

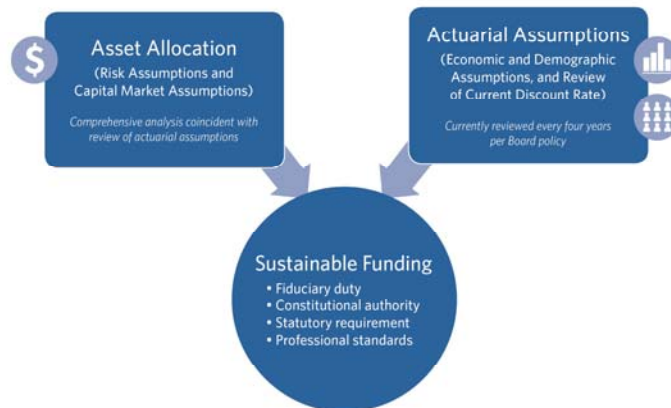
CalPERS | System Update

Wylie Tollette, Chief Operating Investment Officer
Kerry Worgan, Supervising Pension Actuary

December 13, 2017
League of California Cities | Municipal Finance Institute



Asset Liability Management Process



ALM Model Building Blocks

- Starting Point
 - Assets and Liabilities at June 30, 2016
 - Benefit payments for FY 2016-2017
 - Contributions for FY 2016-2017
 - Investment return for FY 2016-17 (11.2%)
- Liability Projection for 30 Years
 - Liabilities projected for each discount rate
 - Open Group (New members join in future years)
- Asset Projection for 30 Years
 - For each discount rate 5,000 investment return paths over 30 years are randomly simulated

Economic Assumptions

- Price Inflation
- Wage Inflation
- Payroll Growth
- Long-term Expected Return on Assets

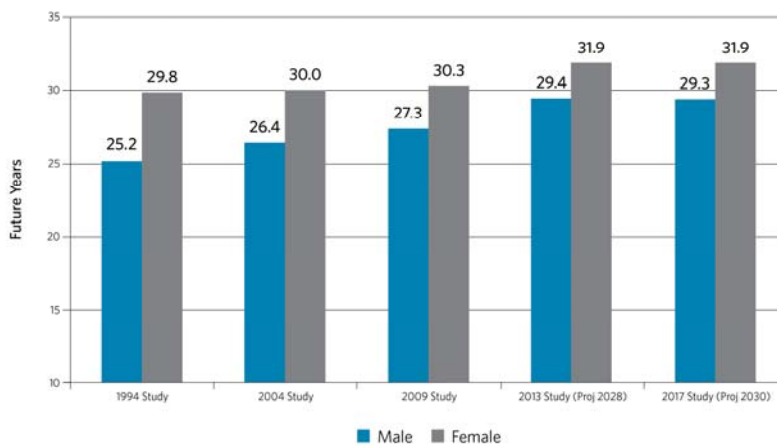


Demographic Assumptions

- Workforce Demographics
- Disability Retirement
- Mortality



Male and Female Life Expectancy at Age 55 for Healthy Recipients



Financial Highlights

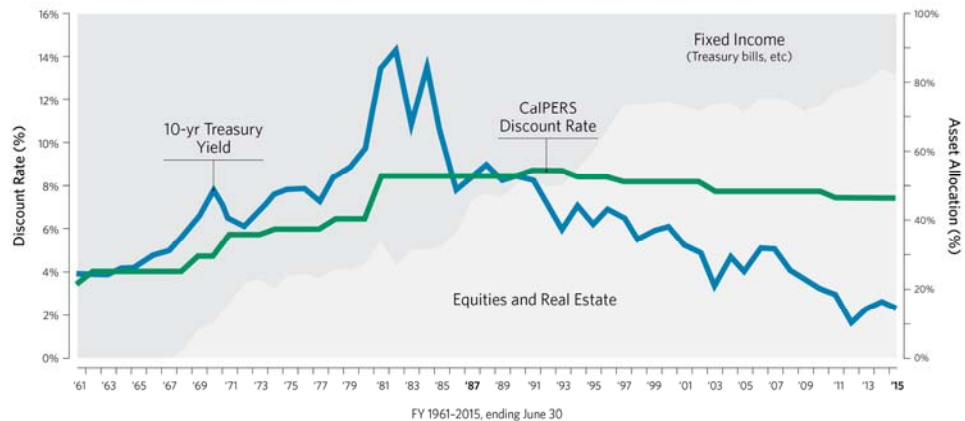
Current Value \$345 billion*



* As of 11/28/2017

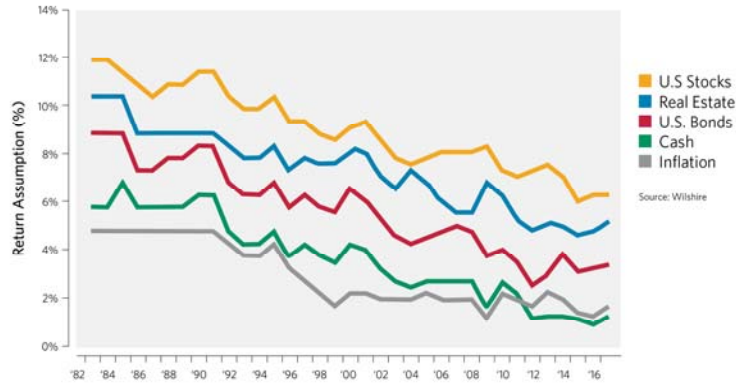


Interest Rates vs CalPERS Investment Mix

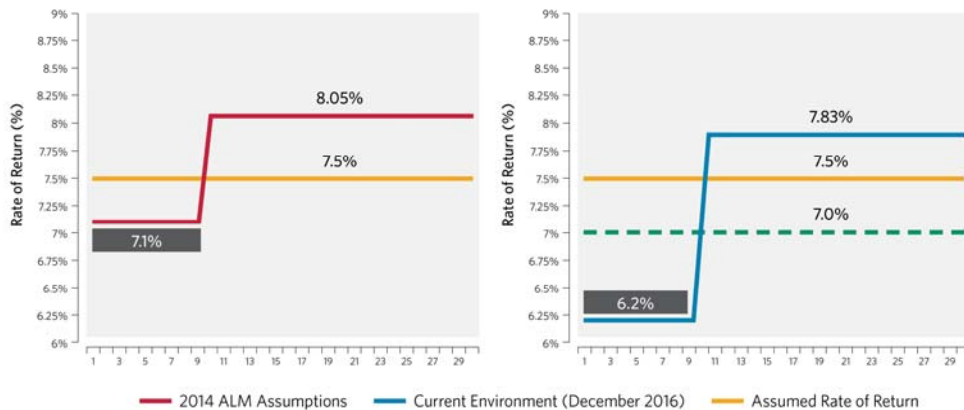


Wilshire Forecasts through Time

Return prospects have been declining for decades, following the downward trend in interest rates



Change in CalPERS Market Forecasts



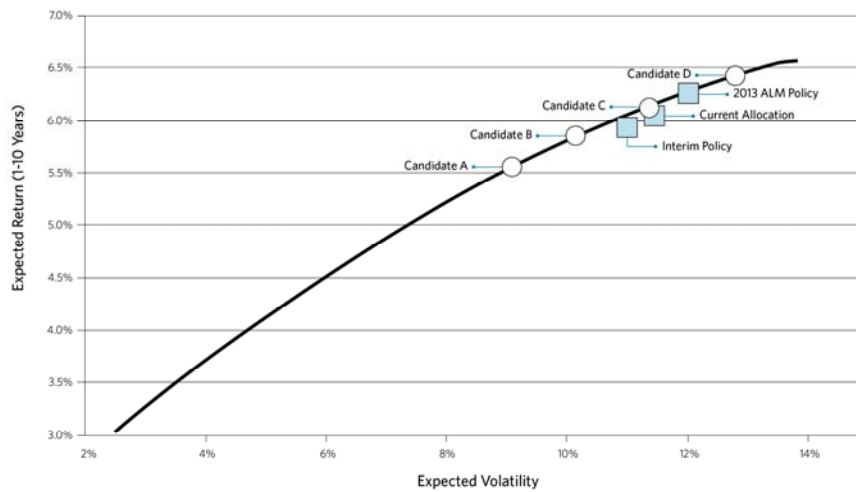
Candidate Portfolios

Asset Allocation of Preliminary Candidate Portfolios					Allocation 9/30/2017	Interim Policy 9/30/2016	ALM Policy 2013
Asset Class Component	Candidate A	Candidate B	Candidate C	Candidate D			
Global Equity	34%	42%	50%	59%	50%	46%	47%
Private Equity	8%	8%	8%	8%	8%	8%	12%
Fixed Income	44%	36%	28%	19%	19%	20%	19%
Real Assets	13%	13%	13%	13%	—	—	—
Real Estate	—	—	—	—	9%	11%	11%
Infrastructure/Forestland	—	—	—	—	2%	2%	3%
Inflation Assets	0%	0%	0%	0%	8%	9%	6%
Liquidity	1%	1%	1%	1%	4%	4%	2%
Expected Compound Return (1-10 yrs.)	5.6%	5.8%	6.1%	6.4%	6.0%	5.9%	6.2%
Long Term Expected Return (11-60 yrs.)	7.8%	8.0%	8.3%	8.5%	8.1%	8.0%	8.3%
Blended Return (1-60 yrs.)	6.50%	6.75%	7.00%	7.25%	6.85%	6.77%	7.09%
Expected Volatility	9.1%	10.2%	11.4%	12.8%	11.5%	11.0%	12.0%
Cash Yield	3.1%	3.0%	2.9%	2.7%	—	—	—

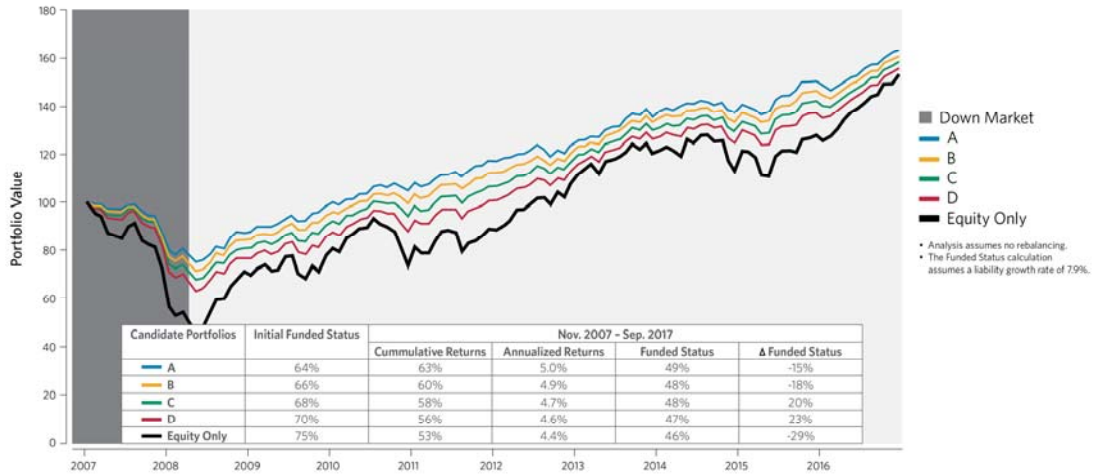
- With the 2013 Capital Market Assumptions, the Current Policy Portfolio had an expected compound return of 7.15% for years 1 through 10, expected compound return of 8.39% for the long term (i.e., years greater than 10), blended return of 7.56% and expected volatility of 11.76%.
- Blended Return is the weighted expected compound rate of return of years 1 through 10 and the long term, minus 15 bps for admin fees.
- Symbols (circles, squares) correspond to Candidate Portfolios illustrated on pages 6 and 7.



Candidate Portfolios - Efficient Frontier

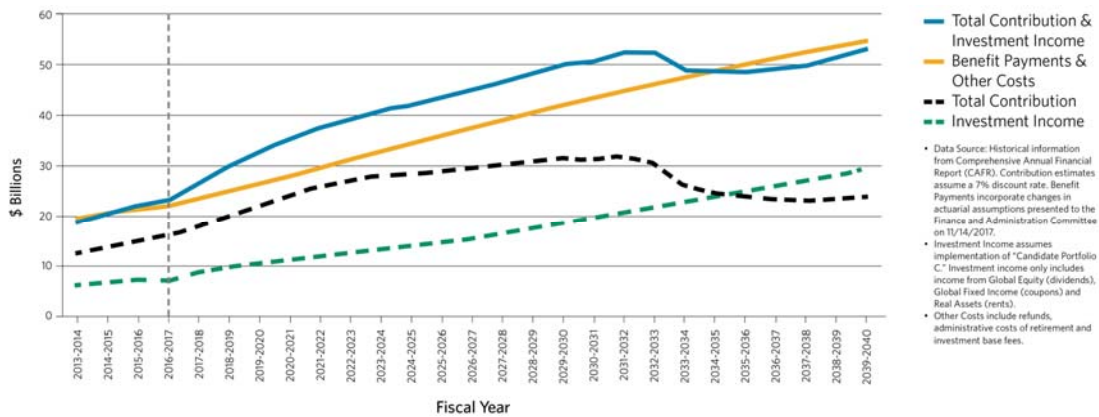


Scenario Analysis (Global Financial Crisis & Recovery)



Total Fund Cash Flows are Improving

Historic & Projected PERF Cash Flow Analysis



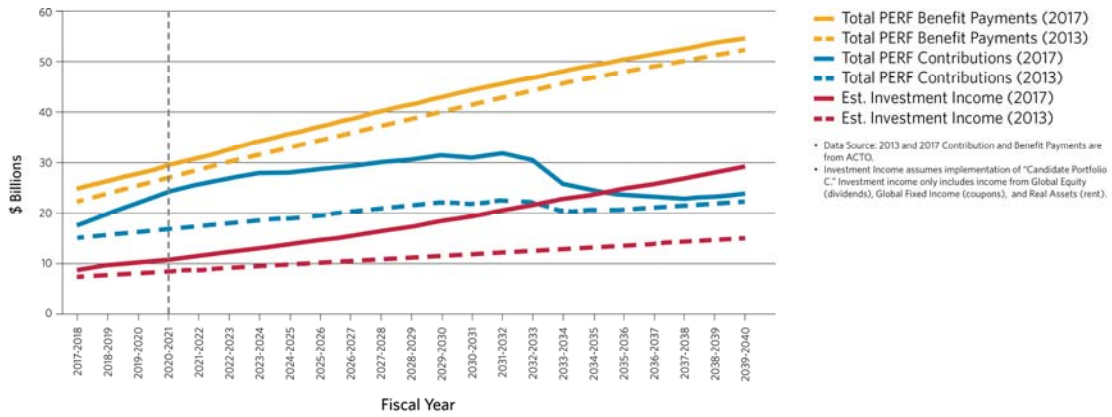
- Data Source: Historical information from Comprehensive Annual Financial Report (CAFR). Contribution estimates assume a 7% discount rate. Benefit Payments incorporate changes in actuarial assumptions presented to the Finance and Administration Committee on 11/14/2017.

- Investment Income assumes implementation of "Candidate Portfolio C." Investment income only includes income from Global Equity (dividends), Global Fixed Income (coupons) and Real Assets (rents).

- Other Costs include refunds, administrative costs of retirement and investment base fees.

Contribution, Benefit Payments and Investment Income

2013 and Today



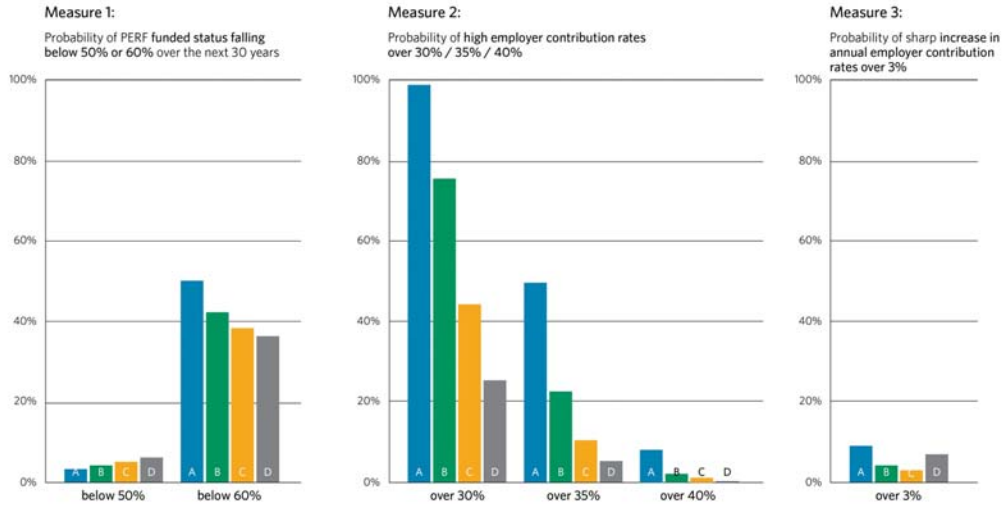
Discount Rate Determination

Based on Blended CMA rates and projected Cash Flows

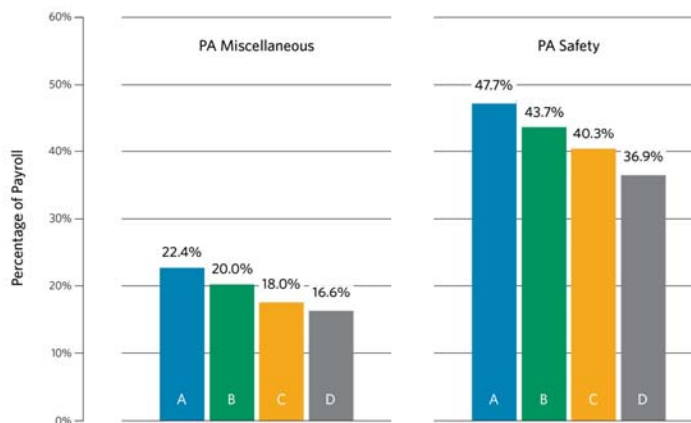
Portfolio	Discount Rate ¹	Portfolio Volatility
A	6.50%	9.1%
B	6.75%	10.2%
C	7.00%	11.4%
D	7.25%	12.8%

¹ Does not include any provision for adverse deviation.

Public Agency Miscellaneous

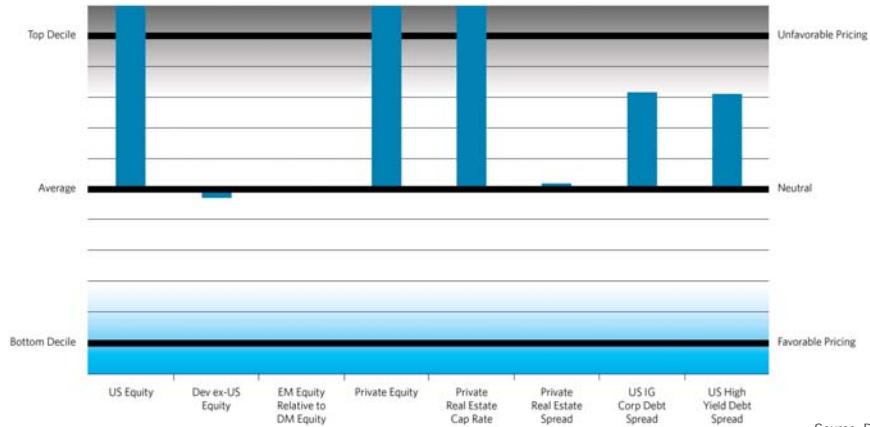


Average Employer Contribution Rates Over Next 30 Years



Market Valuations

Valuation Metrics vs. Historical Range – A Measure of Risk (as of September 2017)



Source: Pension Consulting Alliance



Current Actuarial Amortization Policy

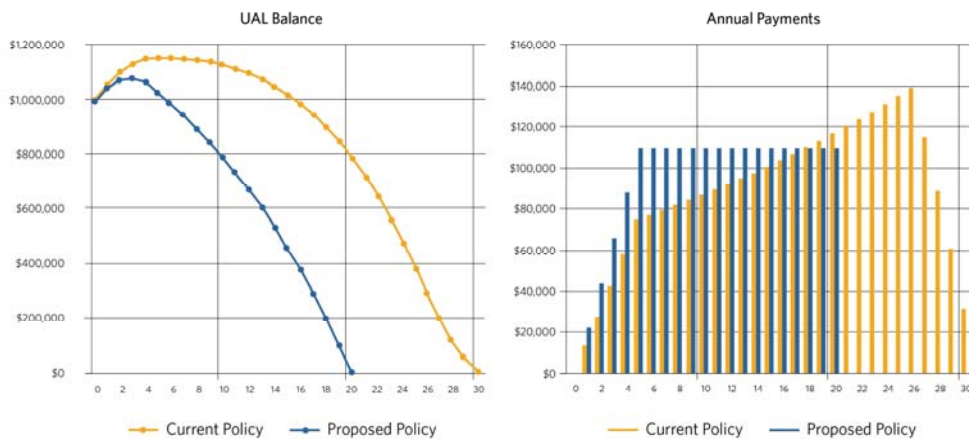
Driver	Source				
	(Gain)/Loss		Assumption/ Method Change	Benefit Change	Golden Handshake
	Investment	Non-Investment			
Amortization Period	30 Years	30 Years	20 Years	20 Years	5 Years
Escalation Rate - Active Plans	Payroll (3%) 0%	3%	3%	3%	3%
- Inactive Plans		0%	0%	0%	0%
Ramp Up	5	5	5	0	0
Ramp Down	5	5	5	0	0



Proposed Actuarial Amortization Policy

Driver	Source				
	(Gain)/Loss		Assumption/ Method Change	Benefit Change	Golden Handshake
	Investment	Non-Investment			
Amortization Period - Active Agencies - Inactive Agencies	20 Years Closed Period (15 years or less)	20 Years Closed Period (15 years or less)	20 Years	20 Years	5 Years
Escalation Rate	0%	0%	0%	0%	0%
Ramp Up	5	0	0	0	0
Ramp Down	0	0	0	0	0

Investment Gain or Loss (\$1,000,000 Loss)



2017-18 ALM Timeline



2017 Capital Market Assumptions

Asset Class	Arithmetic Return	Compound Return	Volatility (Std. Dev)	Correlation						Constraints (%)	
				Global Equity	Private Equity	Fixed Income	Real Asset	Inflation Asset	Liquidity	Floor	Cap
Global Equity	8.14%	6.80%	17.00%	1.00	0.81	0.01	0.59	0.39	0.00	0%	100%
Private Equity	11.26%	8.30%	25.50%	0.81	1.00	0.00	0.48	0.33	0.00	5%	8%
Fixed Income	3.21%	3.00%	6.58%	0.01	0.00	1.00	0.09	0.40	0.31	15%	100%
Real Assets	6.49%	5.75%	12.55%	0.59	0.48	0.09	1.00	0.21	0.00	9%	13%
Inflation Asset	3.08%	2.77%	8.00%	0.39	0.33	0.40	0.21	1.00	0.08	0%	12%
Liquidity	2.00%	2.00%	1.00%	0.00	0.00	0.31	0.00	0.08	1.00	1%	100%

U.S. Inflation Assumption: 2.00%