real Estate	Callan Real Estate	6.00%	16.50%
Cash Equivalents	90-Day T-Bill	2.25%	0.90%

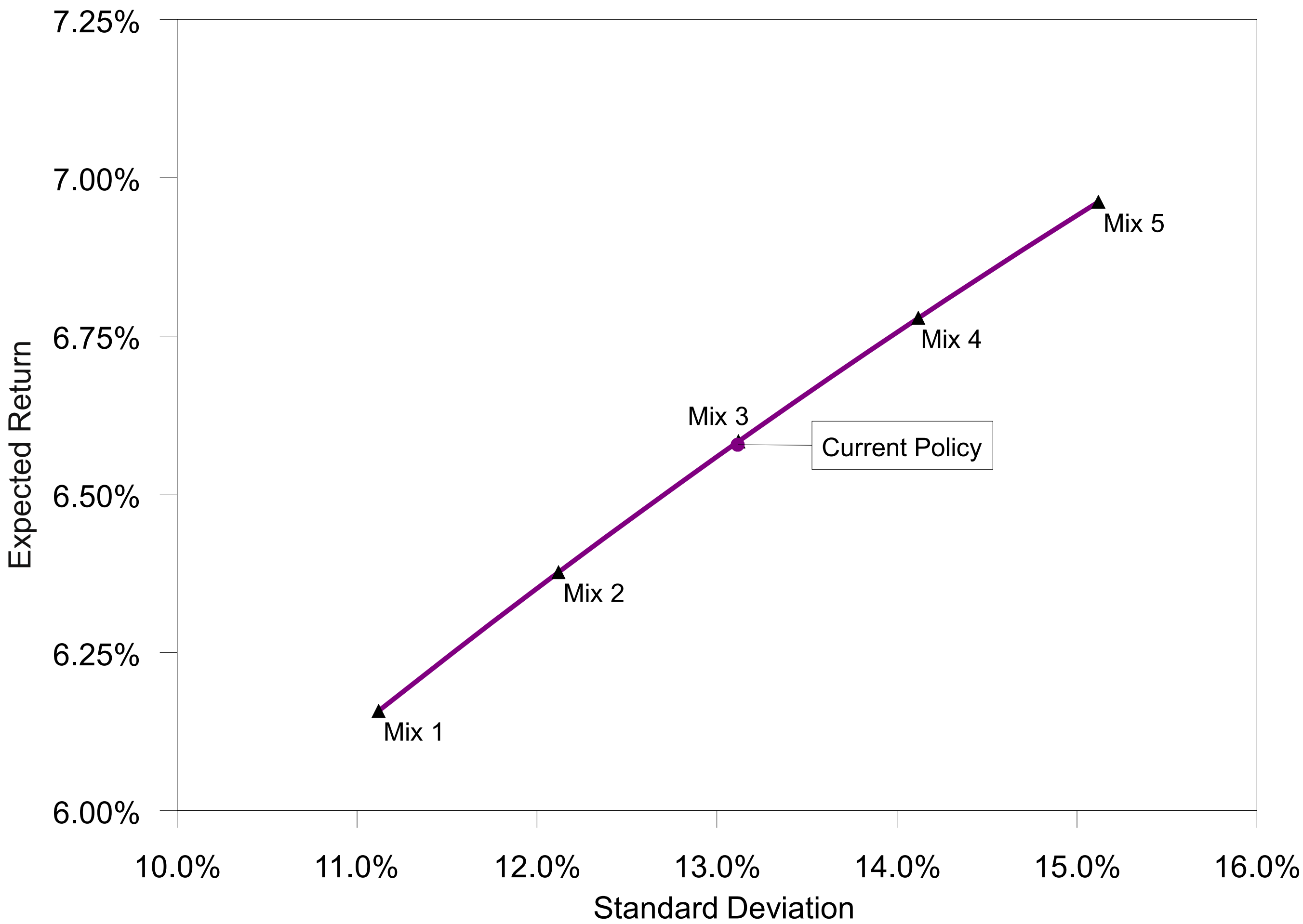
* 10 year annualized (geometric) return

2016 Capital Market Expectations—Correlations

Correlation Matrix	US Equity	Glb Ex-US Equity	Private Equity	US Fixed Income	Private Real Estate	Cash
US Broad Equity	1.00					
Global Ex-US Equity	0.88	1.00				
Private Equity	0.95	0.93	1.00			
US Broad Fixed Income	-0.11	-0.12	-0.19	1.00		
Private Real Estate	0.73	0.67	0.71	-0.02	1.00	
Cash Equivalents	-0.04	-0.04	0.00	0.10	-0.06	1.00

- Correlations are what define the diversification benefit of asset class combinations

Efficient Frontier



- MCERA's current policy is on the efficient frontier with an expected return of 6.6%
- 5 candidate mixes are evaluated ranging from lowest risk (Mix 1) to highest risk (Mix 5)

Efficient Frontier Mixes

	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Broad US Equity	38%	24%	26%	29%	31%	33%
Global Ex-US Equity	25%	19%	21%	22%	24%	25%
Private Equity	0%	6%	6%	7%	7%	8%
Broad US Fixed Income	28%	42%	37%	32%	27%	23%
Private Real Estate	9%	9%	10%	10%	11%	12%
Total	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***

Role in Portfolio

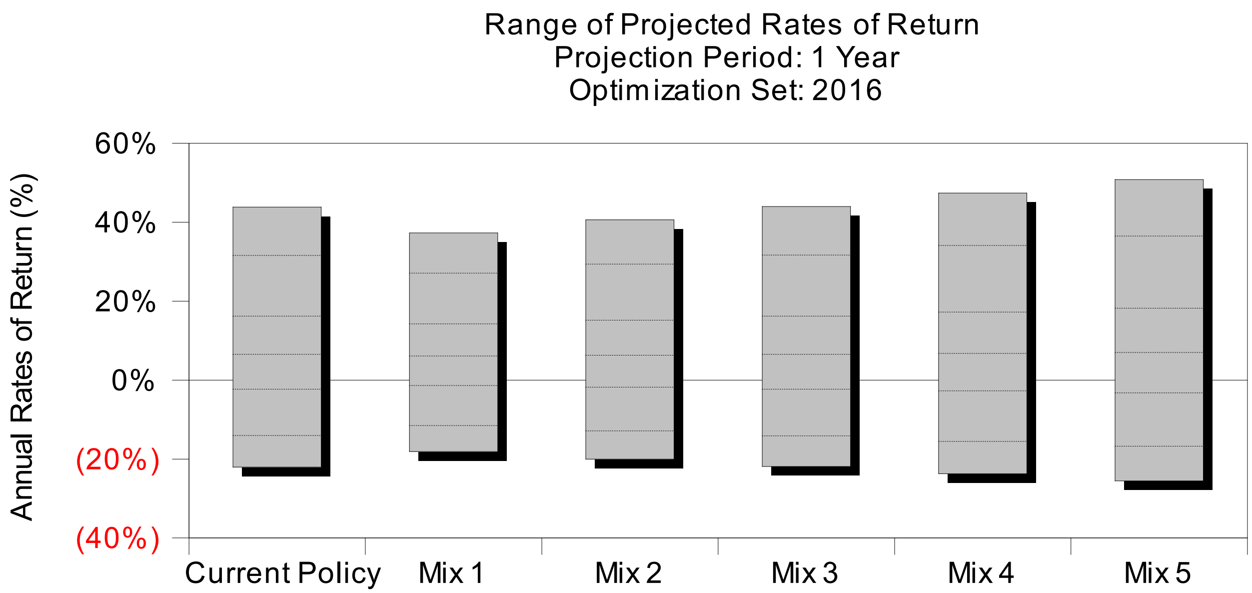
	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Growth	63%	49%	53%	58%	62%	65%
Risk Mitigation	28%	42%	37%	32%	27%	23%
Real Assets	9%	9%	10%	10%	11%	12%

Mix Characteristics

	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Expected Return*	6.6%	6.2%	6.4%	6.6%	6.8%	7.0%
Standard Deviation	13.1%	11.1%	12.1%	13.1%	14.1%	15.1%

* 10 year annualized (geometric) return

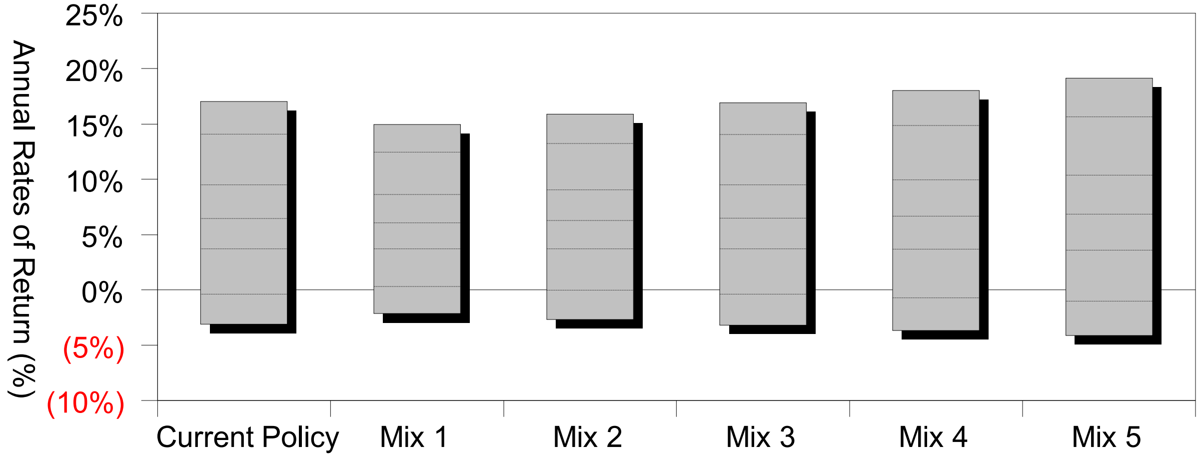
Comparison of 1 Year Projected Asset Returns



	Current Policy	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
1st Percentile	43.8%	37.3%	40.6%	44.0%	47.4%	50.8%
5th Percentile	31.6%	27.1%	29.4%	31.7%	34.1%	36.5%
25th Percentile	16.2%	14.2%	15.2%	16.2%	17.3%	18.2%
Median	6.5%	6.1%	6.3%	6.6%	6.8%	7.0%
75th Percentile	(2.3%)	(1.3%)	(1.8%)	(2.3%)	(2.7%)	(3.2%)
95th Percentile	(14.0%)	(11.5%)	(12.9%)	(14.1%)	(15.5%)	(16.7%)
99th Percentile	(22.0%)	(18.1%)	(20.0%)	(21.9%)	(23.7%)	(25.6%)

- 99% percentile: 1% probability that current policy sustains a one-year loss of 22% or more

Comparison of 10 Year Projected Asset Returns



	Current Policy	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
1st Percentile	17.0%	15.0%	15.9%	16.9%	18.0%	19.1%
5th Percentile	14.1%	12.5%	13.2%	14.0%	14.9%	15.6%
25th Percentile	9.5%	8.6%	9.1%	9.5%	9.9%	10.4%
Median	**6.6%**	**6.2%**	**6.4%**	**6.6%**	**6.8%**	**7.0%**
75th Percentile	3.7%	3.7%	3.7%	3.7%	3.7%	3.6%
95th Percentile	(0.4%)	0.3%	0.0%	(0.4%)	(0.7%)	(1.0%)
99th Percentile	(3.1%)	(2.1%)	(2.7%)	(3.2%)	(3.7%)	(4.1%)

- 10-year return projections appear less volatile as investment gains and losses offset over multiple years
- No mix is expected to deliver a 7.25% annualized (geometric) return over the next 10 years

2. Liability Modeling

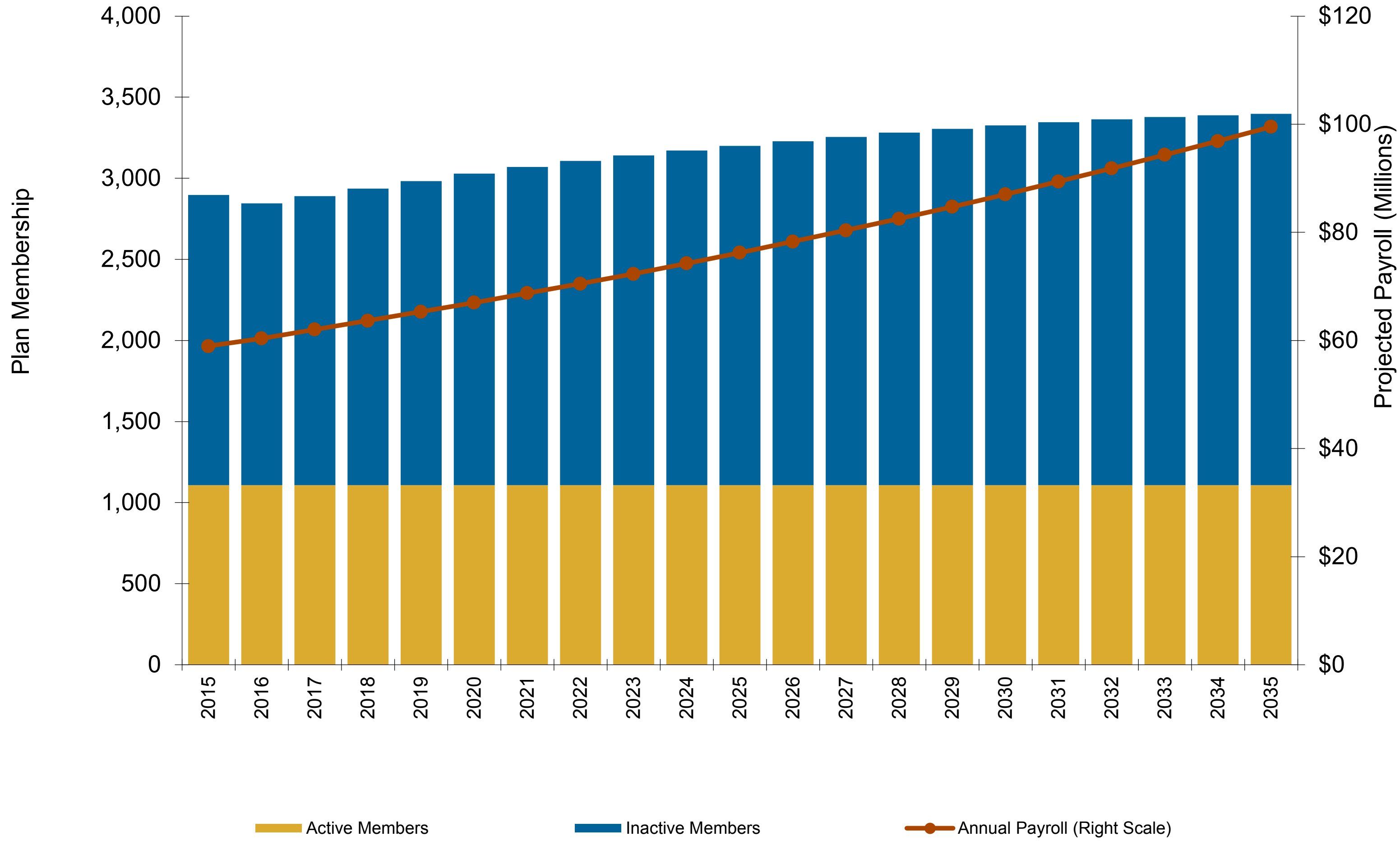
Build Actuarial Liability Model

- Liability model is based on the June 30, 2015 actuarial valuation report prepared by Segal
- Employer Contributions: Currently 32.6% of pay (averaged across plan)
- Employee Contributions: Currently 9.9% of pay (averaged across plan)
- Simulations start on June 30, 2015

Funded Status Characteristics:	June 30, 2015 (Segal report)
Market Value of Assets (MVA)	$444m
Actuarial Liability (AL)	$610m
Market Funded Status (MVA/AL)	72.8%
Actuarial Value of Assets (AVA)	$428m
Actuarial Funded Status (AVA/AL)	70.2%

Key Assumptions:	Actuarial	Callan
Investment Return	7.25%	6.58% (Current Mix)
Price Inflation	3.25%	2.25%
Salary Growth	3.75% + Merit/ Seniority	2.75% + Merit/ Seniority

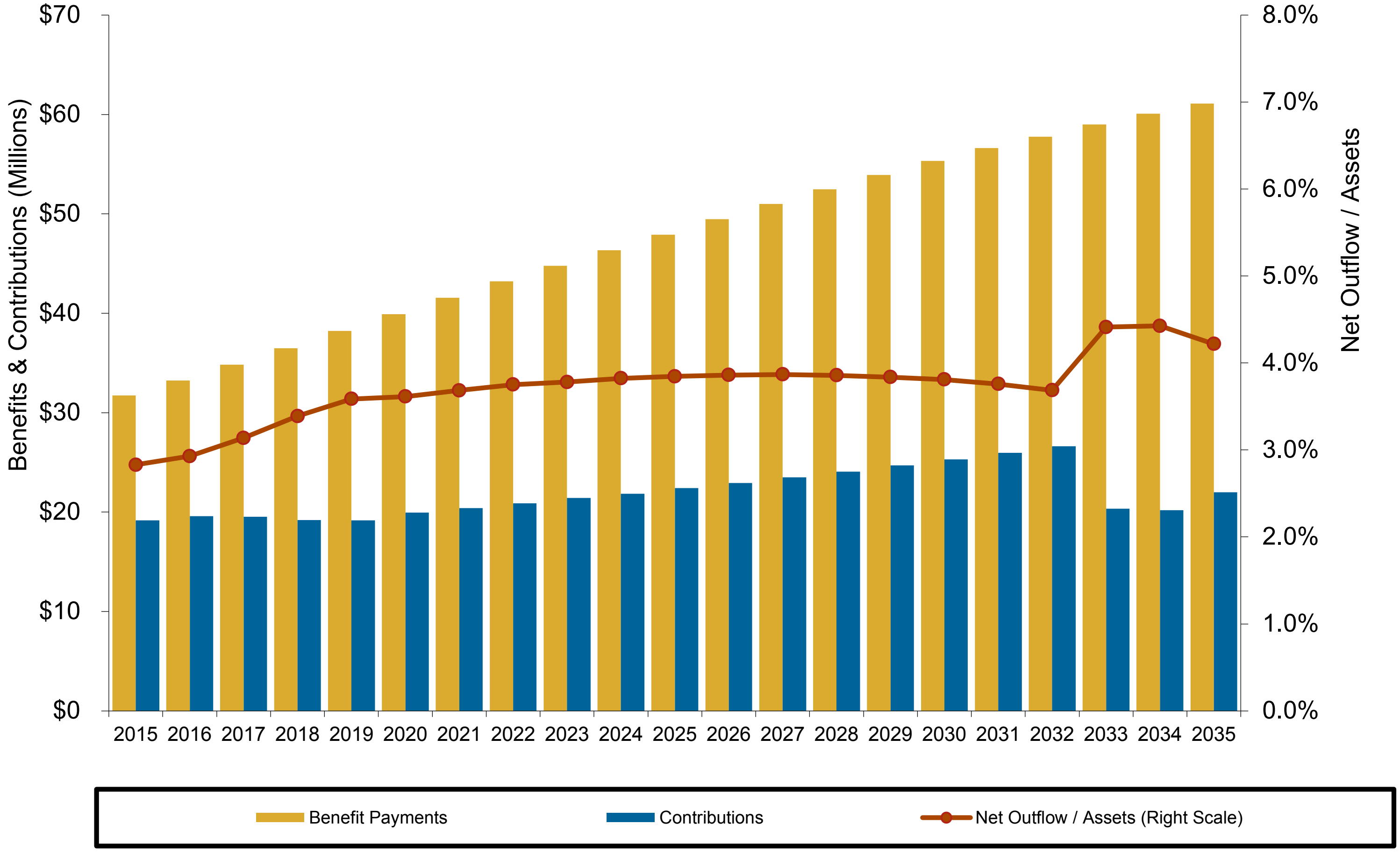
Plan Membership



- Active members are held constant
  - Future new hires replace exits due to retirement, death, disability, and withdrawal
  - Active membership is constant (implies 0% workforce growth)
- Payroll adjusted to be consistent with Callan capital market assumptions

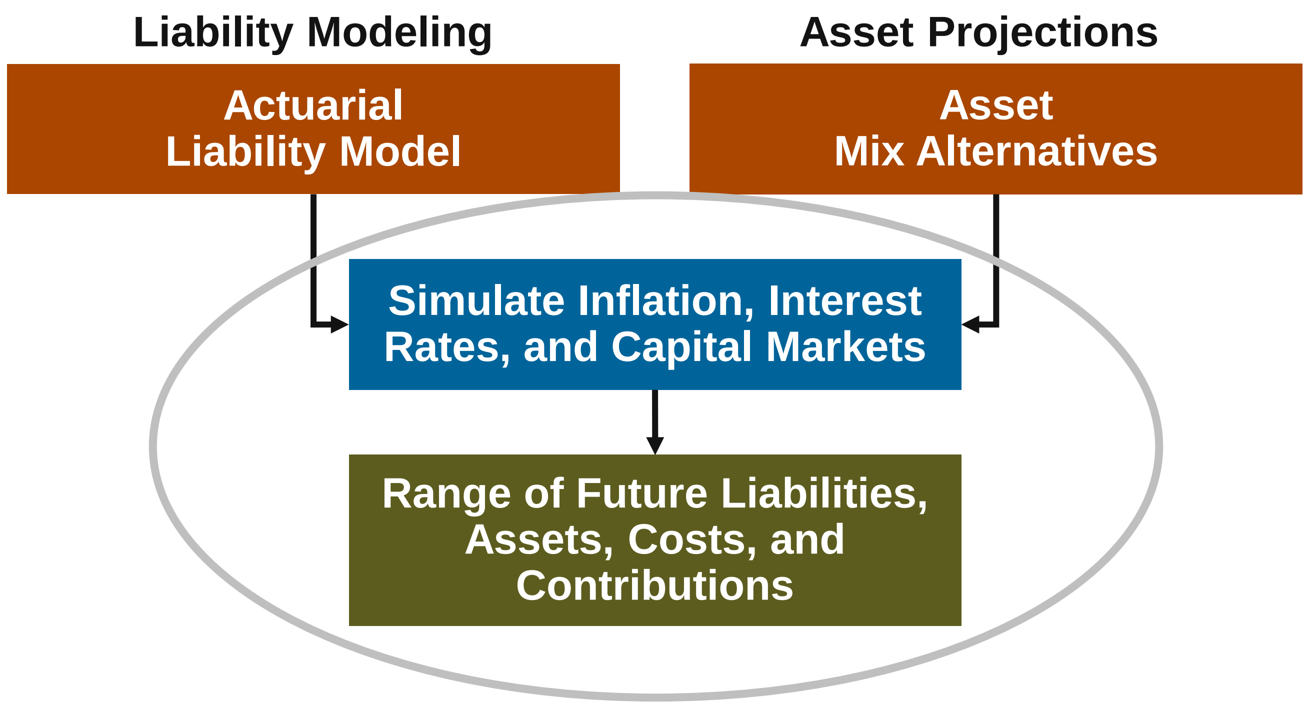
Expected cash flow profile

Net outflows, (benefits-costs)/ assets, are roughly 4%/year



- Under the current funding policy, rate of expected net outflows is <5%
  - Does not preclude additional allocation to illiquid investments

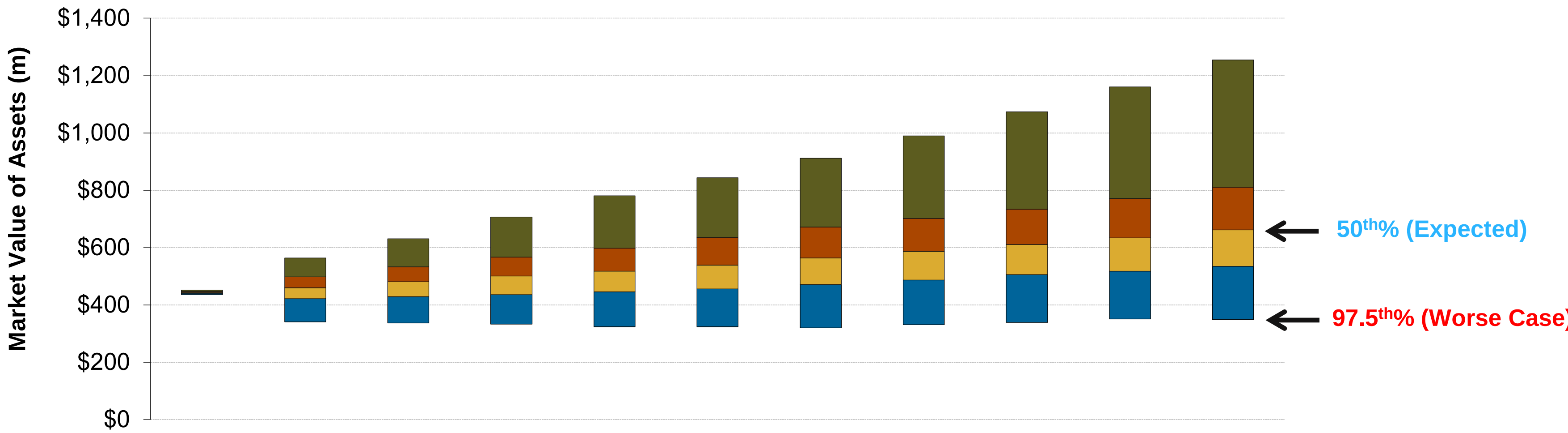
Simulate Financial Condition



- Generate 2,000 simulations per year, per asset mix to capture possible future economic scenarios and their impacts on potential asset allocations
- The simulation results were then ranked from highest to lowest to develop probability distributions

Market Value of Assets for Current Target Mix

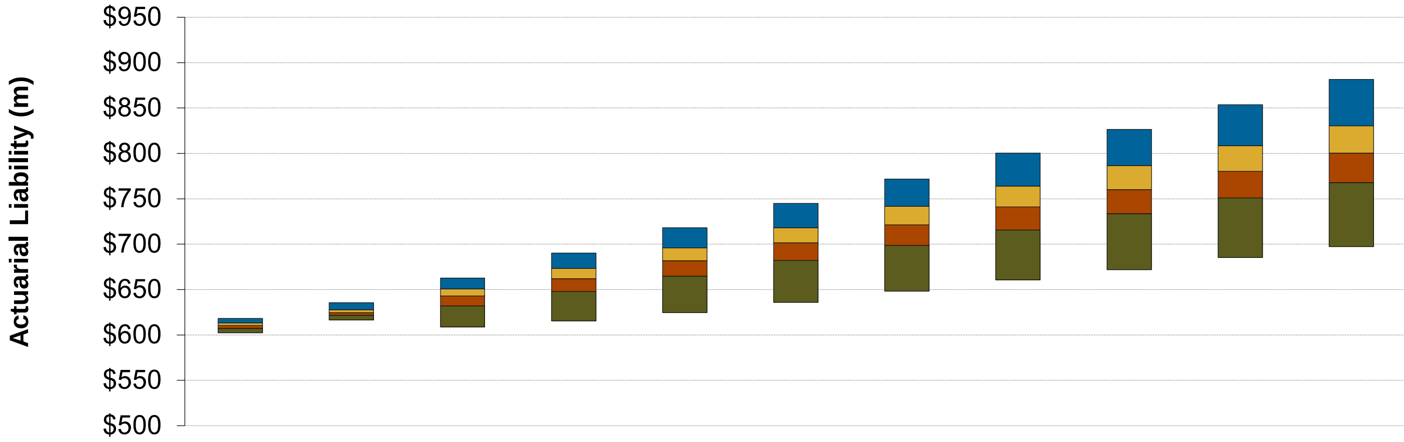
Asset growth = Contributions – Benefit payments + Investment Return



Percentile	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2.5th	$444	$564	$631	$707	$781	$844	$912	$990	$1,074	$1,161	$1,255
25th	444	498	532	567	598	636	672	702	734	771	810
50th	444	460	481	501	517	539	564	587	611	633	662
75th	444	422	429	436	446	456	471	487	506	518	535
97.5th	444	341	337	333	324	324	320	331	339	351	349
Range	0	223	294	374	457	520	592	659	735	810	906

- The expected outcome is the 50th percentile, a 50/50 chance of occurrence
- The worse case scenario is the 97.5th percentile; a 1 in 40 chance of occurrence
  - For example, there is a 1 in 40 chance (2.5% probability) that the 6/30/2025 market value of assets will be $349m or less.

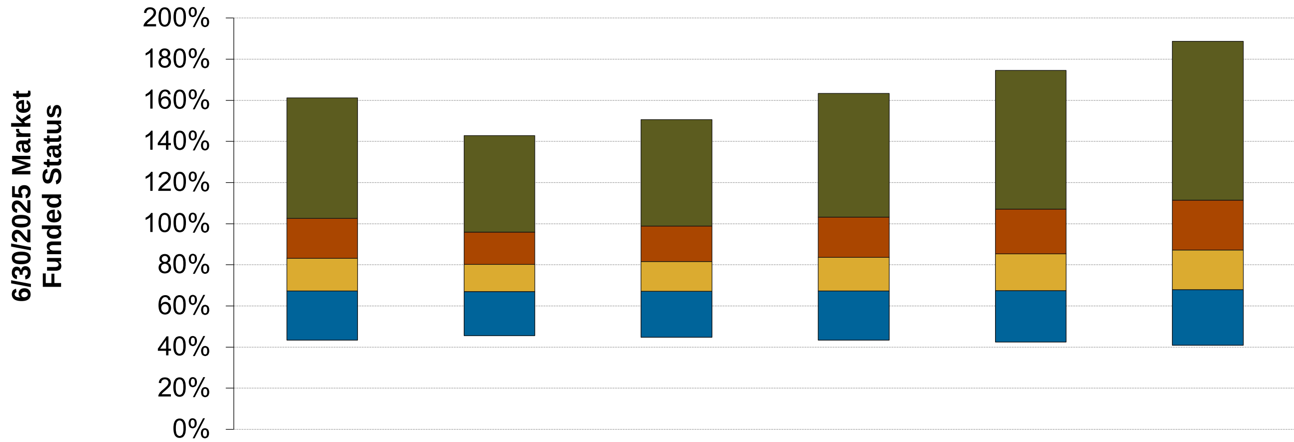
Actuarial Liability



Percentile	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
97.5th	$610	$636	$663	$690	$718	$745	$772	$800	$826	$854	$881
75th	610	628	651	673	696	718	742	764	787	809	830
50th	610	625	643	662	682	702	721	741	760	780	800
25th	610	622	632	648	665	682	699	716	734	751	768
2.5th	610	617	609	615	624	636	648	661	672	685	697
Range	0	19	54	75	94	109	123	140	155	168	184

- Plan liabilities are increasing at a steady pace – typical for an open plan
- Based on Callan's 10-year capital market expectations, the liability return is 6.50%
  - The liabilities are not growing at the full interest cost of 7.25% since Callan's price inflation expectation of 2.25% is lower than the actuary's assumed inflation of 3.25%

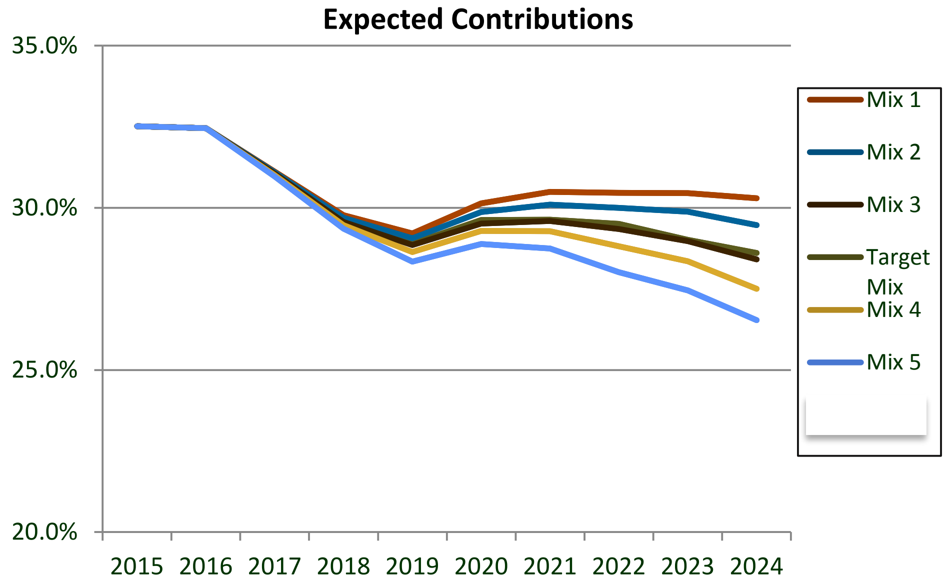
Evaluating 6/30/2025 Funded Status by Policy Mix

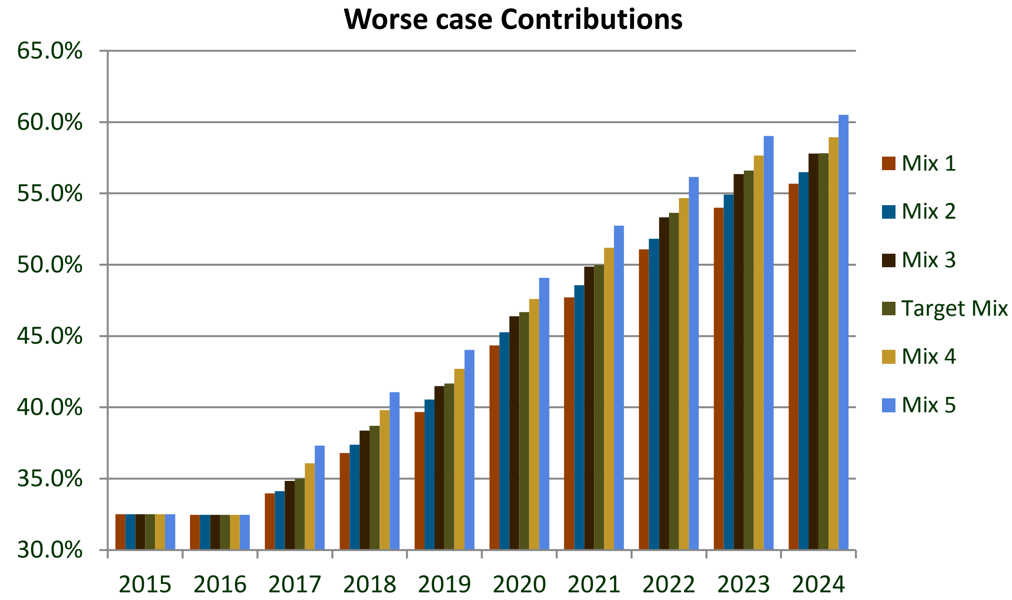


Percentile	Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
2.5th	161%	143%	151%	163%	175%	189%
25th	103%	96%	99%	103%	107%	111%
50th	83%	80%	82%	84%	85%	87%
75th	67%	67%	67%	67%	67%	68%
97.5th	43%	46%	45%	43%	42%	41%
Expected Return	6.6%	6.2%	6.4%	6.6%	6.8%	7.0%
Standard Deviation	13.1%	11.1%	12.1%	13.1%	14.1%	15.1%

- More aggressive mixes are expected to have a higher funded status at the end of 10 years but will have a lower funded status in a worse case scenario (97.5th percentile)

Projected Employer Contributions (% of Payroll)

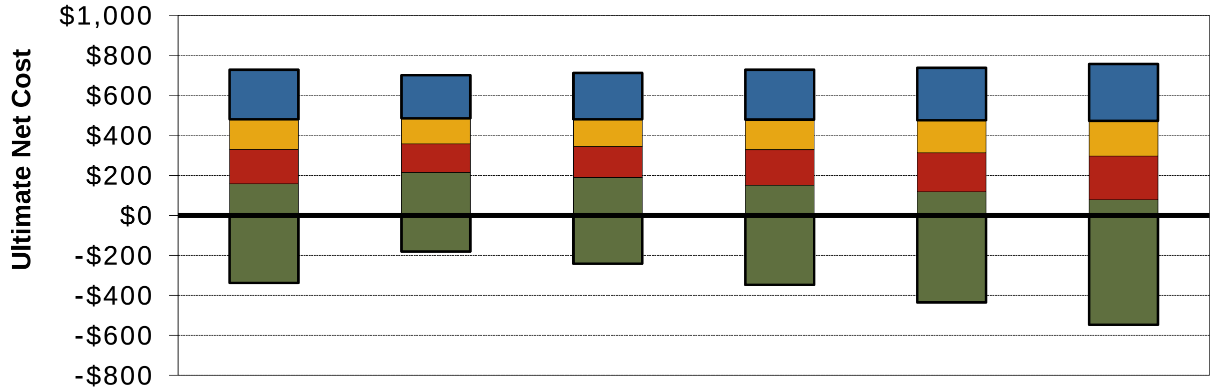




- The above two graphs illustrate the reward-risk trade-off of the alternative mixes in contribution space
  - The left side graph shows expected contributions and the reward for taking more risk
  - The right side graph shows the worse case contribution sorted by individual calendar year (the graph does not convey a possible pattern of contributions). In a worse case scenario, contributions are higher for a more aggressive asset mix.
- Median contributions go from 33% in 2015 to 27-30% in 2024 depending on the asset mix
- Worse case contributions range from 56% to 61% in 2024 depending on the asset mix

Ultimate Net Cost

Projection Date: June 30, 2025

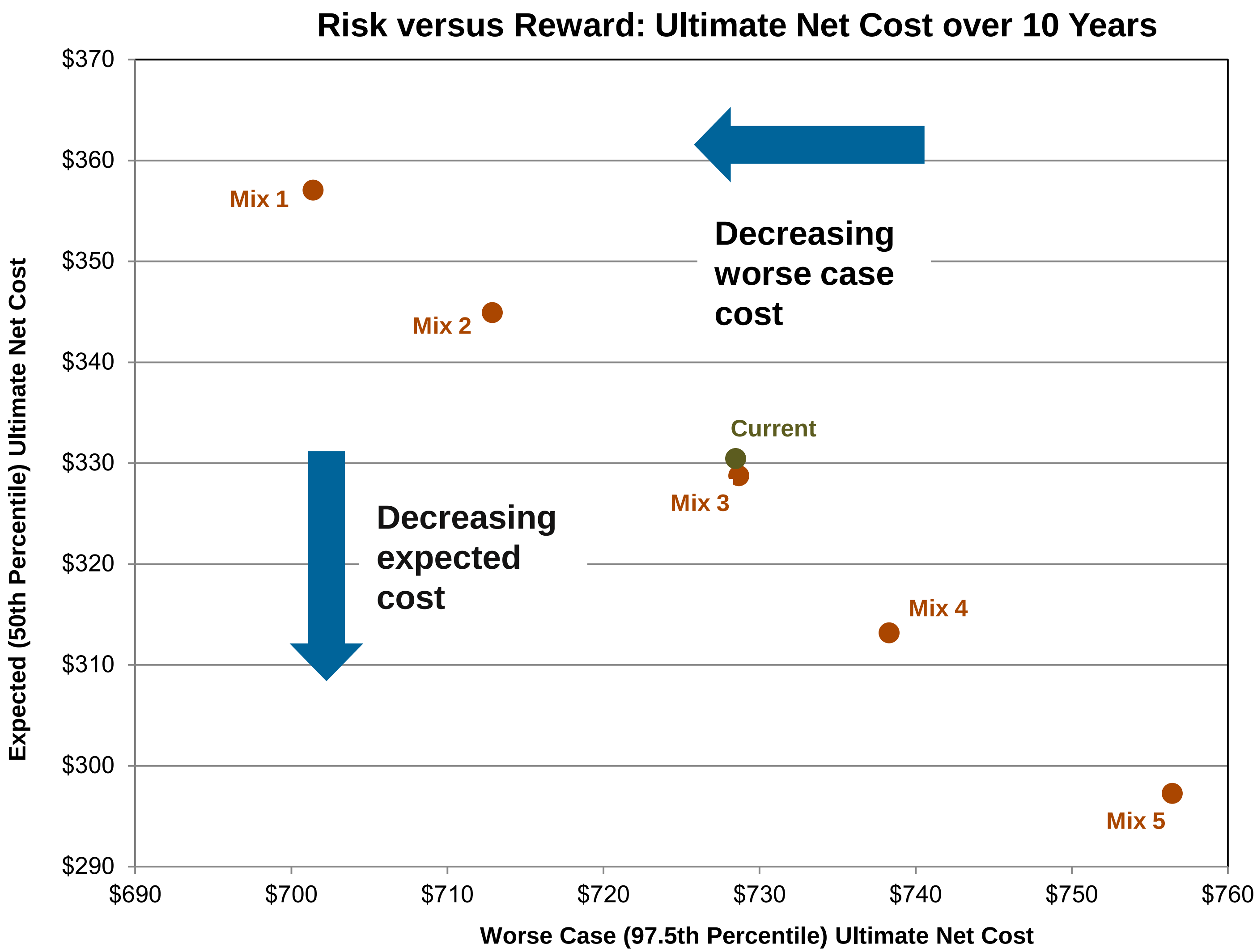


Percentile	Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
97.5th	$728	$701	$713	$729	$738	$756
75th	480	485	481	478	476	472
50th	330	357	345	329	312	297
25th	158	215	189	151	118	78
2.5th	-337	-181	-241	-347	-436	-547

- Ultimate Net Cost (UNC) = 10-Year Cumulative Contributions + 6/30/2025 Unfunded Actuarial Liability
- UNC is a more complete measure of the cost to the Plan since it captures what is expected to be paid over 10 years plus what is owed at the end of the 10-year period.
  - Negative numbers indicate the Plan is in a surplus position on 6/30/2025
- More aggressive mixes lower UNC in the expected case but result in greater UNC in a worse case scenario

Ultimate Net Cost (UNC)

UNC = 10-Year Cumulative Contributions + 6/30/2025 Unfunded Actuarial Liability



- Relative to the current policy, moving to Mix 4 is expected to cost less over the next 10 years ($17m) but will provide less downside protection in a worse case scenario (change in 97.5th percentile is $10m)

Decision Factors

Factor	Description
Return Objective	• The actuarial investment return is 7.25% • Callan models the expected liability return at 6.5% on price inflation expectations of 2.25% over the next 10 year
Time Horizon	• Indefinite (plan is open)
Liquidity Needs	• Liquidity needs are manageable and can support additional allocations to illiquid investments
Actuarial Methodology	• Unfunded actuarial accrued liability balance (pre-2013) will be fully amortized by 2039 • Assets are smoothed
Contribution Risk	• Clear trade-off between lower median contribution rates and higher worst case contribution rates
Risk Tolerance	• Risk tolerance is the ability and willingness to take risk • What is comfort level in taking more risk? • Consider worst case results for projected funded status, ultimate net cost and annual returns
Liability Growth	• Liabilities are growing • Using 2.25% inflation, Callan models liability growth at approximately 6.5%
Funded Status*	• 6/30/2015 funded status was 73% on market value basis • Expected funding status is 83% in 2025 with the current asset allocation policy

** A more aggressive asset allocation may assist with closing a plan deficit over the long run. However, a more aggressive asset allocation can make the financial situation worse, if investment performance is below average.*

Recommendation

- The table to the right compares MCERA's current policy to candidate mixes with comparable risk profiles
- Relative to MCERA's current policy:
  - Mix 4 is more aggressive, with an expected return of 6.8%
  - Mix 3 has the same expected return with greater scenario diversification due to incorporation of private equity
  - Mix 2 is more conservative, with an expected return of 6.4%, slightly below the expected liability return

	Current	Mix 2	Mix 3	Mix 4
Broad US Equity	38%	26%	29%	31%
Global Ex-US Equity	25%	21%	22%	24%
Private Equity	0%	6%	7%	7%
Broad US Fixed Income	28%	37%	32%	27%
Private Real Estate	9%	10%	10%	11%
Total	***100%***	***100%***	***100%***	***100%***
Role in Portfolio				
Growth	63%	53%	58%	62%
Risk Mitigation	28%	37%	32%	27%
Real Assets	9%	10%	10%	11%
Mix Characteristics				
Expected Return*	6.6%	6.4%	6.6%	6.8%
Standard Deviation	13.1%	12.1%	13.1%	14.1%

*10 year annualized (geometric) return

Note: It will take years to reach the target private equity allocation. Private equity assets can be held in public equity until actual funding occurs. After an implementation strategy is selected, Callan and Staff will develop a transitional funding plan.

Appendix 1: Alternate Mixes

Efficient Frontier Mixes: Real estate held at current target

	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Broad US Equity	38%	24%	27%	29%	32%	34%
Global Ex-US Equity	25%	19%	20%	22%	24%	26%
Private Equity	0%	6%	6%	7%	7%	8%
Broad US Fixed Income	28%	42%	38%	33%	28%	23%
Private Real Estate*	9%	9%	9%	9%	9%	9%
Total	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***
Role in Portfolio						
Growth	63%	49%	53%	58%	63%	68%
Risk Mitigation	28%	42%	38%	33%	28%	23%
Real Assets	9%	9%	9%	9%	9%	9%
Mix Characteristics						
Expected Return**	6.6%	6.2%	6.4%	6.6%	6.8%	7.0%
Standard Deviation	13.1%	11.1%	12.1%	13.1%	14.1%	15.1%

* Private Real Estate held at current 9% allocation

** 10 year annualized (geometric) return

Efficient Frontier Mixes: No Private Equity

	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Broad US Equity	38%	30%	32%	35%	38%	40%
Global Ex-US Equity	25%	22%	25%	27%	29%	31%
Private Equity	0%	0%	0%	0%	0%	0%
Broad US Fixed Income	28%	39%	33%	28%	22%	17%
Private Real Estate	9%	9%	10%	10%	11%	12%
Total	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***

Role in Portfolio

	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Growth	63%	52%	57%	62%	67%	71%
Risk Mitigation	28%	39%	33%	28%	22%	17%
Real Assets	9%	9%	10%	10%	11%	12%

Mix Characteristics

	Current	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
Expected Return*	6.6%	6.2%	6.4%	6.6%	6.8%	7.0%
Standard Deviation	13.1%	11.1%	12.1%	13.1%	14.1%	15.1%

* 10 year annualized (geometric) return

Appendix 2: Private Equity Summary

Private Equity – Asset Class Profile

Benefits and Considerations

Benefits

- Returns above stocks and bonds
  - Large variation between best and worst-performing funds
  - Large variation between vintage years
  - Proper implementation is essential
- Moderate diversifier due to valuation based accounting

Considerations

- More costly (higher fees) and significantly less liquid than public stocks and bonds
- Implementation, which requires a long time horizon and continual investment, is the key risk and critical to success
- Requires greater oversight than public market investments and is more difficult to value and monitor

Highest expected return and risk asset class. Requires long horizon commitment and is highly illiquid. High fees. Highly correlated with public equity so only modest diversification benefits.

Expected Return	Cash	Very High	Equity
Expected Risk	Cash	Very High	Equity
Observed Volatility	Cash	Moderate	Equity
Correlation with CPI	Low	Relatively Low	High
Short-Term Inflation Hedge	Poor	Fair	Excellent
Long Term Inflation Hedge	Poor	Good	Excellent
Flight to Quality Hedge	Poor	Fair	Excellent
Diversification Benefit	Poor	Fair	Excellent
Liquidity	Poor	Poor	Excellent
Availability of Product	Poor	Very Good	Excellent
Opportunity for Alpha	Poor	Excellent	Excellent
Fees and Expenses	Low	High	High

Private Equity Returns vs. Public Equity Returns

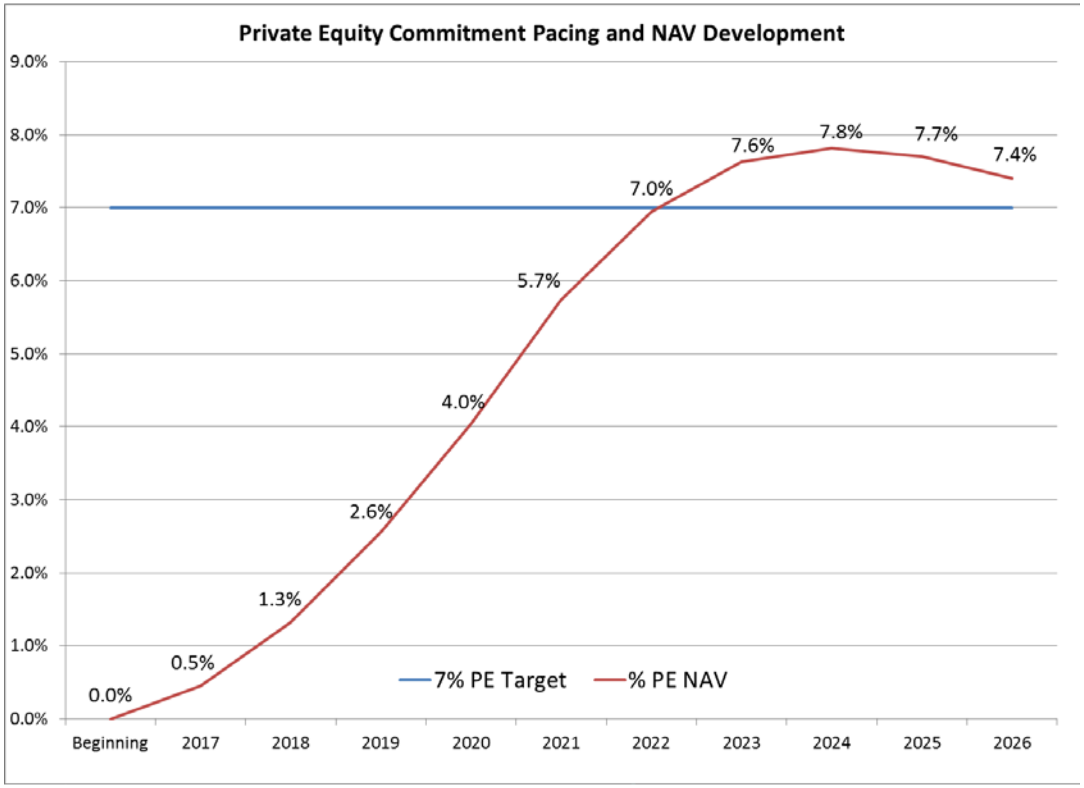
U.S. Private Equity Performance Database – Pooled Horizon IRRs (%)
Through September 30, 2015 – Returns are net of fees

Strategy	1 Year	3 Years	5 Years	10 Years	15 Years	20 Years
Venture capital	25.1	21.4	18.0	11.1	3.5	25.5
Buyouts	8.4	13.9	13.7	11.8	11.4	13.0
Mezzanine	6.8	10.5	11.4	10.3	7.8	9.8
All Private Equity	**10.0**	**14.6**	**13.8**	**11.4**	**8.9**	**14.0**
S&P 500	-0.6	12.4	13.3	6.8	4.0	8.1

Source: Thomson-Cambridge

- There can be large return differences between strategy types over time
  – Each strategy has contributed to success at various times
- Venture capital has struggled for about ten years since the technology bust, but returns have recovered over the last five years.
- “All Private Equity” has outperformed public stocks over longer horizons
  – Approximately 4% to 5% over past 10 to 20 years

Hypothetical PE Commitment Pacing Example



Year	MCERA FOF Commitments	FOF Commits to Partnerships	**Resulting NAV Development**	MCERA Private Equity $ Target	Over/ (Under) Target
2017	40,000	13,333	**1,867**	28,840	(26,973)
2018	-	13,333	**5,600**	29,705	(24,105)
2019	-	13,333	**11,200**	30,596	(19,396)
2020	30,000	10,000	**18,200**	31,514	(13,314)
2021	-	10,000	**26,600**	32,460	(5,860)
2022	-	10,000	**33,200**	33,433	(233)
2023	20,000	6,667	**37,533**	34,436	3,097
2024	-	6,667	**39,600**	35,470	4,130
2025	-	6,667	**40,200**	36,534	3,666
2026	30,000	10,000	**39,800**	37,630	2,170
Total	**120,000**	**100,000**	NM	NM	NM

- $400 million fund sponsor with a 7% Private Equity Target
- Fund net growth rate is 3% = 7% investment return – 4% net cash flow (contributions – benefit payments and expenses)
- Every $1 committed peaks at 70 cents of NAV due to cash flow timing and fees
- FOFs commit to partnerships over three years
- Partnerships invest and liquidate over a 12-year period

Disclaimers

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