OCERS BOARD OF RETIREMENT

2017 STRATEGIC PLANNING WORKSHOP

Visioning the Future

DoubleTree Club by Hilton-Orange County Airport
7 Hutton Centre Drive
Santa Ana, CA 92707

AGENDA
Wednesday morning, September 13, 2017

BREAKFAST	***7:15 - 8:00***
WELCOME & INTRODUCTORY COMMENTS *Steve Delaney, CEO, OCERS*	***8:00 - 8:15***
A. **STAKEHOLDER VIEWS ON OCERS PENSIONS** *Presentations by Michelle Aguirre, County of Orange; Mark McDorman, Orange County Managers Association, and Luz Napoles, Orange County In-Home Supportive Services Public Authority.*	***8:15 - 9:15***
B. **TRIENNIAL REVIEW OF ACTUARIAL ASSUMPTIONS (INFORMATIONAL)** *Presentation by Paul Angelo, Segal Consulting*	***9:15 - 10:30***
REFRESHMENT BREAK	***10:30 - 10:45***

C. OCFA ACCELERATED PENSION PAYDOWN PLAN ***10:45 - 11:45***
Presentation by Lori Zeller, Orange County Fire Authority

D. OPERATIONAL RISK MANAGEMENT ***11:45 - 12:15***
Presentation by Brenda Shott, Assistant CEO of Internal Operations, OCERS and Jim Doezie, Contracts Administrator, OCERS

LUNCH ***12:15 - 1:15***

E. CYBER SECURITY – OUR WORLD TODAY ***1:15 - 2:15***
Presentation by Bryan Cunningham, UCI

REFRESHMENT BREAK ***2:15 - 2:30***

Wednesday afternoon, September 13, 2017
INVESTMENT FORUM

INTRODUCTORY COMMENTS ***2:30 - 2:45***
Molly Murphy, CIO, OCERS

A. OREGON STATE PENSION FUNDS – AN OVERVIEW ***2:45 - 4:00***
Discussion led by John Skjervem, CIO, Oregon State Treasury

B. INVESTMENT FEES, DISCERNING EXPENSES FROM FEES, AND WHERE DOES ONE DRAW THE LINE ***4:00 - 5:00***
Discussion led by Thomas A. Hickey, III, Partner & Chair of the Fund Formation & Investment Management Group, Foley & Lardner LLP; Stephen McCourt Managing Principal/Co-Chief Executive Officer, Meketa Investment Group, Inc.; Allan Emkin, Managing Director, Pension Consulting Alliance, LLC

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AGENDA
Thursday morning, September 14, 2017
INVESTMENT FORUM

BREAKFAST		***7:15 - 8:00***
A.	**OCERS INVESTMENT PORTFOLIO – A LOOK INTO THE FUTURE** *Discussion led by Molly Murphy, CIO, OCERS*	***8:00 - 8:15***
B.	**VIEW OF THE WORLD** *Discussion led by Paul Podolsky, Senior Portfolio Strategist, Bridgewater Investment Group*	***8:15 - 9:15***
C.	**INVESTMENT RISK MANAGEMENT** *Discussion led by Molly Murphy, CIO, OCERS; Stephen McCourt Managing Principal/Co-Chief Executive Officer, Meketa Investment Group, Inc.; Allan Emkin, Managing Director, Pension Consulting Alliance, LLC;*	***9:15 - 10:15***
	REFRESHMENT BREAK	***10:15 - 10:30***
D.	**ASSET CLASS POLICY – RISK MITIGATION** *Discussion led by Alan Emkin, Managing Director, Pension Consulting Alliance, LLC; Stephen McCourt Managing Principal/Co-Chief Executive Officer, Meketa Investment Group, Inc. , Molly Murphy, CIO, OCERS*	***10:30 - 12:00***
	LUNCH	***12:00 - 1:00***
E.	**OPPORTUNISTIC INVESTING AND BEST PRACTICES: AN INVESTMENT CASE STUDY** *Discussion led by Molly Murphy, CIO, OCERS*	***1:00 - 2:00***

Thursday afternoon, September 14, 2017

OCERS ADMINISTRATION

A. **2018-2020 PRELIMINARY STRATEGIC PLAN** ***2:00 - 2:30***
Presentation by Steve Delaney, CEO, OCERS

REFRESHMENT BREAK ***2:30 - 2:45***

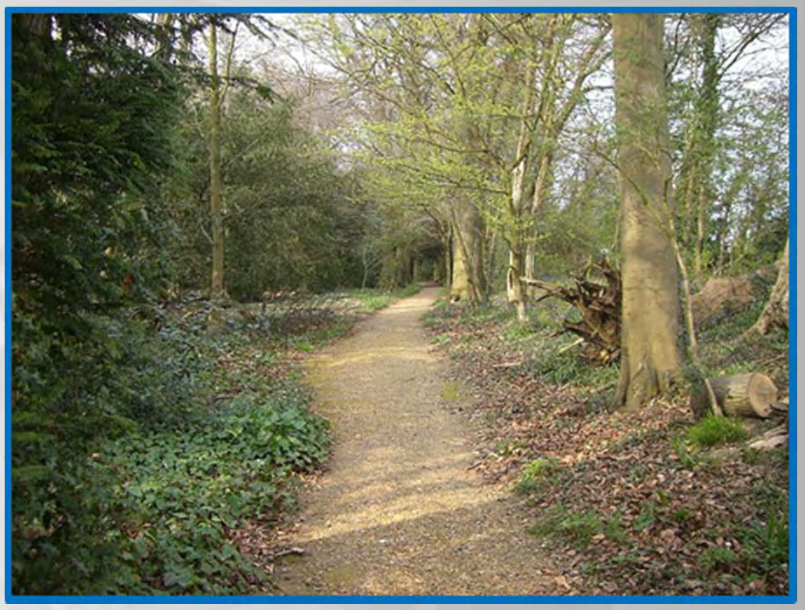
B. **2018 PRELIMINARY BUSINESS PLAN** ***2:45 - 4:30***
Presentation by Steve Delaney, CEO and OCERS Management Team

It is OCERS' intention to comply with the Americans with Disabilities Act ("ADA") in all respects. If, as an attendee or participant at this meeting, you will need any special assistance beyond that normally provided, OCERS will attempt to accommodate your needs in a reasonable manner. Please contact OCERS via email at adminsupport@ocers.org or call 714-558-6200 as soon as possible prior to the meeting to tell us about your needs and to determine if accommodation is feasible. We would appreciate at least 48 hours' notice, if possible. Please also advise us if you plan to attend meetings on a regular basis.

Michelle Aguirre, Chief Financial Officer

September 13, 2017

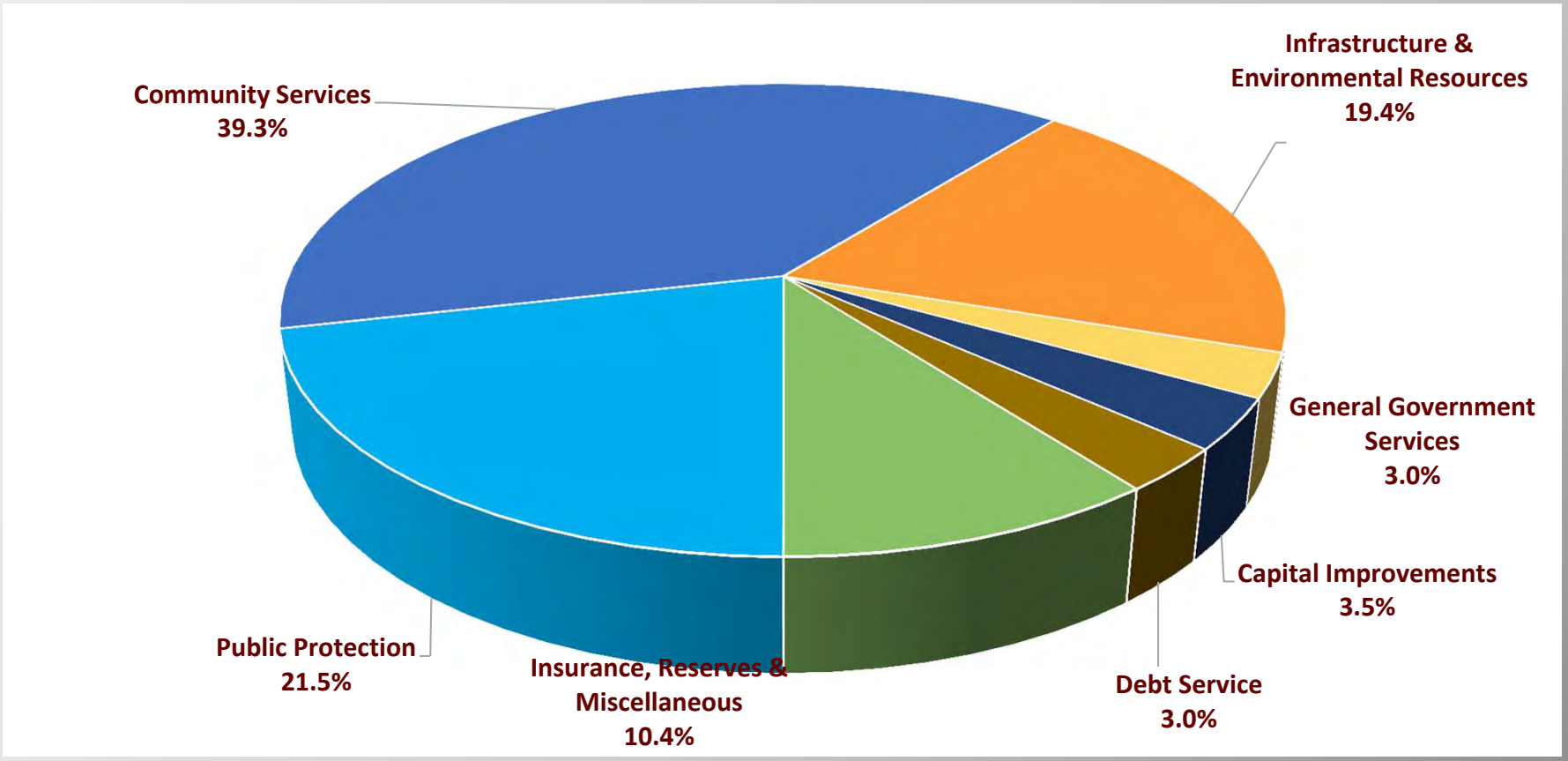
OCERS 2017 Strategic Planning Workshop
County of Orange Presentation



"Making Orange County a safe, healthy, and fulfilling place to live, work, and play, today and for generations to come, by providing outstanding, cost-effective regional public services."

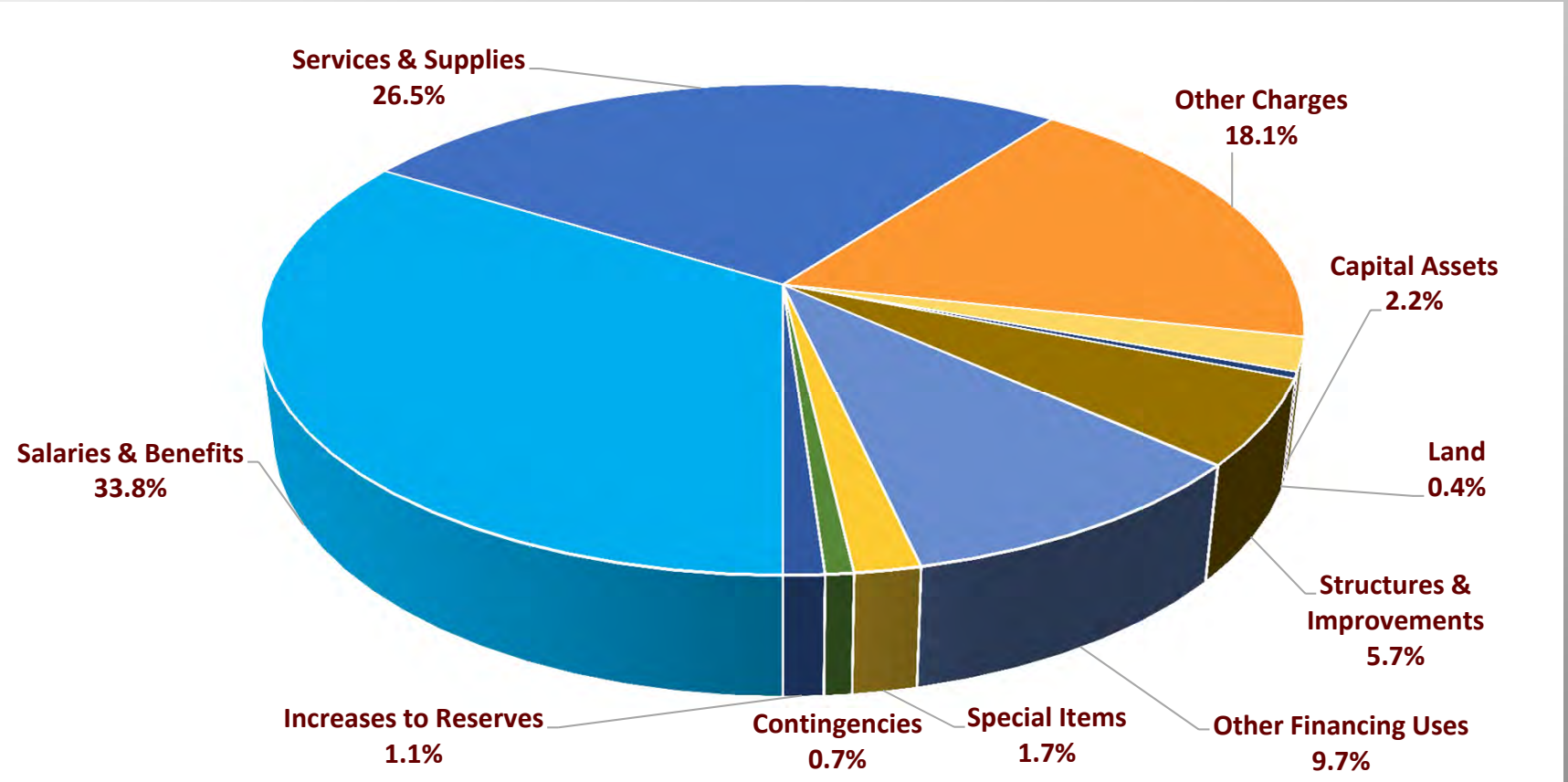
Total County Appropriations by Program

FY 2017-18 Recommended Budget Total = $6.2 Billion



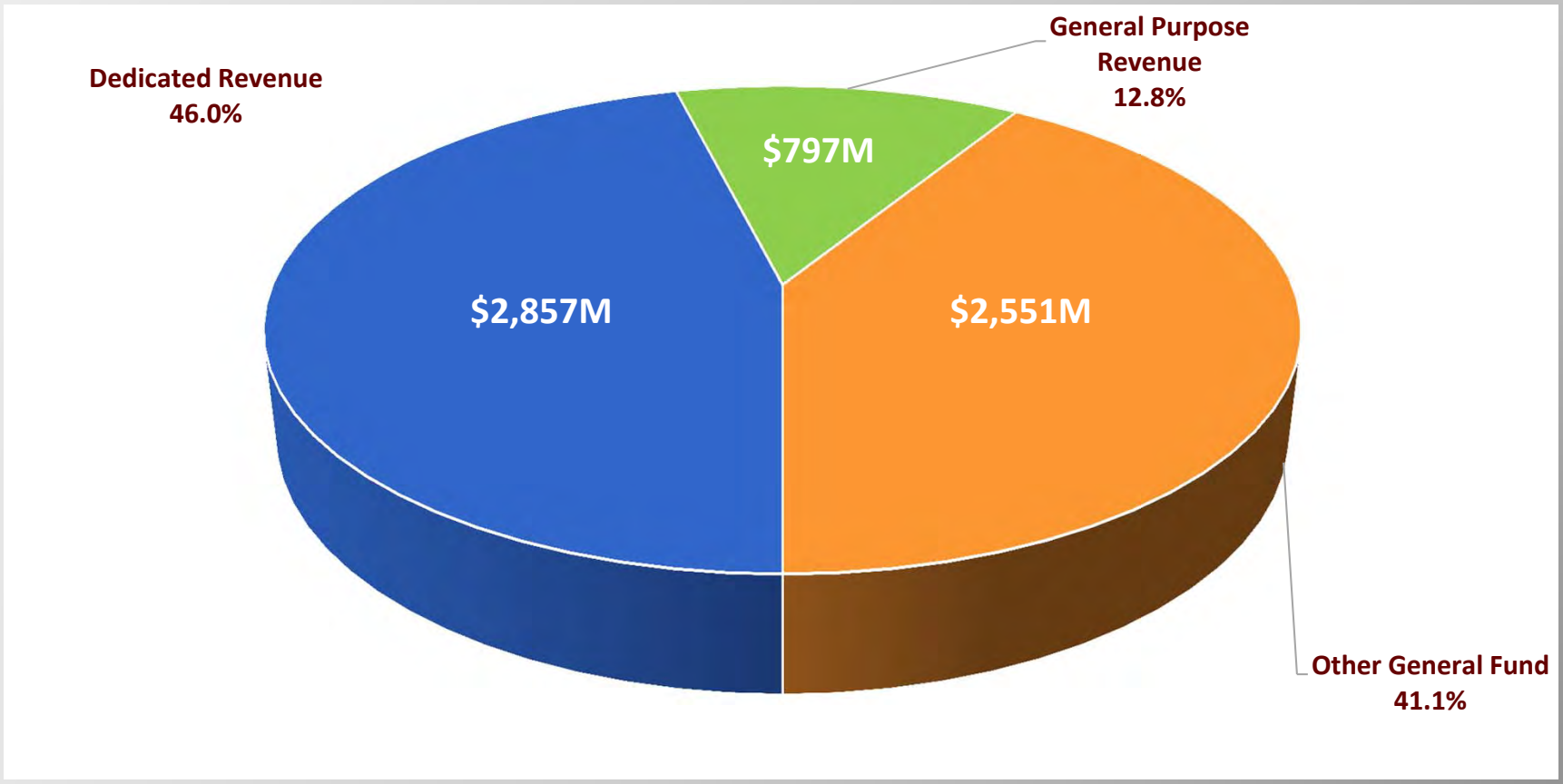
Total County Appropriations by Expenditure Category

FY 2017-18 Recommended Budget Total = $6.2 Billion



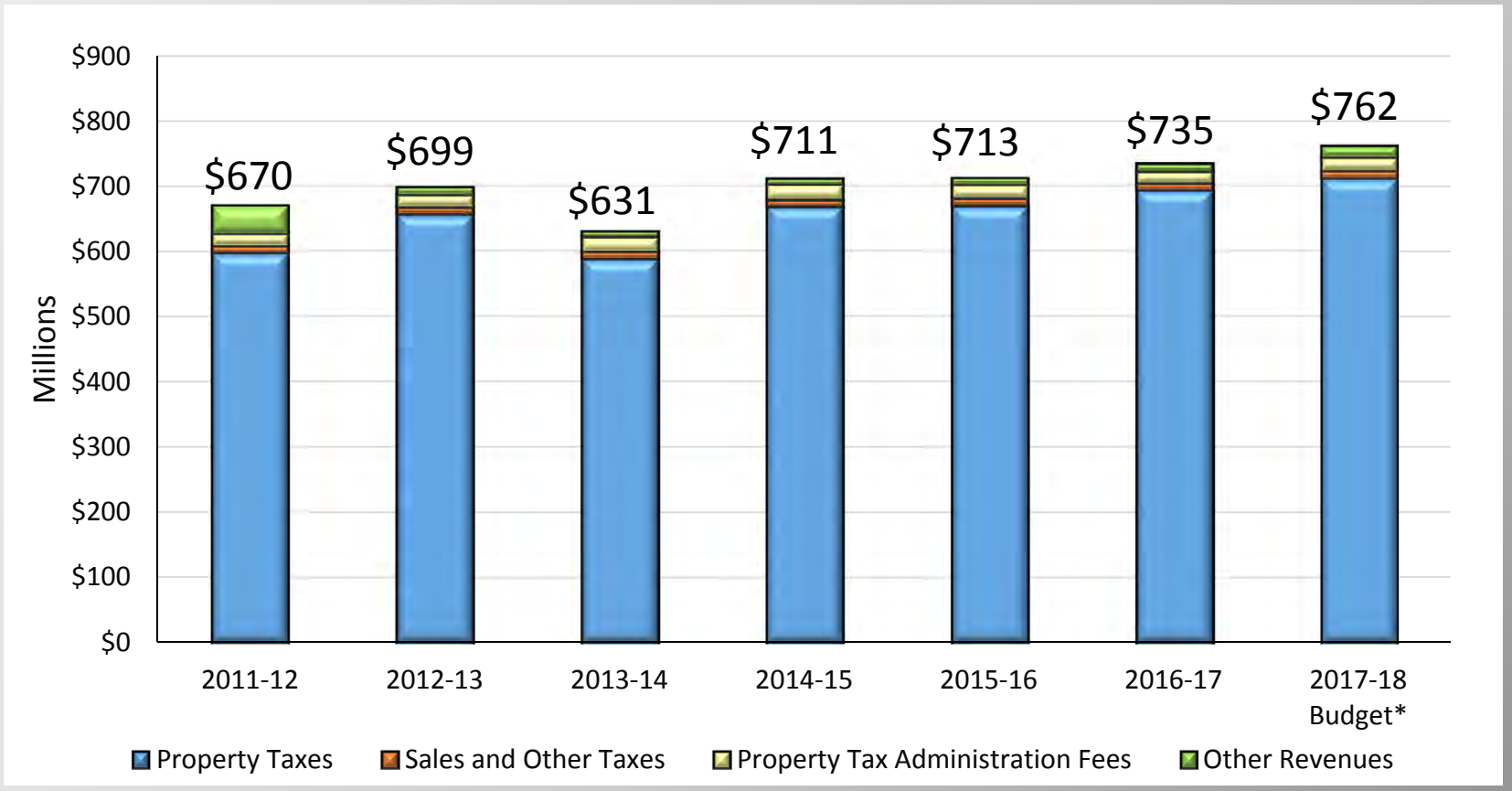
Total County Revenue Budget

FY 2017-18 Recommended Budget Total = $6.2 Billion



General Purpose Revenues (GPR)

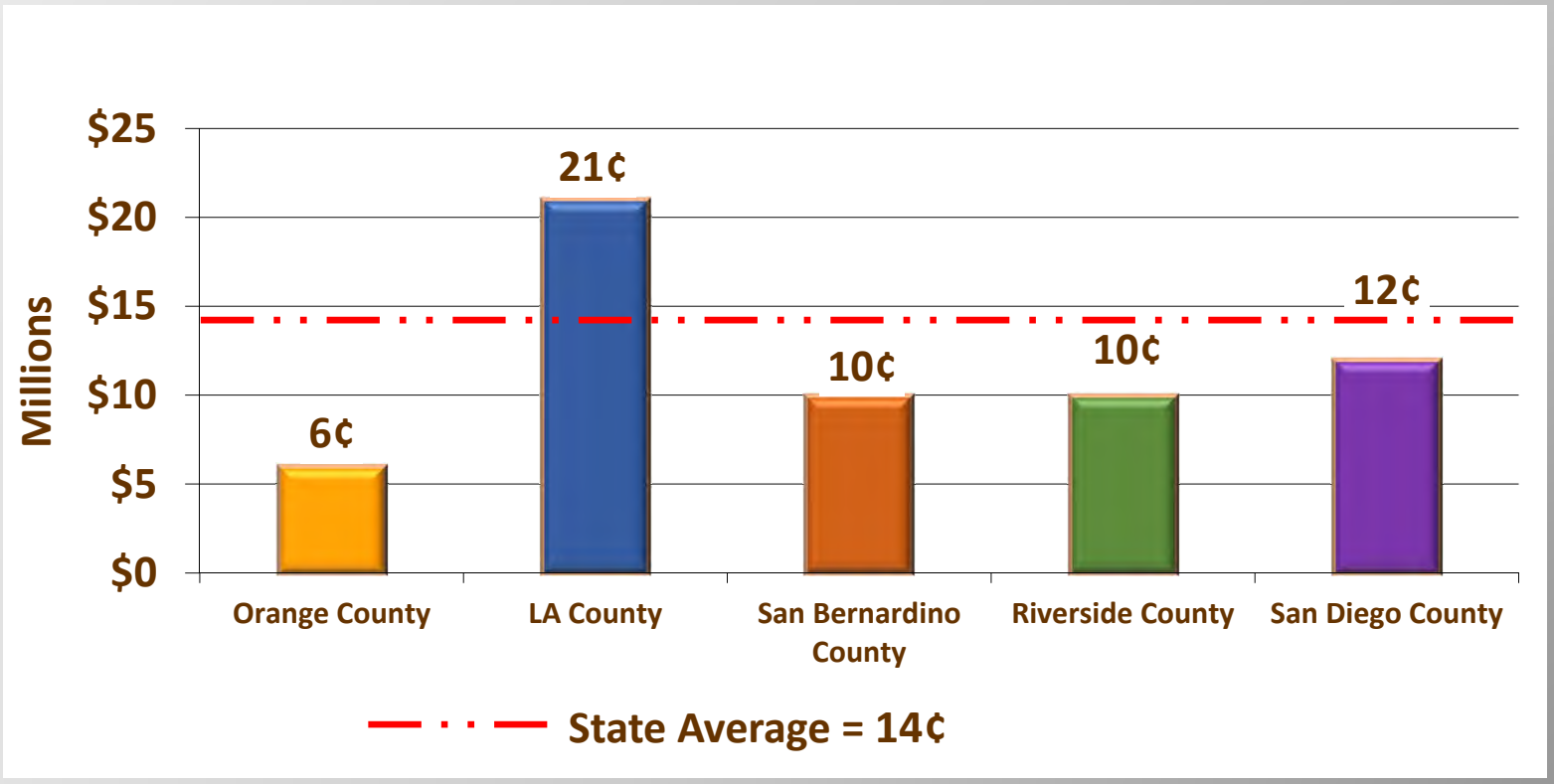
Property Taxes = 94% of Total General Purpose Revenue



*Excludes use of one-time funding sources of $35.2 million ($15.1M for Teeter, $3.9M from Fund 15D, $14.2M from excess bond proceeds and $2M draw from General Fund reserves)

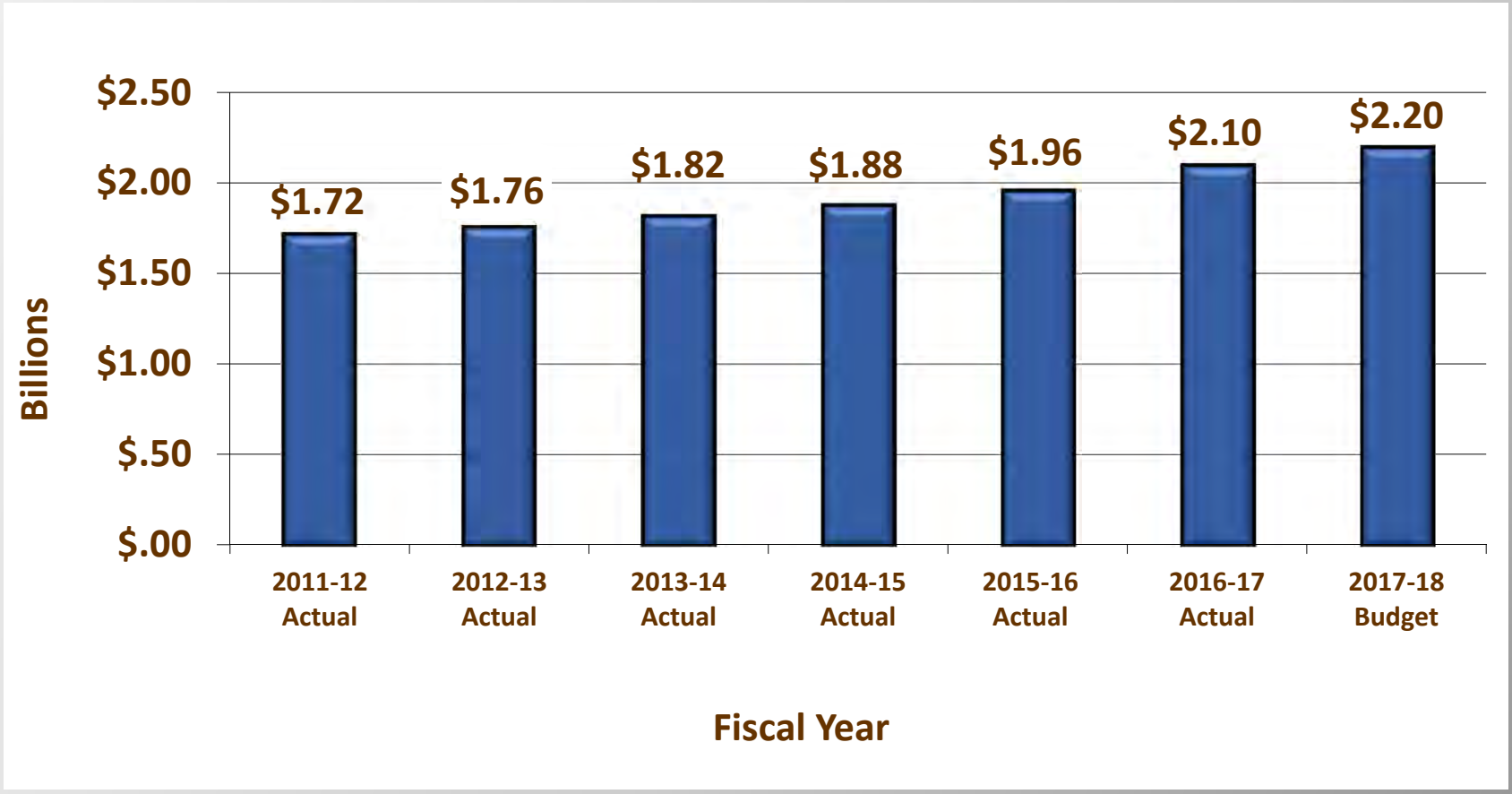
Percent of Property Tax Allocated to County Governments

Orange County Receives the Lowest Property Tax Revenue of All 58 Counties

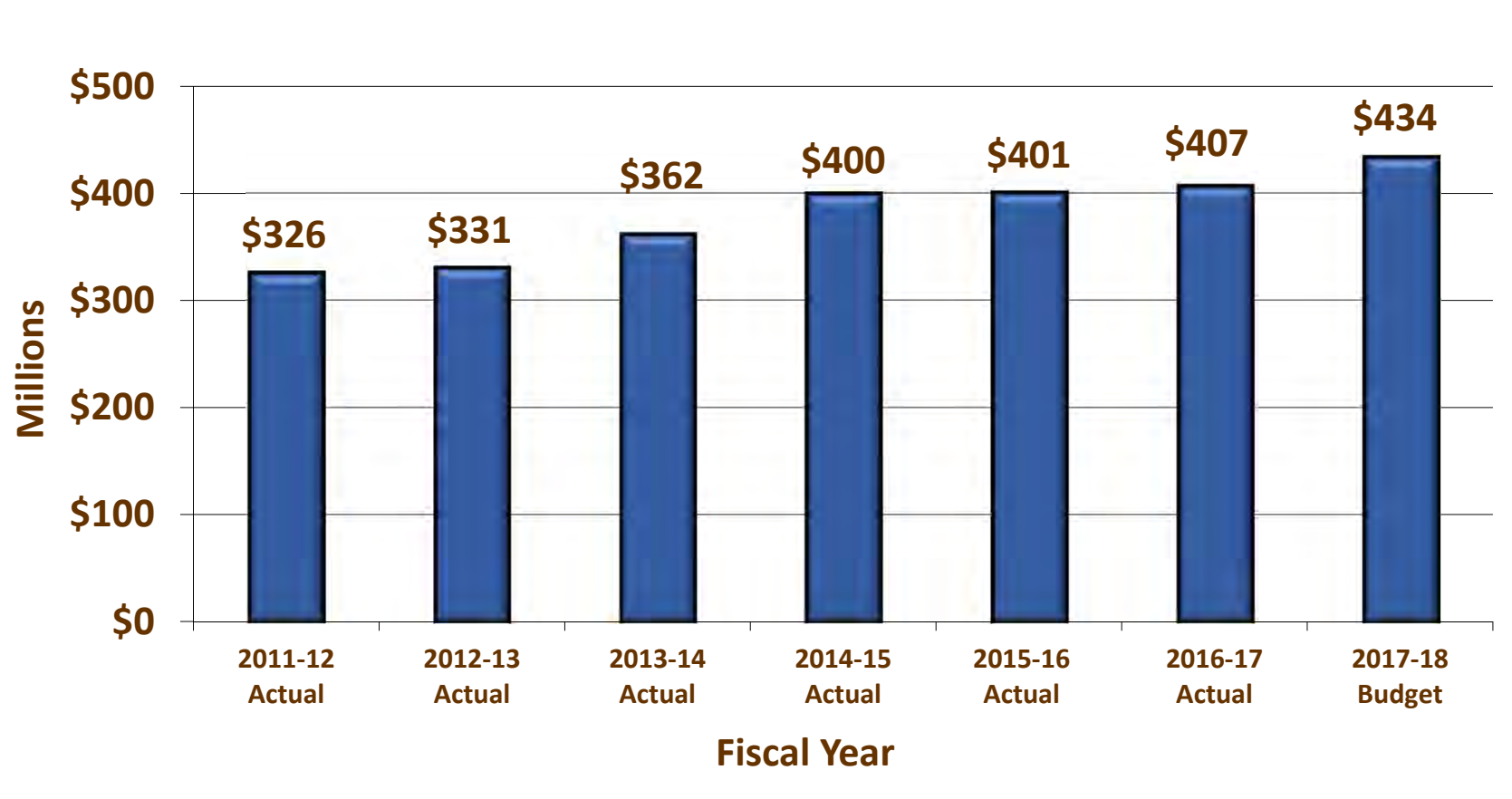


*Source: FY 2015-16 Annual Report Statistical Tables from Board of Equalization Website (https://www.boe.ca.gov/annual/annualrptsarchives.htm)

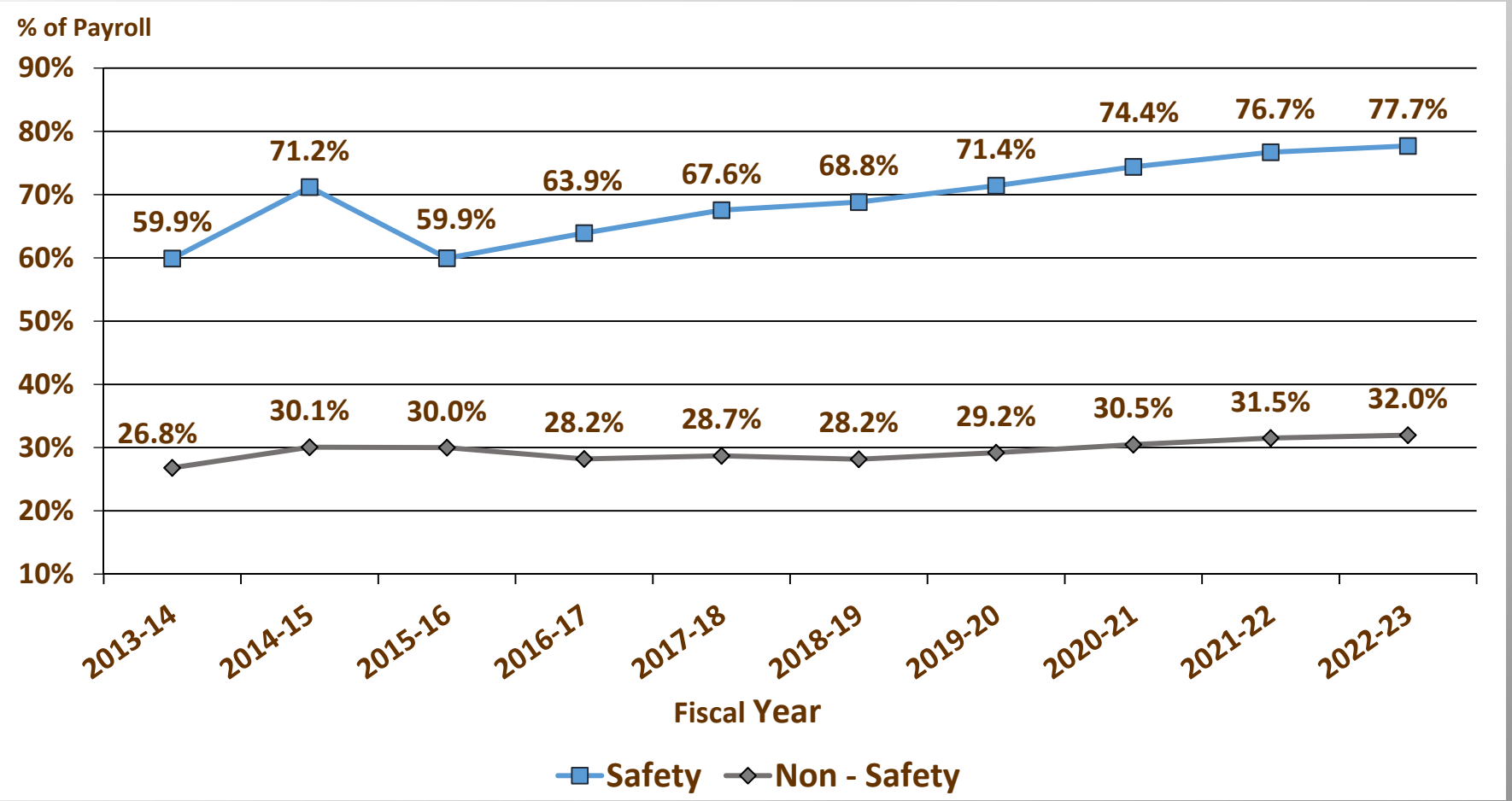
Growing Costs for Salaries and Benefits



Growing Pension Costs

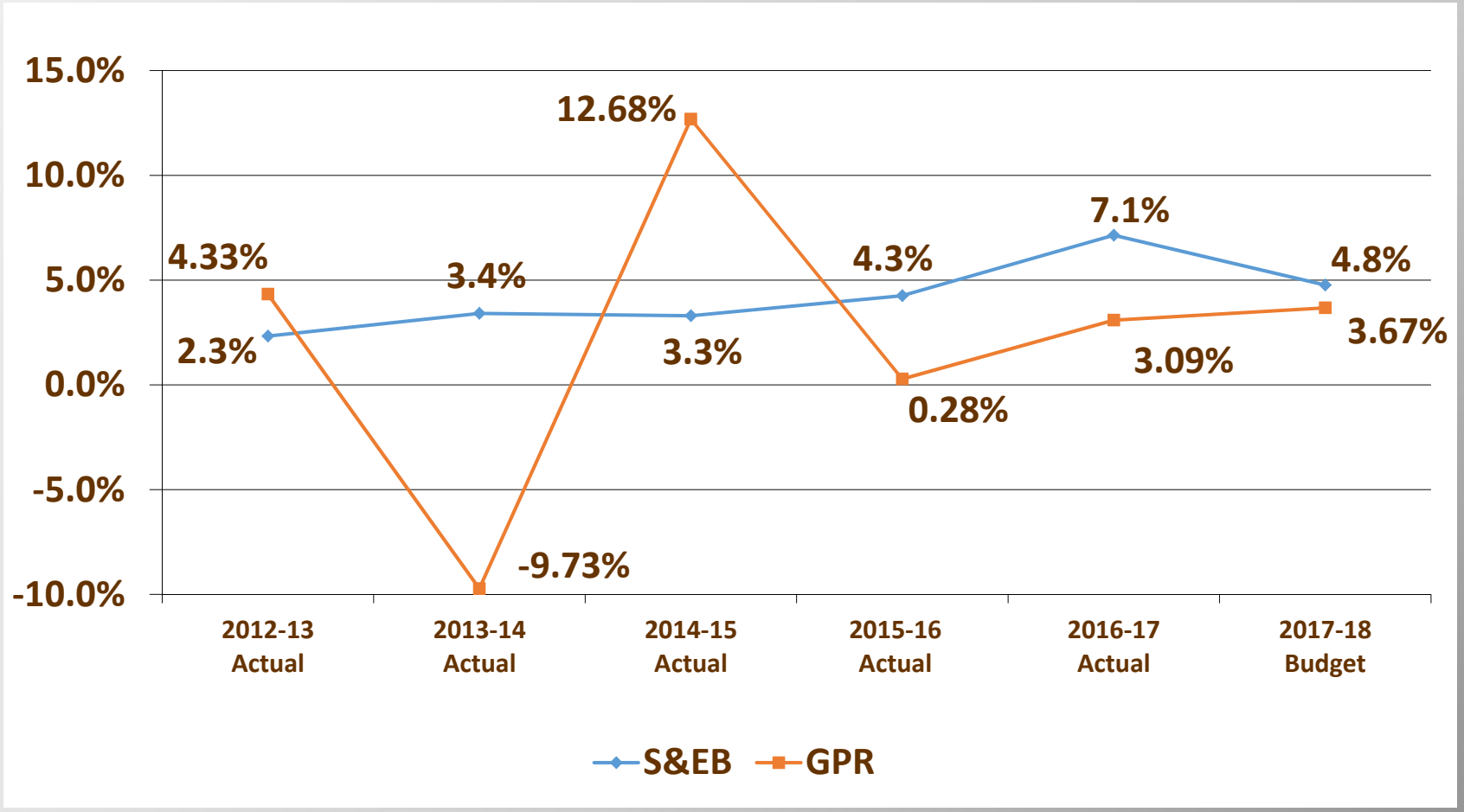


Higher Retirement Rates



Assumption changes result in an estimated additional increase of 4-7% in Year 1 (FY 2019-20)

Growing Costs for Salaries and Employee Benefits (S&EB) vs Growth in GPR



County of Orange

FY 2017-18 Budget Highlights

Board Objectives: Stabilize Budget; Infrastructure; Contingencies

Risks

- State and Federal Budgets
  - IHSS
  - ACA/American Healthcare Act

Reserves and One-Time Funding

- Reserves – Target, Contingency
- VLFAA Payments
- One-time funding

FY 2017-18 Augmentations

Program	Restore Augmentations		Expand Augmentations	
	Requested NCC	Board Approved NCC	Requested NCC	Board Approved NCC
I. Public Protection	$ 52,596,126	$ 33,046,261	$ 8,559,627	$ 7,721,570
II. Community Services	-	-	-	-
III. Infrastructure & Environmental Services	794,503	397,252	291,338	291,338
IV. General Government	1,196,124	667,180	145,000	145,000
V. Capital Improvements	-	-	4,319,366	-
TOTAL	**$ 54,586,753**	**$ 34,110,693**	**$ 13,315,331**	**$ 8,157,908**

General Fund Reserve Balances

In Millions

Reserve Type	June 30, 2016	June 30, 2017
Contingencies	$ 61.3	$ 62.3
Reserve for Operations	148.8	110.0
Reserve for Maintenance, Construction, Capital and Information Technology Projects	63.1	59.6
Teeter Loss Reserve	46.7	46.7
Target Reserve	236.0	336.1
Total GF Reserve Balances	**$555.9**	**$614.7**

Conclusions

Limited Resources for Competing Needs

- Increasing Salaries & Employee Benefits
- Strategic Priorities
- Infrastructure
- Homelessness

Continued Focus on Board Priorities

- Stabilize Budget
- Preparing for Contingencies
- Infrastructure

- **Pension Prepayment to Reduce Costs**
- **Phase-In Changes to Provide Stability**

B

Memorandum

DATE: August 14, 2017

TO: Members of the Board of Retirement

FROM: Steve Delaney, Chief Executive Officer

SUBJECT: **TRIENNIAL REVIEW OF ACTUARIAL ASSUMPTIONS (INFORMATIONAL)**

Every three years OCERS engages the actuary to conduct an experience study. The current process involves comparing assumed to actual experience for the period of January 1, 2014 through December 31, 2016. Such a study often leads to modifications to existing economic and demographic assumptions.

On August 21, 2017, Mr. Paul Angelo of Segal made the first presentation of the results of the current actuarial experience study. His presentation was informational only. Based on questions raised at that August 21, 2017 meeting, and with focus especially on the economic assumptions, Mr. Angelo will share the attached information with the OCERS Board at the September 13, 2017 Strategic Planning Workshop. The Board will take no action on September 13, 2017. The presentation continues to be informational only.

Mr. Angelo will return to the October 16, 2017 meeting of the OCERS Board to present final assumption options and look to the Board to approve the assumptions to be used in the December 31, 2017 actuarial valuation. That valuation will in turn be used to set member and employer contribution rates first effective July 1, 2019.

Submitted by:

Steve Delaney
Chief Executive Officer

Segal Consulting

Orange County Employees Retirement System

2017 Actuarial Experience Study – 2nd Presentation

September 13, 2017

Paul Angelo, FSA

Segal Consulting, San Francisco

5503927v1

OCERS 2017 Review of Actuarial Assumptions

- New assumptions will be used in December 31, 2017 valuation
  - Sets employer and member contributions for 2019 – 2020 fiscal year
- 1st Presentation – August 21, 2017
  - Based on full Experience Study report dated August 14, 2017
  - Discussed all demographic and economic assumptions
- Today's (2nd) Presentation – September 13, 1017
  - Focus on mortality and alternative economic assumptions
  - For alternative economic assumptions, terminology change:
    - "Recommended" is now "Recommendation A"
    - "Alternative 1" is now "Recommendation B"
    - "Alternative 2" is now "Recommendation C"
    - All three are reasonable
  - Includes cost impact by Rate Group (from full report)
  - Includes illustration of phase-in of cost impact
- 3rd presentation – October 17, 2017 – adopt assumptions

Always remember

C + I = B + E

Contributions + Investment Income

equals

Benefit Payments + Expenses

- Actuarial valuation determines the current or "measured" cost, not the ultimate cost
- Assumptions and funding methods affect only the timing of costs
- Desired pattern of cost incidence
  - Good assumptions produce level cost
  - Beware "results based" assumptions
    - Even if assumption selection is "results aware"

Recommendations – Demographic Assumptions

- Retirement rates:
  - Maintain age-based assumptions
  - Overall, slight adjustments to retirement rates
- Termination rates:
  - Decrease in termination rates
  - Decrease assumption for how many members elect a refund
- Disability incidence:
  - Increase assumption overall
    - Decrease assumption for General OCTA members

Setting Demographic Assumptions – Mortality

- Society of Actuaries (SOA) develops tables of mortality rates
  - RP-2000 Combined Healthy Mortality Table
  - RP-2014: Headcount-Weighted vs. Benefit-Weighted
  - Longer life expectancies in each new table
  - NOTE: Segal adjusts standard tables based on OCERS actual experience
- SOA also develops scales to estimate future mortality improvements:
  - Scale AA – Was the standard since around 2000
    - Does not accurately reflect recent improvements in mortality
  - Scale BB – Interim standard scale issued in 2012
  - Scale MP-2014 – Issued in October 2014
  - Scale MP-2015 – Issued in October 2015
  - Scale MP-2016 – Issued in October 2016

Setting Demographic Assumptions – Mortality

- Two ways to use mortality improvement scales to project future mortality improvements: Static or Generational
- Static projection to a future year –
  - To reflect expected mortality at a future date, not as of today
  - Preferable to have a margin of around 20% to be consistent with generational
    - Actual deaths during the study period should be around 20% greater than the expected deaths
  - Current OCERS assumption
    - RP-2000 projected to 2020 with Scale BB
      - For General, with no age adjustment for males or females
      - For Safety, with ages "set back" two years for males and females
    - Provided a roughly 10% margin, which was previously the common practice

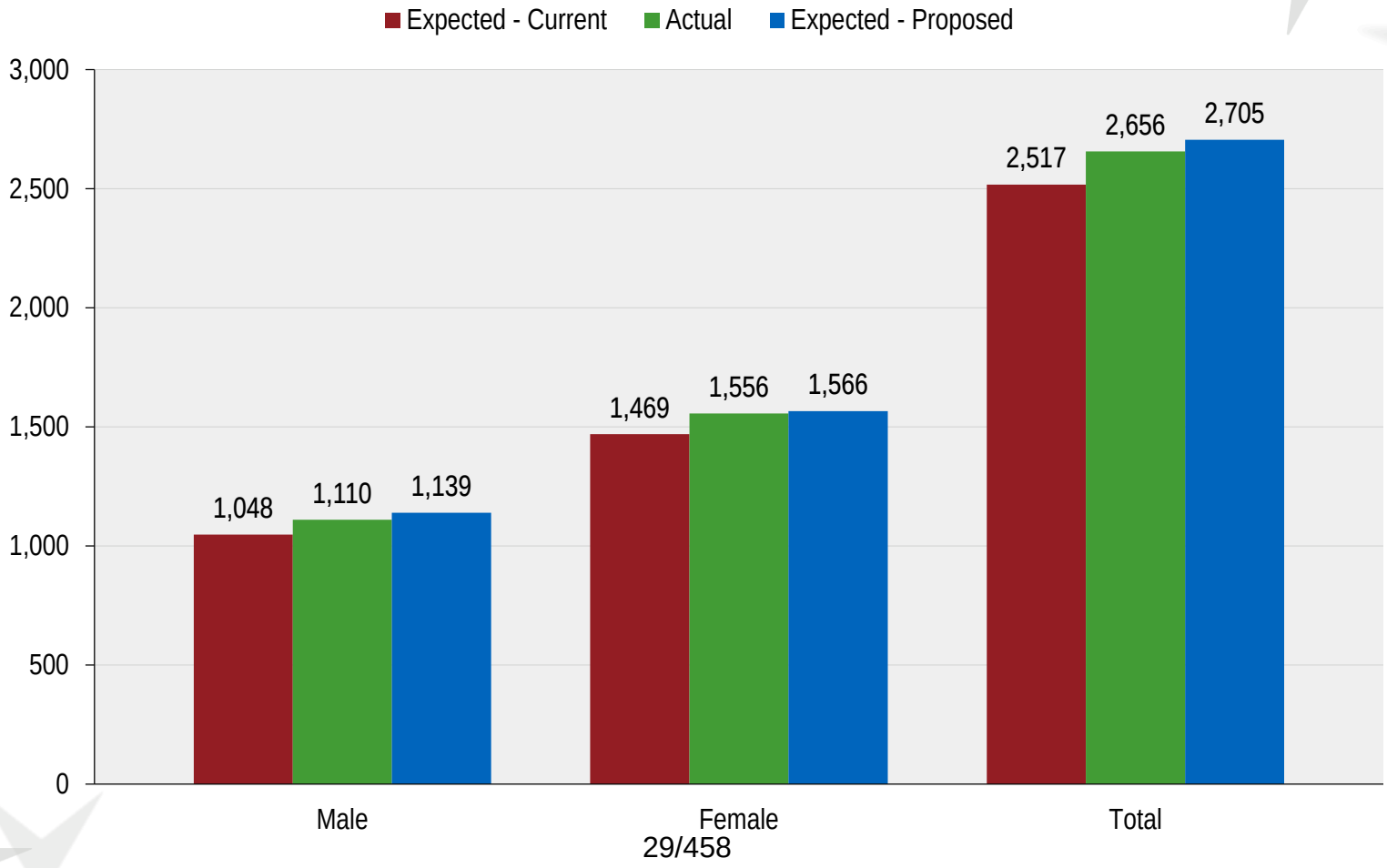
Recommended Demographic Assumptions – Mortality

- Recommend generational mortality
  - Use most recent SOA tables (RP-2014) as a starting point ("base table")
  - Each future year has its own mortality table that reflects the forecasted improvements at every age
    - Probability of dying depends not only on age and sex but also what year it is
    - Younger participants have more future mortality improvement built in than for older participants
    - Current year tables reflect recent actual experience, with no margin
  - Headcount-Weighted RP-2014, projected generationally using the two-dimensional Scale MP-2016
    - For General, no age adjustment for males or females
    - For Safety, ages are set back four years for males and females
- Administrative tables will still use static projection
  - Member contribution rates for legacy tiers, optional benefits and reserve factors
  - Use same base table, with static projection for 20 years
    - Approximates generational mortality

Setting Demographic Assumptions – Mortality Rates

- Mortality Experience from Experience Study

CHART 15: POST-RETIREMENT DEATHS
NON-DISABLED GENERAL MEMBERS AND ALL BENEFICIARIES
(JANUARY 1, 2008 THROUGH DECEMBER 31, 2016)



Cost Impact of Different Mortality Tables

	Employer and Member Combined Contribution Rate Impact
Headcount Weighted RP-2014 Family of Tables – Static Approach WITHOUT Increased Margin (10%)	1.5% of payroll
Headcount Weighted RP-2014 Family of Tables – Static Approach WITH Increased Margin (20%)	3.5% of payroll
Benefit Weighted RP-2014 Family of Tables – Static Approach without Increased Margin	5.1% of payroll
Headcount Weighted RP-2014 Family of Tables – Generational Approach (Recommended)	4.3% of payroll

DISCUSSION

Economic Assumptions

- Price Inflation (CPI):
  - Investment Return, Salary Increases, COLAs
- Salary Increases
  - Wage inflation (or payroll growth)
    - Includes price inflation plus “across the board” real wage growth
  - Promotional & Merit: based on experience
- Investment Return (Investment Earnings)
  - Components include price inflation, real return and investment expenses
  - Generally based on passive returns

Current Economic Assumptions

- Last full review was for December 31, 2014 valuation
  - Price inflation (CPI): 3.00%
  - Wage inflation (includes price inflation plus real wage growth): 3.50%
    - So “across the board” real wage growth is 0.50%
  - Investment return: 7.25%
    - So net real return is 4.25%
    - Assumed return is net of investment and administrative expenses
- New assumptions will be used in December 31, 2017 valuation
  - Sets contributions for 2019 – 2020 fiscal year

Economic Assumptions – Recommendations

- Price inflation (CPI)
  - Maintain at 3.00%
    - Alternative recommendation: decrease from 3.00% to 2.75%
- Salary increases – by component
  - Maintain price inflation component at 3.00%
    - Alternative recommendation: decrease price inflation from 3.00% to 2.75%
  - Maintain "across the board" real wage growth at 0.50%
  - Total wage inflation maintained at 3.50%
    - Alternative recommendation: total wage inflation reduced from 3.50% to 3.25%
  - Merit and promotional: slight increases overall for General and slight decreases overall for Safety
    - Alternative recommendation: slight decrease overall for General and Safety

Economic Assumptions – Alternative Recommendations

- Investment return – depends on inflation component
  - Recommendation A based on 3.00% inflation
    - Recommendation A: Decrease from 7.25% to 7.00%
      - Reduces net real return from 4.25% to 4.00%
  - Recommendations B and C based on 2.75% inflation
    - Recommendation B: Decrease from 7.25% to 7.00%
      - Maintains net real return at 4.25%
    - Recommendation C: Decrease from 7.25% to 6.75%
      - Reduces net real return from 4.25% to 4.00%

Economic Assumptions – Alternative Recommendations

	12/31/2016 Valuation		Recommendation A		Recommendation B		Recommendation C	
	Investment Return	Payroll Growth	Investment Return	Payroll Growth	Investment Return	Payroll Growth	Investment Return	Payroll Growth
Price Inflation	3.00%	3.00%	3.00%	3.00%	2.75%	2.75%	2.75%	2.75%
Real Wages	n/a	0.50%*	n/a	0.50%*	n/a	0.50%*	n/a	0.50%*
Net Real Return	4.25%**	n/a	4.00%**	n/a	4.25%**	n/a	4.00%**	n/a
Total	7.25%**	3.50%*	7.00%**	3.50%*	7.00%**	3.25%*	6.75%**	3.25%*

* Assumed individual salaries increases also include "merit and promotion" component:
- Merit component varies by service
- For General, increase ultimate assumption from 0.75% to 1.00%
- For Safety, maintain ultimate assumption at 1.50%

** Return is net of investment and administrative expense

Price Inflation (CPI)

- Historical Consumer Price Index
  - Median 15-year moving average = 3.4%
  - Median 30-year moving average = 3.9%
  - Averages have been declining due to recent low inflation
- NASRA Survey
  - Median inflation assumption is 3.00%
- Social Security Intermediate Forecast = 2.60%
- Market based inflation expectations = 1.87% (June 2017)
- Recommendation A: maintain at 3.00%
  - Segal's 2017 recommended inflation for all our California public system clients
  - Assumed COLAs remain unchanged (3.00%)
  - Considered but do not recommend stochastic approach to COLA assumption
- Recommendations B and C: decrease inflation to 2.75%
  - Assumed COLAs reduced from 3.00% to 2.75%

Salary Increase Assumption - Recommended

- Three components
- Price inflation Recommendation A: maintain at 3.00%
  - Recommendations B and C: decrease from 3.00% to 2.75%
- "Across the board" real wage growth: maintain at 0.50%
  - Department of Labor: Annual State and Local Government real productivity increase: 0.6% - 0.9% over 10 - 20 years
- Promotional & Merit:
  - Based on years of service
  - General: 9.00% (0-1 years) to 1.00% (16+ years)
    - Small increases for some service categories
  - Safety: 14.00% (0-1 years) to 1.50% (16+ years)
    - Small decreases for some service categories
- Net impact on total assumed future individual salary increases
  - Recommendation A: slight increase for General and slight decrease for Safety
    - Recommendations B and C: slight decrease for both General and Safety

Payroll Growth Assumption

- Active member payroll growth based on wage inflation
  - Assumes constant future active headcount
  - Used to project total payroll for UAAL amortization
- Includes price inflation and "across the board" real wage growth
  - Price inflation Recommendation A: maintain at 3.00%
    - Recommendations B and C: decrease from 3.00% to 2.75%
  - "Across the board" real wage growth: maintain at 0.50%
  - Recommendation A: maintains total payroll growth at 3.50%
    - Recommendations B and C: reduces total payroll growth from 3.50% to 3.25%

Investment Earnings Assumption

- Also called the discount rate, investment return
- Used for contribution requirements and financial reporting
- Affects timing of Plan cost
  - Lower assumed rate means higher current cost
  - Ultimately, actual earnings determine cost
    - **C + I = B + E**
  - "Can't pay benefits with assumed earnings!"
- Four components
  - Inflation: consistent with salary increase and COLA assumption
  - Real returns by asset class
    - Weighted by asset allocation
  - Reduced by assumed investment and administrative expenses
  - Reduced by "risk adjustment"
    - Margin for adverse deviation
    - Expressed as confidence level above 50%

OCERS Earnings Assumption

Preview:
Components of Investment Return Assumption

	Current from 2014 Study	Current, Restated Expenses	Recommendation A	Recommendation B	Recommendation C
Assumed Inflation	3.00%	3.00%	3.00%	2.75%	2.75%
Portfolio Real Rate of Return	5.33%	5.33%	5.27%	5.27%	5.27%
Assumed Expenses	(0.60%)	(0.80%)	(0.80%)	(0.80%)	(0.80%)
Risk Adjustment	(0.48%)	(0.28%)	(0.47%)	(0.22%)	(0.47%)
Assumed Investment Return	7.25%	7.25%	7.00%	7.00%	6.75%
Confidence Level	56%	53%	55%	53%	55%

Real Returns by Asset Class

- Segal uses an average of 8 investment advisory firms retained by Segal public clients
  - Used results from Meketa for asset categories unique to OCERS
- Small decrease in real return is due to a combination of:
  - Changes in the target asset allocation (-0.08%)
  - Changes in real return assumptions in survey (-0.07%)
  - Interaction of these two changes (+0.09%)

OCERS Real Rate of Return

Asset Class	Target Allocation	Real Return	Weighted Return
Global Equity	35.0%	6.38%	2.23%
Core Bonds	13.0%	1.03%	0.13%
High Yield Bonds	4.0%	3.52%	0.14%
Bank Loan	2.0%	2.86%	0.06%
TIPS	4.0%	0.96%	0.04%
Emerging Market Debt	4.0%	3.78%	0.15%
Real Estate	10.0%	4.33%	0.43%
Core Infrastructure	2.0%	5.48%	0.11%
Natural Resources	10.0%	7.86%	0.79%
Risk Mitigation	5.0%	4.66%	0.23%
Mezzanine/Distressed Debts	3.0%	6.53%	0.20%
Private Equity	8.0%	9.48%	0.76%
Total	100.0%		5.27%

Administrative and Investment Expenses ($000s)

Plan Year	Valuation Value of Assets[1]	Administrative Expenses	Investment Expenses	Administrative %	Investment %	Total %
2009	$7,748,380	$10,893	$34,819	0.14	0.45	0.69
2010	8,154,687	12,448	68,027[2]	0.15	0.83	0.98[2]
2011	8,672,592	15,479	39,023	0.18	0.45	0.63
2012	9,064,355	14,295	40,992	0.16	0.45	0.61
2013	9,469,208	14,904	38,759	0.16	0.41	0.57
2014	10,417,125	11,905	41,487	0.11	0.40	0.51
2015	11,449,911	12,521	54,532	0.11	0.48	0.59
2016	12,228,009	16,870	80,810[3]	0.14	0.66	0.80[3]
Last Experience Study Five-Year Average (2009-2013)				0.16	0.52	0.68
Current Experience Study Five-Year Average (2012-2016)				0.14	0.48	0.62

[1] As of the beginning of the plan year.
[2] Included some one-time expenses.
[3] **We understand that this increase reflects a change in how expenses are reported.**

- Based on this experience, we have increased the future total expense component from 0.60% to 0.80%.
  - For comparison purposes, we include 2014 analysis with restated expenses

Risk Adjustment Model and Confidence Level

- Compares OCERS' risk position over time
- Confidence level is a relative, not absolute measure
  - Can be reevaluated and reset for future comparisons
- Confidence level is based on standard deviation
  - Measure of volatility based on portfolio assumptions
- Results should be evaluated for reasonableness

Risk Adjustment Model and Confidence Level

- Most useful for comparing risk position over time
- Confidence level is based on standard deviation
  - Likelihood that actual average 15-year return will exceed investment return assumption

Year Ending December 31	Investment Return Assumption	Risk Adjustment	Confidence Level
2004-2007	7.75%	0.39%	56%
2008-2010	7.75%	0.80%	61%
2011	7.75%	-0.23%	<50%
2012-2013	7.25%	0.34%	55%
2014-2016	7.25%	0.48%	56%
2014-2016 (Restated)	7.25%	0.28%	53%
2017 Recommendation A	7.00%	0.47%	55%
2017 Recommendation B	7.00%	0.22%	53%
2017 Recommendation C	6.75%	0.47%	55%

OCERS Earnings Assumption

Components of Investment Return Assumption

	Current from 2014 Study	Current, Restated Expenses	Recommendation A	Recommendation B	Recommendation C
Assumed Inflation	3.00%	3.00%	3.00%	2.75%	2.75%
Portfolio Real Rate of Return	5.33%	5.33%	5.27%	5.27%	5.27%
Assumed Expenses	(0.60%)	(0.80%)	(0.80%)	(0.80%)	(0.80%)
Risk Adjustment	(0.48%)	(0.28%)	(0.47%)	(0.22%)	(0.47%)
Assumed Investment Return	7.25%	7.25%	7.00%	7.00%	6.75%
Confidence Level	56%	53%	55%	53%	55%

Investment Earnings Assumption - 2017

- Recommendation A: 7.00% with 3.00% inflation
  - Gives confidence level of 55%
  - Inflation maintained at 3.00%
  - Portfolio real return decreased slightly from 5.33% to 5.27%
  - Reported expenses increased from 0.60% to 0.80%
- Recommendation B: 7.00% return with 2.75% inflation
  - Confidence level (53%) consistent with 7.25% in 2014 with restated expenses
- Recommendation C: 6.75% return with 2.75% inflation
  - Confidence level (55%) slightly lower than for 7.25% in 2016 before restated expenses (56%)
- Segal would find any of these sets of assumptions to be reasonable

Investment Earnings Assumption - 2017

- Comparison with other systems
  - National median is 7.50% but continues to trend down nationwide
  - Most common for California county employees retirement systems
    - Nine systems have adopted 7.25%
  - Five California county employees retirement system have adopted 7.00% (Contra Costa, Fresno, Mendocino, Sacramento and Santa Barbara)
    - San Mateo is at 6.75% (with 2.50% inflation)
    - San Diego City system is at 7.00%
    - Both San Jose City systems are at 6.875%
  - CalPERS approved reduction from 7.50% to 7.00% over three years
  - CalSTRS approved reduction from 7.50% to 7.00% over two years

Anticipated Impact on Valuation Results

- Modeled as of December 31, 2016 for illustration

	Recommendation A (7.00% Return & 3.00% Inflation)	Recommendation B (7.00% Return & 2.75% Inflation)	Recommendation C (6.75% Return & 2.75% Inflation)
Impact on Average Employer Contributions			
Change due to demographic assumptions	3.94%	3.94%	3.94%
Change due to economic assumptions	4.00%	0.70%	4.08%
Total change in employer rate	7.94%	4.64%	8.02%
Total estimated change in annual dollar amount ($000s)	$140,411	$80,539	$140,077
Impact on Average Member Contributions			
Change due to demographic assumptions	0.57%	0.57%	0.57%
Change due to economic assumptions	1.04%	0.20%	1.02%
Total change in member rate	1.61%	0.77%	1.59%
Total estimated change in annual dollar amount ($000s)	$28,559	$13,232	$27,567
Impact on UAAL and Funded Percentage			
Change in UAAL	$1,404 million	$763 million	$1,385 million
Change in funded percentage	From 73.1% to 67.7%	From 73.1% to 70.1%	From 73.1% to 67.9%

Cost Impact of Assumption Components

- Economic assumptions are set in “clicks” of 0.25% (25 basis points)
  - Helps to avoid the “illusion of precision”
- Results in “cost clicks” of cost increase (loss) or decrease (gain)
- For lower assumed investment return:
  - Each cost click adds about 4% average employer and 1% average member rate
- For lower assumed price inflation below 3.0%:
  - Each cost click saves about 4% average employer and 1% average member rate
  - Combined effect of lower salary increases and lower COLAs for 3% COLA tiers
- For Rec. A versus Rec. C, these offset each other
- For Rec. B versus Current, there is some net cost increase
  - about 0.7% average employer and 0.2% average member rate
- Note the demographic assumptions add roughly one cost click
  - about 4% average employer and 0.6% average member rate

Estimated Impact on Employer Contributions by Rate Groups -- Recommendation A

➢ **Recommendation A (7.00% Return & 3.00% Inflation)** as of Dec. 31, 2016 for illustration

Increases in Employer Contribution Rates (% of Payroll) under Recommended Assumptions				
Rate Group	**Normal Cost**	**UAAL**	**Total**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	1.87%	3.49%[2]	5.36%	$4,462
Rate Group #2 (County et al.)	1.92%	5.50%	7.42%	$79,640
Rate Group #3 (OCSD)	1.77%	1.06%[3]	2.83%	$1,865
Rate Group #5 (OCTA)	2.02%	5.03%	7.05%	$7,393
Rate Group #9 (TCA)	1.53%	3.22%	4.75%	$325
Rate Group #10 (OCFA)	1.90%	4.42%	6.32%	$1,698
Rate Group #11 (Cemetery)	1.77%	2.71%[4]	4.48%	$63
Rate Group #12 (Law Library)	1.60%	4.39%	5.99%	$71
Rate Group #6 (Probation)	3.20%	9.16%	12.36%	$8,054
Rate Group #7 (Law Enforcement)	2.67%	9.45%	12.12%	$26,599
Rate Group #8 (Fire Authority)	2.09%	6.31%	8.40%	$10,241
Total All Rate Groups Combined	**2.07%**	**5.87%**	**7.94%**	**$140,411**

(1) *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

(2) *Before adjusting for UAAL allotted to U.C.I and Department of Education.*

(3) *The UAAL for Rate Group #3 after reflecting the recommended assumptions has been partially offset by the OCSD UAAL Deferred Account of $34,067,000 as of December 31, 2016. If Rate Group #3 had not been overfunded prior to the changes in assumptions and if the OCSD UAAL Account was not available to offset the change in UAAL due to the changes in assumptions, the UAAL Contribution rate impact due to the changes in assumptions would have been 5.36% of payroll.*

(4) *If Rate Group #11 had not been overfunded prior to the changes in assumptions, the UAAL contribution rate impact due to the changes in assumptions would have been 4.36% of payroll.*

Estimated Impact on Average Member Contributions by Rate Groups -- Recommendation A

- **Recommendation A (7.00% Return & 3.00% Inflation)** as of Dec. 31, 2016 for illustration

Increases in Average Member Contribution Rates (% of Payroll) under Recommended Assumptions				
Rate Group	**Current**	**Proposed**	**Difference**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	8.62%	10.19%	1.57%	$1,310
Rate Group #2 (County et al.)	11.10%	12.58%	1.48%	$15,943
Rate Group #3 (OCSD)	11.52%	12.98%	1.46%	$967
Rate Group #5 (OCTA)	9.35%	10.71%	1.36%	$1,434
Rate Group #9 (TCA)	10.08%	11.43%	1.35%	$93
Rate Group #10 (OCFA)	11.03%	12.59%	1.56%	$420
Rate Group #11 (Cemetery)	8.87%	10.26%	1.39%	$20
Rate Group #12 (Law Library)	13.06%	14.49%	1.43%	$17
Rate Group #6 (Probation)	15.53%	17.81%	2.28%	$1,486
Rate Group #7 (Law Enforcement)	16.39%	18.46%	2.07%	$4,540
Rate Group #8 (Fire Authority)	15.44%	17.35%	1.91%	$2,329
Total All Rate Groups Combined	**12.01%**	**13.62%**	**1.61%**	**$28,559**

[1] *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

Estimated Impact on Employer Contributions by Rate Groups -- Recommendation B

➢ **Recommendation B (7.00% Return & 2.75% Inflation)** as of Dec. 31, 2016 for illustration

Increases in Employer Contribution Rates (% of Payroll) under Recommended Assumptions				
Rate Group	**Normal Cost**	**UAAL**	**Total**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	1.18%	2.30%[2]	3.48%	$2,866
Rate Group #2 (County et al.)	1.08%	3.41%	4.49%	$47,504
Rate Group #3 (OCSD)	0.97%	0.00%[3]	0.97%	$628
Rate Group #5 (OCTA)	1.37%	3.22%	4.59%	$4,756
Rate Group #9 (TCA)	0.88%	1.96%	2.84%	$191
Rate Group #10 (OCFA)	1.08%	2.62%	3.70%	$973
Rate Group #11 (Cemetery)	1.01%	0.99%[4]	2.00%	$28
Rate Group #12 (Law Library)	0.86%	2.83%	3.69%	$44
Rate Group #6 (Probation)	1.93%	5.84%	7.77%	$4,980
Rate Group #7 (Law Enforcement)	1.12%	5.50%	6.62%	$14,169
Rate Group #8 (Fire Authority)	0.63%	3.10%	3.73%	$4,400
Total All Rate Groups Combined	**1.11%**	**3.53%**	**4.64%**	**$80,539**

(1) *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

(2) *Before adjusting for UAAL allotted to U.C.I and Department of Education.*

(3) *The UAAL for Rate Group #3 after reflecting the recommended assumptions has been offset by the OCSD UAAL Deferred Account of $34,067,000 as of December 31, 2016. If Rate Group #3 had not been overfunded prior to the changes in assumptions and if the OCSD UAAL Account was not available to offset the change in UAAL due to the changes in assumptions, the UAAL Contribution rate impact due to the changes in assumptions would have been 2.81% of payroll.*

(4) *If Rate Group #11 had not been overfunded prior to the changes in assumptions, the UAAL contribution rate impact due to the changes in assumptions would have been 2.56% of payroll.*

Estimated Impact on Average Member Contributions by Rate Groups -- Recommendation B

- **Recommendation B (7.00% Return & 2.75% Inflation)** as of Dec. 31, 2016 for illustration

Increases in Average Member Contribution Rates (% of Payroll) under Recommended Assumptions				
Rate Group	**Current**	**Proposed**	**Difference**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	8.62%	9.56%	0.94%	$767
Rate Group #2 (County et al.)	11.10%	11.85%	0.75%	$7,864
Rate Group #3 (OCSD)	11.52%	12.26%	0.74%	$477
Rate Group #5 (OCTA)	9.35%	10.11%	0.76%	$784
Rate Group #9 (TCA)	10.08%	10.79%	0.71%	$48
Rate Group #10 (OCFA)	11.03%	11.86%	0.83%	$216
Rate Group #11 (Cemetery)	8.87%	9.59%	0.72%	$10
Rate Group #12 (Law Library)	13.06%	13.79%	0.73%	$9
Rate Group #6 (Probation)	15.53%	16.53%	1.00%	$627
Rate Group #7 (Law Enforcement)	16.39%	17.16%	0.77%	$1,598
Rate Group #8 (Fire Authority)	15.44%	16.16%	0.72%	$832
Total All Rate Groups Combined	**12.01%**	**12.78%**	**0.77%**	**$13,232**

[1] *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

Estimated Impact on Employer Contributions by Rate Groups -- Recommendation C

- **Recommendation C (6.75% Return & 2.75% Inflation)** as of Dec. 31, 2016 for illustration

Increases in Employer Contribution Rates (% of Payroll) under Recommended Assumptions				
Rate Group	**Normal Cost**	**UAAL**	**Total**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	1.92%	3.48%[2]	5.40%	$4,460
Rate Group #2 (County et al.)	2.01%	5.48%	7.49%	$79,313
Rate Group #3 (OCSD)	1.84%	1.00%[3]	2.84%	$1,851
Rate Group #5 (OCTA)	2.12%	4.99%	7.11%	$7,372
Rate Group #9 (TCA)	1.65%	3.26%	4.91%	$332
Rate Group #10 (OCFA)	1.99%	4.39%	6.38%	$1,691
Rate Group #11 (Cemetery)	1.87%	2.72%[4]	4.59%	$64
Rate Group #12 (Law Library)	1.71%	4.43%	6.14%	$72
Rate Group #6 (Probation)	3.40%	9.17%	12.57%	$8,102
Rate Group #7 (Law Enforcement)	2.87%	9.39%	12.26%	$26,520
Rate Group #8 (Fire Authority)	2.32%	6.27%	8.59%	$10,300
Total All Rate Groups Combined	**2.18%**	**5.84%**	**8.02%**	**$140,077**

(1) *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

(2) *Before adjusting for UAAL allotted to U.C.I and Department of Education.*

(3) *The UAAL for Rate Group #3 after reflecting the recommended assumptions has been partially offset by the OCSD UAAL Deferred Account of $34,067,000 as of December 31, 2016. If Rate Group #3 had not been overfunded prior to the changes in assumptions and if the OCSD UAAL Account was not available to offset the change in UAAL due to the changes in assumptions, the UAAL Contribution rate impact due to the changes in assumptions would have been 5.31% of payroll.*

(4) *If Rate Group #11 had not been overfunded prior to the changes in assumptions, the UAAL contribution rate impact due to the changes in assumptions would have been 4.38% of payroll.*

Estimated Impact on Average Member Contributions by Rate Groups -- Recommendation C

- **Recommendation C (6.75% Return & 2.75% Inflation)** as of Dec. 31, 2016 for illustration

Increases in Average Member Contribution Rates (% of Payroll) under Recommended Assumptions				
Rate Group	**Current**	**Proposed**	**Difference**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	8.62%	10.20%	1.58%	$1,298
Rate Group #2 (County et al.)	11.10%	12.59%	1.49%	$15,733
Rate Group #3 (OCSD)	11.52%	13.00%	1.48%	$960
Rate Group #5 (OCTA)	9.35%	10.71%	1.36%	$1,408
Rate Group #9 (TCA)	10.08%	11.41%	1.33%	$90
Rate Group #10 (OCFA)	11.03%	12.59%	1.56%	$412
Rate Group #11 (Cemetery)	8.87%	10.24%	1.37%	$19
Rate Group #12 (Law Library)	13.06%	14.50%	1.44%	$17
Rate Group #6 (Probation)	15.53%	17.66%	2.13%	$1,361
Rate Group #7 (Law Enforcement)	16.39%	18.33%	1.94%	$4,160
Rate Group #8 (Fire Authority)	15.44%	17.21%	1.77%	$2,109
Total All Rate Groups Combined	**12.01%**	**13.60%**	**1.59%**	**$27,567**

[1] *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

Possible Phase-In of Cost Impact of Assumption Changes

- Many systems (including OCERS) have managed the impact of assumption changes on employers by phasing in the cost impact.
  - Over two or three years (i.e., no longer than until the next experience study)
  - Some increase in employer cost for contributions not made during phase-in
    - Next slide illustrates the additional cost of the phase-in
  - Member rate changes are not phased in
    - Smaller impact (Normal Cost only, not UAAL cost)
    - Cost of phase-in would be shifted to employers
- In 2016 OCERS adopted a three-year phase-in of the cost impact of all assumption changes for the Safety Cost Groups
- Recently some California systems have phased-in only the UAAL contribution rate impact, and not the Normal Cost impact
  - PEPRA tier members pay one-half the Normal Cost and member rate impact is not phased in
  - In Employer Rate Impact table, phase-in only the UAAL portion, not the Normal Cost

Illustration of the Cost to Phase-In Contribution Rate Impact

Fiscal Year		Without Phase-in	With Two-year Phase-in	With Three-year Phase-in
2019/20		6.00%	3.00%	2.00%
2020/21		6.00%	6.20%	4.30%
2021/22 and later		6.00%	6.20%	6.40%

Segal Consulting

Orange County Employees Retirement System

ACTUARIAL EXPERIENCE STUDY

Analysis of Actuarial Experience
During the Period
January 1, 2014 through December 31, 2016

Segal Consulting

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T 415.263.8200 www.segalco.com

August 14, 2017

Board of Retirement
Orange County Employees Retirement System
2223 Wellington Avenue
Santa Ana, CA 92701

Re: Review of Actuarial Assumptions for the December 31, 2017 Actuarial Valuation

Dear Members of the Board:

We are pleased to submit this report of our review of the actuarial experience for the Orange County Employees Retirement System. This study utilizes the census data for the period January 1, 2014 to December 31, 2016 and provides the proposed actuarial assumptions, both economic and demographic, to be used in the December 31, 2017 valuation.

We are members of the American Academy of Actuaries and we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein.

We look forward to reviewing this report with you and answering any questions you may have.

Sincerely,

Paul Angelo, FSA, MAAA, FCA, EA
Senior Vice President and Actuary

Andy Yeung, ASA, MAAA, FCA, EA
Vice President and Actuary

EK/jl

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Table of Contents

Actuarial Experience Study
Analysis of Actuarial Experience
During the Period January 1, 2014 through December 31, 2016

I. Introduction, Summary, and Recommendations

To project the cost and liabilities of the pension plan, assumptions are made about all future events that could affect the amount and timing of the benefits to be paid and the assets to be accumulated. Each year actual experience is compared against the projected experience, and to the extent there are differences, the future contribution requirement is adjusted.

If assumptions are modified, contribution requirements are adjusted to take into account a change in the projected experience in all future years. There is a great difference in both philosophy and cost impact between recognizing the actuarial deviations as they occur annually and changing the actuarial assumptions. Taking into account one year's gains or losses without making a change in the assumptions means that year's experience is treated as temporary and that, over the long run, experience will return to what was originally assumed. Changing assumptions reflects a basic change in thinking about the future, and it has a much greater effect on the current contribution requirements than recognizing gains or losses as they occur.

The use of realistic actuarial assumptions is important in maintaining adequate funding, while paying the promised benefit amounts to participants already retired and to those near retirement. The actuarial assumptions used do not determine the "actual cost" of the plan. The actual cost is determined solely by the benefits and administrative expenses paid out, offset by investment income received. However, it is desirable to estimate as closely as possible what the actual cost will be so as to permit an orderly method for setting aside contributions today to provide benefits in the future, and to maintain equity among generations of participants and taxpayers.

This study was undertaken in order to review the economic and demographic actuarial assumptions and to compare the actual experience with that expected under the current assumptions during the three-year experience period from January 1, 2014 through December 31, 2016. The study was performed in accordance with Actuarial Standard of Practice (ASOP) No. 27 "Selection of Economic Assumptions for Measuring Pension Obligations" and ASOP No. 35, "Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations." These Standards of Practice put forth guidelines for the selection of the various actuarial assumptions utilized in a pension plan actuarial valuation. Based on the study's results and expected future experience, we are recommending various changes in the current actuarial assumptions.

We are recommending changes in the assumptions for investment return, salary increases, retirement from active employment, retirement age for inactive vested members, reciprocity, pre-retirement mortality, post-retirement healthy and disabled life mortality, termination (refunds and deferred vested retirements), disability (non-service connected and service connected) and additional cashouts.

Our recommendations for the major actuarial assumption categories are as follows, along with reasonable alternative economic assumptions also developed in this report.

Pg #	Actuarial Assumption Categories	Recommendation
6	Inflation: Future increases in the Consumer Price Index (CPI), which drives investment returns and active member salary increases, as well as cost-of-living adjustments (COLAs) for retirees.	Maintain the assumed rate of price inflation at 3.00% per annum as discussed in Section III (A). Alternative: Reduce price inflation to 2.75% per annum.
10	Investment Return: The estimated average future net rate of return on current and future assets of the System as of the valuation date. This rate is used to discount liabilities.	Reduce the current investment return assumption from 7.25% per annum to 7.00% per annum as discussed in Section III (B). Alternative 1: 7.00% investment return with 2.75% inflation. Alternative 2: 6.75% investment return with 2.75% inflation.
17	Individual Salary Increases: Increases in the salary of a member between the date of the valuation to the date of separation from active service. This assumption has three components: • Inflationary salary increases • Real "across the board" salary increases • Merit and promotional increases	Maintain the current inflationary salary increase assumption at 3.00% and maintain the current real "across the board" salary increase assumption at 0.50%. This means that the combined inflationary and real "across the board" salary increases will remain unchanged at 3.50%. Alternative: 2.75% inflation and 3.25% combined inflationary and real "across the board" salary increases. We recommend adjusting the merit and promotional rates of salary increase as developed in Section III (C) to reflect past experience. The recommended assumptions anticipate slightly higher salary increases for General and slightly lower salary increases for Safety.
24	Retirement Rates: The probability of retirement at each age at which participants are eligible to retire. Other Retirement Related Assumptions including: • Percent married and spousal age differences for members not yet retired • Retirement age for inactive vested members • Future reciprocal members and reciprocal salary increases	We recommend adjusting the retirement rates to those developed in Section IV (A). For active and inactive vested members, increase the percent married at retirement assumption for females from 50% to 55% and maintain the assumption at 75% for males. For inactive vested members, increase the assumed retirement age from 58 to 59 for General members and maintain the assumed retirement age at 53 for Safety members. Reduce the current proportion of future terminated members expected to be covered by a reciprocal system from 20% to 15% for General members and from 30% to 25% for Safety members. In addition, increase the current reciprocal salary increase assumption from 4.25% to 4.50% for General members and maintain the current reciprocal salary increase assumption at 5.00% for Safety members.

Pg #	Actuarial Assumption Categories	Recommendation
39 46	Mortality Rates: The probability of dying at each age. Mortality rates are used to project life expectancies.	For members who retire from service, we recommend adjusting the rates as developed in Section IV (B) for General and Safety members and all beneficiaries to reflect a generational approach for anticipating future mortality improvement. The disabled member mortality rates for General and Safety members have also been adjusted as developed in Section IV (C). The recommended pre-retirement mortality assumptions for General and Safety members have been adjusted as developed in Section IV (B). In addition, we recommend maintaining the assumption that all General pre-retirement deaths and 90% of Safety pre-retirement deaths are assumed to be non-service connected deaths.
49	Termination Rates: The probability of leaving employment at each age and receiving either a refund of member contributions or a deferred vested retirement benefit.	We recommend adjusting the termination rates to those developed in Section IV (D) to reflect a slightly lower incidence of termination for General All Other (non-OCTA) members, General OCTA members and Safety members. In addition, a lower proportion of members is expected to elect a withdrawal of member contributions with a higher proportion electing instead to receive a deferred vested benefit under the recommended assumptions.
55	Disability Incidence Rates: The probability of becoming disabled at each age.	We recommend adjusting the disability rates to those developed in Section IV (E) to reflect slightly higher incidence of disability for General All Other and Safety members and slightly lower incidence of disability for General OCTA members.
59	Additional Cashouts: Additional pay elements that are expected to be received during the member's final average earnings period.	We recommend adjusting the additional cashout assumptions to those developed in Section IV (F) to reflect recent years' experience.

We have estimated the impact of the recommended and alternative assumption changes as if they were applied to the December 31, 2016 actuarial valuation.

Cost Impact of Recommended Assumptions		
Change in Costs	**Contribution Rate**	**Estimated Annual Dollar Amount in Thousands***
Total Normal Cost	3.68%	$65,260
Member Normal Cost	1.61%	$28,559
Employer Normal Cost	2.07%	$36,701
Employer UAAL Payments	5.87%	$103,710
Total for Employer	7.94%	$140,411

* *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

Cost Impact of Alternative 1 Assumptions (7.00% Investment Return Assumption & 2.75% Inflation)		
Change in Costs	**Contribution Rate**	**Estimated Annual Dollar Amount in Thousands***
Total Normal Cost	1.88%	$32,321
Member Normal Cost	0.77%	$13,232
Employer Normal Cost	1.11%	$19,089
Employer UAAL Payments	3.53%	$61,450
Total for Employer	4.64%	$80,539

* *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

Cost Impact of Alternative 2 Assumptions (6.75% Investment Return Assumption & 2.75% Inflation)		
Change in Costs	**Contribution Rate**	**Estimated Annual Dollar Amount in Thousands***
Total Normal Cost	3.77%	$65,566
Member Normal Cost	1.59%	$27,567
Employer Normal Cost	2.18%	$37,999
Employer UAAL Payments	5.84%	$102,078
Total for Employer	8.02%	$140,077

* *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

The breakdown of the contribution impacts due only to the recommended demographic assumption changes (as recommended in Section IV of this report) and the contribution rate impacts (after implementing the demographic assumption changes) due to the recommended and alternative economic assumption changes (as recommended in Section III of this report), as well as the changes in funded status, are summarized in the following table.

Cost Impact			
	Recommended (7.00% Return & 3.00% Inflation)	**Alternative 1 (7.00% Return & 2.75% Inflation)**	**Alternative 2 (6.75% Return & 2.75% Inflation)**
Impact on Employer			
Change due to demographic assumptions	3.94%	3.94%	3.94%
Change due to economic assumptions	4.00%	0.70%	4.08%
Total change in employer rate	7.94%	4.64%	8.02%
Total estimated change in annual dollar amount ($000s)	$140,411	$80,539	$140,077
Impact on Member			
Change due to demographic assumptions	0.57%	0.57%	0.57%
Change due to economic assumptions	1.04%	0.20%	1.02%
Total change in member rate	1.61%	0.77%	1.59%
Total estimated change in annual dollar amount ($000s)	$28,559	$13,232	$27,567
Impact on UAAL and Funded Percentage			
Change in UAAL	$1,404 million	$763 million	$1,385 million
Change in funded percentage	From 73.1% to 67.7%	From 73.1% to 70.1%	From 73.1% to 67.9%

Section II provides some background on the basic principles and methodology used for the experience study and for the review of the economic and demographic actuarial assumptions. A detailed discussion of each assumption and reasons for the proposed changes are found in Section III for the economic assumptions and Section IV for the demographic assumptions. The cost impact of the proposed changes is detailed in Section V.

II. Background and Methodology

In this report, we analyzed both economic and demographic ("non-economic") assumptions. The primary economic assumptions reviewed are inflation, investment return, and salary increases. Demographic assumptions include the probabilities of certain events occurring in the population of members, referred to as "decrements," e.g., termination from service, disability retirement, service retirement, and death before and after retirement. In addition to decrements, other demographic assumptions reviewed in this study include the percentage of members with an eligible spouse or domestic partner, spousal age difference, percentage of members assumed to go on to work for a reciprocal system, reciprocal salary increases and additional cashouts.

Economic Assumptions

Economic assumptions consist of:

- **Inflation:** Increases in the price of goods and services. The inflation assumption reflects the basic return that investors expect from securities markets. It also reflects the expected basic salary increase for active employees and drives increases in the allowances of retired members.

- **Investment Return:** Expected long-term rate of return on the System's investments after expenses. This assumption has a significant impact on contribution rates.

- **Salary Increases:** In addition to inflationary increases, it is assumed that salaries will also grow by "across the board" real pay increases in excess of price inflation. It is also assumed that employees will receive raises above these average increases as they advance in their careers. These are commonly referred to as merit and promotional increases. Payments to amortize any Unfunded Actuarial Accrued Liability (UAAL) are assumed to increase each year by the price inflation rate plus any "across the board" real pay increases that are assumed.

The setting of these economic assumptions is described in Section III.

Demographic Assumptions

In order to determine the probability of an event occurring, we examine the "decrements" and "exposures" of that event. For example, taking termination from service, we compare the number of employees who actually terminate in a certain age and/or service category (i.e., the number of "decrements") with those who could have terminated (i.e., the number of "exposures"). For example, if there were 500 active employees in the 20-24 age group at the beginning of the year and 50 of them terminate during the year, we would say the probability of termination in that age group is 50 ÷ 500 or 10%.

The reliability of the resulting probability is highly dependent on both the number of decrements and the number of exposures. For example, if there are only a few people in a high age category at the beginning of the year (number of exposures), we would not lend as much credibility to the

probability of termination developed for that age category, especially if it is out of line with the pattern shown for the other age groups. Similarly, if we are considering the death decrement, there may be a large number of exposures in, say, the age 20-24 category, but very few decrements (actual deaths); therefore, we would not be able to rely heavily on the probability developed for that category.

One reason we use several years of experience for such a study is to have more exposures and decrements, and therefore more statistical reliability. Another reason for using several years of data is to smooth out fluctuations that may occur from one year to the next. However, we also calculate the rates on a year-to-year basis to check for any trend that may be developing in the later years.

III. Economic Assumptions

A. Inflation

Unless an investment grows at least as fast as prices increase, investors will experience a reduction in the inflation-adjusted value of their investment. There may be times when "riskless" investments return more or less than inflation, but over the long term, investment market forces will generally require an issuer of fixed income securities to maintain a minimum return which protects investors from inflation.

The inflation assumption is long term in nature, so our analysis included a review of historical information. Following is an analysis of 15 and 30 year moving averages of historical inflation rates:

HISTORICAL CONSUMER PRICE INDEX – 1930 TO 2016[1]
(U.S. City Average - All Urban Consumers)

	25th Percentile	Median	75th Percentile
15-year moving averages	2.5%	3.4%	4.5%
30-year moving averages	3.1%	3.9%	4.8%

The average inflation rates have continued to decline gradually over the last several years due to the relatively low inflationary period over the past two decades. Also, the later of the 15-year averages during the period are lower as they do not include the high inflation years of the mid-1970s and early 1980s.

Based on information found in the Public Plans Data website, which is produced in partnership with the National Association of State Retirement Administrators (NASRA), the median inflation assumption used by 142 large public retirement funds in their 2015 fiscal year valuations was 3.00%. In California, San Mateo County uses an inflation assumption of 2.50%, CalPERS, CalSTRS, Contra Costa County, Los Angeles County, and two other 1937 Act CERL systems use an inflation assumption of 2.75%, San Joaquin County uses an inflation assumption of 2.90% while OCERS and eleven other 1937 Act CERL systems use an inflation assumption of 3.00%.

OCERS' investment consultant, Meketa, anticipates an annual inflation rate of 2.60%, while the average inflation assumption provided by Meketa and seven other investment advisory firms retained by Segal's California public sector clients was 2.32%. Note that, in general, investment consultants use a time horizon[2] for this assumption that is shorter than the time horizon of the actuarial valuation.

[1] Source: Bureau of Labor Statistics – Based on CPI for All items in U.S. city average, all urban consumers, not seasonally adjusted (Series Id: CUUR0000SA0)

[2] After removing an outlier, the time horizon used by the remaining seven investment consultants included in our review range from 10 years to 30 years. Most of those investment consultants use 10 years and Meketa uses 20 years.

To find a forecast of inflation based on a longer time horizon, we referred to the 2017 report on the financial status of the Social Security program.[3] The projected average increase in the Consumer Price Index (CPI) over the next 75 years under the intermediate cost assumptions used in that report was 2.60%. (Besides projecting the results under the intermediate cost assumptions using an inflation of 2.60%, alternative projections were also made using a lower and a higher inflation assumption of 2.00% and 3.20%, respectively.)

We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds.[4] As of June 2017, the difference in yields is about 1.87%, which provides a measure of market expectations of inflation.

Based on all of the above information, we recommend that the current 3.00% annual inflation assumption be maintained for the December 31, 2017 actuarial valuation.

The setting of the inflation assumption using the information outlined above is a somewhat subjective process, and Segal does not apply a specific weight to each of the metrics in determining our recommended inflation assumption. Based on a consideration of all these metrics, we have recently been recommending the same 3.00% inflation assumption in our experience studies for our California based public retirement system clients.

However, we note that the metrics presented above could also lead to a lower inflation assumption, and that in particular Segal would find 2.75% to be a reasonable inflation assumption. As discussed on the previous page of this report, several large California public retirement systems have recently adopted a 2.75% inflation assumption in their valuations, including one system (Contra Costa County ERA) that is a Segal client.

Retiree Cost of Living Increases

In the last valuation, as of December 31, 2016, consistent with the 3.00% annual inflation assumption used by the Board for that valuation, the Board used a 3.00% cost-of-living adjustment for all retirees.

Consistent with our recommended inflation assumptions, we also recommend maintaining the current assumptions to value the post-retirement cost-of-living adjustments (COLA).

In developing the COLA assumption, we also considered the results of a stochastic approach that would attempt to account for the possible impact of low inflation that could occur before COLA banks are able to be established for the member. Although the results of this type of analysis might justify the use of a lower COLA assumption, we are not recommending that at this time. The reasons for this conclusion include the following:

- The results of the stochastic modeling are significantly dependent on assuming that lower levels of inflation will persist in the early years of the projections. If this is not assumed, then the stochastic modeling will produce results similar to our proposed COLA assumptions.

[3] Source: Social Security Administration – The 2017 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds

[4] Source: Board of Governors of the Federal Reserve System

- Using a lower long-term COLA assumption based on a stochastic analysis would mean that an actuarial loss would occur even when the inflation assumption of 3.00% is met in a year. We question the reasonableness of this result.

We do not see the stochastic possibility of COLAs averaging less than those predicted by the assumed rate of inflation as a reliable source of cost savings that should be anticipated in our COLA assumptions. Therefore, we continue to recommend setting the COLA assumptions based on the long-term annual inflation assumption, as we have in prior years.

B. Investment Return

The investment return assumption is comprised of two primary components, inflation and real rate of investment return, with adjustments for expenses and risk.

Real Rate of Investment Return

This component represents the portfolio's incremental investment market returns over inflation. Theory has it that as an investor takes a greater investment risk, the return on the investment is expected to also be greater, at least in the long run. This additional return is expected to vary by asset class and empirical data supports that expectation. For that reason, the real rate of return assumptions are developed by asset class. Therefore, the real rate of return assumption for a retirement association's portfolio will vary with the Board's asset allocation among asset classes.

The following is the System's current target asset allocation and the assumed real rate of return assumptions by asset class. The first column of real rate of return assumptions are determined by reducing Meketa's total or "nominal" 2017 return assumptions by their assumed 2.60% inflation rate. The second column of returns (except for Core Infrastructure, Natural Resources, Risk Mitigation, Mezzanine/Distressed Debts and Private Equity) represents the average of a sample of real rate of return assumptions. The sample includes the expected annual real rate of return provided to us by Meketa and seven other investment advisory firms retained by Segal's public sector clients. We believe these averages are a reasonable consensus forecast of long-term future market returns in excess of inflation.[5]

[5] Note that, just as for the inflation assumption, in general the time horizon used by the investment consultants in determining the real rate of return assumption is shorter than the time horizon encompassed by the actuarial valuation.

OCERS' TARGET ASSET ALLOCATION AND ASSUMED ARITHMETIC REAL RATE OF RETURN ASSUMPTIONS BY ASSET CLASS AND FOR THE PORTFOLIO

Asset Class	Percentage of Portfolio	Meketa' Assumed Real Rate of Return[6]	Average Assumed Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients[7]
Global Equity	35.0%	7.11%	6.38%
Core Bonds	13.0%	0.98%	1.03%
High Yield Bonds	4.0%	4.18%	3.52%
Bank Loan	2.0%	3.40%	2.86%
TIPS	4.0%	1.18%	0.96%
Emerging Market Debt	4.0%	3.99%	3.78%
Real Estate	10.0%	5.92%	4.33%
Core Infrastructure	2.0%	5.48%	5.48%[8]
Natural Resources	10.0%	7.86%	7.86%[8]
Risk Mitigation	5.0%	4.66%	4.66%[8]
Mezzanine/Distressed Debts	3.0%	6.53%	6.53%[8]
Private Equity	8.0%	9.48%	9.48%[8]
Total	**100.0%**	**5.73%**	**5.27%**

The above are representative of "indexed" returns and do not include any additional returns ("alpha") from active management. This is consistent with the Actuarial Standard of Practice No. 27, Section 3.6.3.d, which states:

> "Investment Manager Performance - Anticipating superior (or inferior) investment manager performance may be unduly optimistic (or pessimistic). The actuary should not assume that superior or inferior returns will be achieved, net of investment expenses, from an active investment management strategy compared to a passive investment management strategy unless the actuary believes, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the measurement period."

The following are some observations about the returns provided above:

1. The investment consultants to our California public sector clients have each provided us with their expected real rates of return for each asset class, over various future periods of time. However, in general, the returns available from investment consultants are projected over time periods shorter than the durations of a retirement plan's liabilities.

2. Using a sample average of expected real rate of returns allows the System's investment return assumption to reflect a broader range of capital market information and should help reduce year to year volatility in the investment return assumption.

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[6] Derived by reducing Meketa's nominal rate of return assumptions by their assumed 2.60% inflation rate.

[7] These are based on the projected arithmetic returns provided by Meketa and seven other investment advisory firms serving the county retirement system of Orange and 16 other city and county retirement systems in California. These return assumptions are gross of any applicable investment expenses.

[8] For these asset classes, Meketa's assumption is applied in lieu of the average because there is a larger disparity in returns for these asset classes among the firms surveyed and using Meketa's assumption should more closely reflect the underlying investments made specifically for OCERS.

3. Therefore, we recommend that the 5.27% portfolio real rate of return be used to determine the System's investment return assumption. This is 0.06% lower than the return that was used three years ago in the review to prepare the recommended investment return assumption for the December 31, 2014 valuation. The difference is due to changes in the System's target asset allocation (-0.08%), changes in the real rate of return assumptions provided to us by the investment advisory firms (-0.07%) and the interaction effect between these changes (+0.09%).

System Expenses

For funding purposes, the real rate of return assumption for the portfolio needs to be adjusted for investment and administrative expenses expected to be paid from investment income. The following table provides the investment and administrative expenses in relation to the actuarial value of assets for the five years ending December 31, 2016.

ADMINISTRATIVE AND INVESTMENT EXPENSES AS A PERCENTAGE OF VALUATION VALUE OF ASSETS (Dollars in 000's)

Plan Year	Valuation Value of Assets[9]	Administrative Expenses	Investment Expenses[10]	Administrative %	Investment %	Total %
2009	$7,748,380	$10,893	$34,819	0.14	0.45	0.59
2010	8,154,687	12,448	68,027[11]	0.15	0.83	0.98[11]
2011	8,672,592	15,479	39,023	0.18	0.45	0.63
2012	9,064,355	14,295	40,992	0.16	0.45	0.61
2013	9,469,208	14,904	38,759	0.16	0.41	0.57
2014	10,417,125	11,905	41,487	0.11	0.40	0.51
2015	11,449,911	12,521	54,532	0.11	0.48	0.59
2016	12,228,009	16,870	80,810[12]	0.14	0.66	0.80[12]
Last Experience Study Five-Year Average (2009 – 2013)				0.16	0.52	0.68
Current Experience Study Five-Year Average (2012 – 2016)				0.14	0.48	0.62
					Recommendation	0.80

The average administrative and investment expenses percentage over this five-year period in the current experience study is 0.62% of the valuation value of assets (over the five-year period in the last experience study, that average was 0.68%). However, the total expenses percentage went up to 0.80% for plan year 2016 when the "at-source" investment managed fees started to be disclosed in the financial statements instead of being treated as a reduction in the investment

[9] As of beginning of plan year.

[10] Net of securities lending expenses. Because we do not assume any additional net return for this program, we effectively assume that any securities lending expenses will be offset by related income.

[11] We understand that the 2010 investment expenses included some one-time expenses such as foreign tax expense that is expected to be offset by future tax reclaim.

[12] Per OCERS, the increase in the investment expenses for plan year 2016 is primarily due to the reporting of the "at-source" investment management fees in the financial statement that were previously netted against the investment returns.

returns. Taking into account how the investment expenses are reported starting with the 2016 plan year, we believe that it is reasonable to increase the future expense component from 0.60% used in the last review in 2014 to 0.80%.

We understand that this increase reflects a change in how expensed are reported, and not an increase in the level of actual expenses. This means that, for comparison purposes, it may be helpful to consider a restatement of our 2014 analysis reflecting the higher 0.80% expense component. We have included those restated values in the analysis that follows.

Note related to investment expenses paid to active managers – As cited above, under Section 3.6.3.d of ASOP No. 27, the effect of an active investment management strategy should be considered "net of investment expenses…unless the actuary believes, based on relevant data, that such superior or inferior returns represent a reasonable expectation over the measurement period." For OCERS, nearly all of the investment expenses were paid for expenses associated with active managers.

We have not performed a detailed analysis to measure how much of the investment expenses paid to active managers might have been offset by additional returns ("alpha") earned by that active management. However, we observed based on information provided in the CAFR that the total fund return on a net of investment expense basis was lower than the policy benchmark by about 0.6% over the last five years. We will work with the System's staff to determine whether future studies might potentially exclude the level of investment expenses for active managers that are expected to be offset by investment returns. For now, we will continue to use the current approach that any "alpha" that may be identified would be treated as an increase in the risk adjustment and corresponding confidence level. For example, 0.25% of alpha would increase the confidence level by 3% (see discussions that follow on definitions of risk adjustment and confidence level).

Risk Adjustment

The real rate of return assumption for the portfolio is adjusted to reflect the potential risk of shortfalls in the return assumptions. The System's asset allocation determines this portfolio risk, since risk levels are driven by the variability of returns for the various asset classes and the correlation of returns among those asset classes. This portfolio risk is incorporated into the real rate of return assumption through a risk adjustment.

The purpose of the risk adjustment (as measured by the corresponding confidence level) is to increase the likelihood of achieving the actuarial investment return assumption in the long term.[13] The 5.27% expected real rate of return developed earlier in this report was based on expected mean or average arithmetic returns. This means there is a 50% chance of the actual return in each year being at least as great as the average (assuming a symmetrical distribution of future returns). The risk adjustment is intended to increase that probability somewhat above the 50% level. This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not. Note that, based on the investment return assumptions recently adopted by systems that have been analyzed under this model, we observe a confidence level generally in the range of 50% to 60%.

[13] This type of risk adjustment is sometimes referred to as a "margin for adverse deviation."

Three years ago, the Board adopted an investment return assumption of 7.25%. That return implied a risk adjustment of 0.48%, reflecting a confidence level of 56% that the actual average return over 15 years would not fall below the assumed return, assuming that the distribution of returns over that period follows the normal statistical distribution.[14]

In our model, the confidence level associated with a particular risk adjustment represents the likelihood that the actual average return would equal or exceed the assumed value over a 15-year period. For example, if we set our real rate of return assumption using a risk adjustment that produces a confidence level of 60%, then there would be a 60% chance (6 out of 10) that the average return over 15 years will be equal to or greater than the assumed value. The 15-year time horizon represents an approximation of the "duration" of the fund's liabilities, where the duration of a liability represents the sensitivity of that liability to interest rate variations.

If we use the same 56% confidence level from our last study to set this year's risk adjustment, based on the current long-term portfolio standard deviation of 12.95% provided by Meketa, the corresponding risk adjustment would be 0.51%. Together with the other investment return components, this would result in an investment return assumption of 6.96%, which is lower than the current assumption of 7.25%.

Based on the general practice of using one-quarter percentage point increments for economic assumptions, we evaluated the effect on the confidence level of other alternative investment return assumptions. In particular, a net investment return assumption of 7.00%, together with the other investment return components, would produce a risk adjustment of 0.47%, which corresponds to a confidence level of 55%. This is slightly lower than the confidence level of 56% used in OCERS' last study for the December 31, 2014 valuation. This analysis supports reducing the current assumption from 7.25% to 7.00%. Note that this comparison does not reflect any restatement of the 2014 analysis for higher reported investment expenses.

The table below shows OCERS' investment return assumptions and for the years when this analysis was performed, the risk adjustments and corresponding confidence levels compared to the values for prior studies. For comparison purposes we have included values for 2014-2016 both as originally developed and after restatement for higher reported investment expenses. For any given investment return assumption, higher expenses will mean a lower risk adjustment and so a lower confidence level. As shown below, with an expense component of 0.80% instead of 0.60% the 2014-2016 investment return of 7.25% would have had a confidence level of 53% rather than 56%.

[14] Based on an annual portfolio return standard deviation of 12.30% provided by the prior investment consultant in 2014. Strictly speaking, future compounded long-term investment returns will tend to follow a log-normal distribution. However, we believe the Normal distribution assumption is reasonable for purposes of setting this type of risk adjustment.

HISTORICAL INVESTMENT RETURN ASSUMPTIONS, RISK ADJUSTMENTS AND CONFIDENCE LEVELS BASED ON ASSUMPTIONS ADOPTED BY THE BOARD

Year Ending December 31	Investment Return	Risk Adjustment	Corresponding Confidence Level
2004 - 2007	7.75%	0.39%	56%
2008 - 2010	7.75%	0.80%	61%
2011	7.75%	-0.23%	<50%
2012 - 2013	7.25%	0.34%	55%
2014 - 2016	7.25%	0.48%	56%
2014 - 2016 (restated)	7.25%	0.28%	53%
2017 (Recommended)	7.00%	0.47%	55%

As we have discussed in prior experience studies, the risk adjustment model and associated confidence level is most useful as a means for comparing how the System has positioned itself relative to risk over periods of time.[15] The use of a 55% confidence level should be considered in context with other factors, including:

- As noted above, the confidence level is more of a relative measure than an absolute measure, and so can be reevaluated and reset for future comparisons.
- The confidence level is based on the standard deviation of the portfolio that is determined and provided to us by Meketa. The standard deviation is a statistical measure of the future volatility of the portfolio and so is itself based on assumptions about future portfolio volatility and can be considered somewhat of a "soft" number.
- A confidence level of 55% is within the range of about 50% to 60% that corresponds to the risk adjustments used by most of Segal's other California public retirement system clients. Most public retirement systems that have recently reviewed their investment return assumptions have seen decreases in their confidence level even though they adopted more conservative investment return assumptions for their valuations.
- As with any model, the results of the risk adjustment model should be evaluated for reasonableness and consistency. This is discussed in the later section on "Comparison with Other Public Retirement Systems".

Taking into account the factors above, our recommendation is to reduce the net investment return assumption from 7.25% to 7.00%. As noted above, this return implies a 0.47% risk adjustment, reflecting a confidence level of 55% that the actual average return over 15 years would not fall below the assumed return.

[15] In particular, it would not be appropriate to use this type of risk adjustment as a measure of determining an investment return rate that is "risk-free."

Recommended Investment Return Assumption

The following table summarizes the components of the investment return assumption developed in the previous discussion. For comparison purposes, we have also included similar values from the last study, both before and after restatement for higher reported investment expenses.

CALCULATION OF NET INVESTMENT RETURN ASSUMPTION

	Recommended Value	Restated Expenses	Adopted Value
Assumption Component	**December 31, 2017**	**December 31, 2014**	**December 31, 2014**
Inflation	3.00%	3.00%	3.00%
Plus Average Real Rate of Return	5.27%	5.33%	5.33%
Minus Expense Adjustment	(0.80%)	(0.80%)	(0.60%)
Minus Risk Adjustment	(0.47%)	(0.28%)	(0.48%)
Total	**7.00%**	**7.25%**	**7.25%**
Confidence Level	**55%**	**53%**	**56%**

Based on this analysis, our recommended investment return assumption is a decrease from 7.25% to 7.00% per annum to maintain a confidence level associated with this assumption at a level consistent with values developed in prior reviews of this assumption.

Comparing with Other Public Retirement Systems

One final test of the recommended investment return assumption is to compare it against those used by other public retirement systems, both in California and nationwide.

We note that a 7.00% investment return assumption is becoming more common among California public sector retirement systems. In particular, five County employees retirement systems (Contra Costa, Fresno, Mendocino, Sacramento and Santa Barbara) use a 7.00% earnings assumption. Furthermore, the CalPERS Board has approved a reduction in the earnings assumption from 7.50% to 7.00% over the next three years. In addition, CalSTRS recently adopted a 7.25% earnings assumption for the 2016 valuation (down from 7.50%) and a 7.00% earnings assumption for the 2017 valuation.

The following table compares OCERS' recommended net investment return assumption against those of the nationwide public retirement systems that participated in the National Association of State Retirement Administrators (NASRA) 2016 Public Fund Survey for 142 large public retirement funds in their 2015 fiscal year valuations:

		NASRA 2016 Public Fund Survey[16]		
Assumption	**OCERS**	**Low**	**Median**	**High**
Net Investment Return	7.00%	4.29%	7.50%	8.50%

The detailed survey results show that more than one-half of the systems have an investment return assumption in the range of 6.75% to 7.75%, and over half of those systems have used an

[16] Public Plans Data website – Produced in partnership with the National Association of State Retirement Administrators (NASRA)

assumption of 7.50%. The survey also notes that several plans have reduced their investment return assumption during the last year. State systems outside of California tend to change their economic assumptions less frequently and so may lag behind emerging practices in this area.

In summary, we believe that both the risk adjustment model and other considerations indicate a lower earnings assumption. The recommended assumption of 7.00% provides for a risk margin within the risk adjustment model consistent with recent OCERS practice, and it is consistent with OCERS' current practice relative to other public systems.

Alternative Economic Assumptions

As we noted above in our discussion of the inflation assumption, the metrics presented in that section could also lead to an inflation assumption lower that our recommended 3.00%, and in particular Segal would find 2.75% to be a reasonable inflation assumption. In this section we present for the Board's consideration alternative investment return assumptions based on an inflation component of 2.75%.

We note that several California public retirement systems have lowered their inflation assumptions at the same time that they lowered their investment return assumptions. Whether this results in more conservative or more aggressive assumptions depends on the change in the real return, i.e., the difference between the two assumptions. We have analyzed two sets of alternative economic assumptions in the table below.

ALTERNATIVE INFLATION AND INVESTMENT RETURN ASSUMPTIONS

Assumption Component	Recommended 7.00% Investment 3.00% Inflation	Alternative 1 7.00% Investment 2.75% Inflation	Alternative 2 6.75% Investment 2.75% Inflation
Inflation	3.00%	2.75%	2.75%
Plus Portfolio Real Rate of Return	5.27%	5.27%	5.27%
Minus Expense Adjustment	(0.80%)	(0.80%)	(0.80%)
Minus Risk Adjustment	(0.47%)	(0.22%)	(0.47%)
Total	**7.00%**	**7.00%**	**6.75%**
Confidence Level	**55%**	**53%**	**55%**

Segal would find any of these three sets of economic assumptions to be reasonable.

C. Salary Increase

Salary increases impact plan costs in two ways: (i) by increasing members' benefits (since benefits are a function of the members' highest average pay) and future normal cost collections; and (ii) by increasing total active member payroll which in turn generates lower UAAL contribution rates. The components of the salary increase assumption are discussed below.

As an employee progresses through his or her career, increases in pay are expected to come from three sources:

1. **Inflation:** Unless pay grows at least as fast as consumer prices grow, employees will experience a reduction in their standard of living. There may be times when pay increases lag or exceed inflation, but over the long term, labor market forces will require an employer to maintain its employees' standards of living.

   As discussed earlier in this report, we are recommending that the assumed rate of inflation be maintained at 3.00% per annum. This inflation component is used as part of the salary increase assumption.

2. **Real "Across the Board" Pay Increases:** These increases are typically termed productivity increases since they are considered to be derived from the ability of an organization or an economy to produce goods and services in a more efficient manner. As that occurs, at least some portion of the value of these improvements can provide a source for pay increases. These increases are typically assumed to extend to all employees "across the board". The State and Local Government Workers Employment Cost Index produced by the Department of Labor provides evidence that real "across the board" pay increases have averaged about 0.6% - 0.9% annually during the last ten to twenty years.

   We also referred to the annual report on the financial status of the Social Security program published in July 2017. In that report, real "across the board" pay increases are forecast to be 1.2% per year under the intermediate assumptions.

   The real pay increase assumption is generally considered a more "macroeconomic" assumption, that is not necessarily based on individual plan experience. We note that the actual pay increases over the past five years were less than CPI increases, as shown below. However, this recent experience may not be a credible predictor of future experience.

Valuation Date	Actual Average Pay Increase[17]	Actual Change in CPI[18]
December 31, 2012	0.03%	2.04%
December 31, 2013	-0.83%	1.08%
December 31, 2014	2.22%	1.35%
December 31, 2015	-1.22%	0.91%
December 31, 2016	6.66%	1.89%
Average[19]	**1.37%**	**1.45%**

   Considering these factors, we recommend maintaining the real "across the board" salary increase assumption at 0.50%. This means that the combined inflation and "across the board" salary increase assumption will remain unchanged at 3.50%.

   Note that under the alternative 2.75% inflation assumption, the combined inflation and "across the board" salary increase assumption would decrease from 3.50% to 3.25%.

[17] Reflects the increase in average salary for members at the beginning of the year versus those at the end of the year. It does not reflect the average salary increases received by members who worked the full year.

[18] Based on the change in the Annual CPI for the Los Angeles-Riverside-Orange County area compared to the prior year.

[19] In the last experience study, the actual average increased in salary was 1.56% while the actual average change in CPI was 1.24% during the five-year period ending on December 31, 2013.

3. **Merit and Promotional Increases:** As the name implies, these increases come from an employee's career advances. This form of pay increase differs from the previous two, since it is specific to the individual. For OCERS, there are service-specific merit and promotional increases.

   The annual merit and promotional increases are determined by measuring the actual increases received by members over the experience period, net of the inflationary and real "across the board" pay increases. Increases are measured separately for General and Safety members. This is accomplished by:

   a. Measuring each continuing member's actual salary increase over each year of the experience period;

   b. Excluding any members with large increases (in the case of OCERS, we have excluded increases greater than 50%) or any decreases during any particular year;

   c. Categorizing these increases according to member demographics;

   d. Removing the wage inflation component from these increases (assumed to be equal to the increase in the members' average salary during the year);

   e. Averaging these annual increases over the three-year experience period; and

   f. Modifying current assumptions to reflect some portion of these measured increases reflective of their "credibility."

   To be consistent with the other economic assumptions, these merit and promotional assumptions should be used in combination with the 3.50% assumed inflation and real "across the board" increases.

   The following table shows the General members' actual average merit and promotional increases by years of service over the three-year period from January 1, 2014 through December 31, 2016 along with the actual average increases based on combining the current three-year period with the three years from the prior experience study. The current and proposed assumptions are also shown. The actual average total salary increases for the most recent three-year period were reduced by the actual average inflation plus "across the board" increase (i.e., wage inflation, estimated as the increase in average salaries) for each year over the current three-year experience period (2.4% on average).

GENERAL
MERIT AND PROMOTIONAL INCREASES
(Actual vs. Proposed Assumption)

	Rate (%)			
Years of Service	Current Assumption	Actual Average Increase (Last 3 Years)	Actual Average Increase from Current and Prior Study	Proposed Assumption
Less than 1	10.00	6.48	7.78	9.00
1	7.25	7.14	7.67	7.25
2	6.00	6.61	6.05	6.00
3	4.75	5.76	4.90	5.00
4	4.00	4.62	4.13	4.00
5	3.25	3.70	3.48	3.50
6	2.25	3.17	2.99	2.50
7	2.00	2.91	2.69	2.25
8	1.50	2.76	2.29	1.75
9	1.25	2.55	1.97	1.50
10	1.25	1.95	1.64	1.50
11	1.25	2.04	1.55	1.50
12	1.25	1.83	1.43	1.50
13	1.25	1.81	1.45	1.50
14	1.25	1.64	1.57	1.50
15	1.25	1.72	1.54	1.50
16	0.75	1.51	1.14	1.00
17	0.75	1.56	1.11	1.00
18	0.75	1.87	1.28	1.00
19	0.75	1.48	0.91	1.00
20 & over	0.75	1.37	1.09	1.00

The following table provides the same information for Safety members. The actual average total salary increases for the most recent three-year period were reduced by the actual average inflation plus “across the board” increase (i.e., wage inflation, estimated as the increase in average salaries) for each year over the current three-year experience period (3.8% on average).

SAFETY
MERIT AND PROMOTIONAL INCREASES
(Actual vs. Proposed Assumption)

	Rate (%)			
Years of Service	Current Assumption	Actual Average Increase (Last 3 Years)	Actual Average Increase from Current and Prior Study	Proposed Assumption
Less than 1	14.00	13.91	13.92	14.00
1	10.00	6.23	10.66	10.00
2	8.50	5.67	7.13	7.75
3	6.75	4.80	5.18	6.00
4	5.25	6.61	6.06	5.50
5	4.50	4.22	4.86	4.50
6	3.50	3.93	4.26	3.75
7	3.25	3.12	3.53	3.25
8	2.25	2.68	2.64	2.50
9	2.25	2.21	2.41	2.25
10	1.75	1.61	2.14	1.75
11	1.75	1.59	1.70	1.75
12	1.75	1.24	1.60	1.75
13	1.75	1.69	1.68	1.75
14	1.75	1.41	1.69	1.75
15	1.75	1.67	2.26	1.75
16	1.50	1.53	1.65	1.50
17	1.50	1.89	2.07	1.50
18	1.50	2.23	2.26	1.50
19	1.50	2.19	2.00	1.50
20 & over	1.50	1.28	1.78	1.50

Charts 1 and 2 provide a graphical comparison of the actual merit and promotional increases, compared to the proposed and current assumptions. The charts also show the actual merit and promotional increases based on an average of both the current and previous three-year experience periods. This is discussed above. Chart 1 shows this information for General members and Chart 2 for Safety members.

Based on this experience, we are proposing slight increases overall in the merit and promotional salary increases for General and slight decreases overall in the merit and promotional increases for Safety members. Overall, salary increases are assumed to be higher for General members and lower for Safety members since we are not recommending a change to the price inflation assumption or the "across the board" assumption.

Active Member Payroll

Projected active member payrolls are used to develop the UAAL contribution rate. Future values are determined as a product of the number of employees in the workforce and the average pay for all employees. The average pay for all employees increases only by inflation and real "across the board" pay increases. The merit and promotional increases are not an influence, because this average pay is not specific to an individual.

Under the Board's current practice, the UAAL contribution rate is developed by assuming that the total payroll for all active members will increase annually over the amortization periods at the same assumed rates of inflation plus real "across the board" salary increase assumptions as are used to project the members' future benefits.

We recommend that the active member payroll increase assumption be maintained at 3.50% annually, consistent with the combined inflation plus real "across the board" salary increase assumptions.

Note that under the alternative 2.75% inflation assumption, the active member payroll increase assumption would decrease from 3.50% to 3.25%.

CHART 1: MERIT AND PROMOTIONAL SALARY INCREASE RATES GENERAL MEMBERS

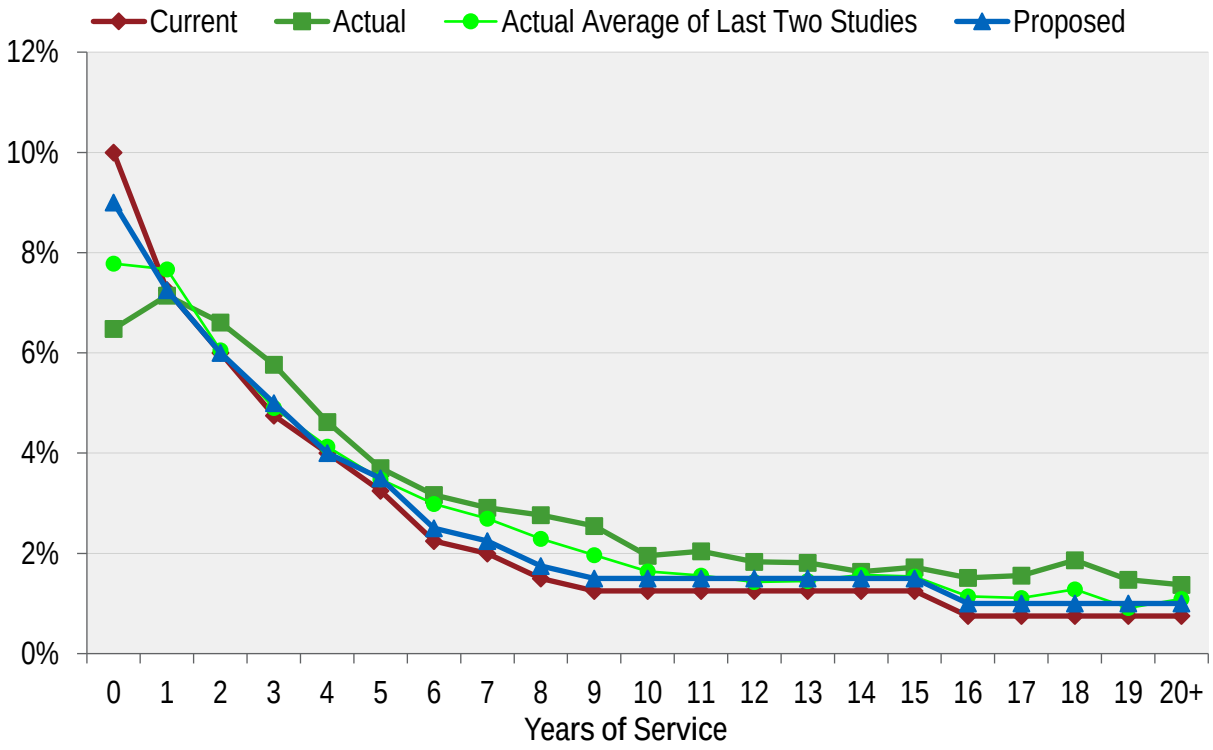
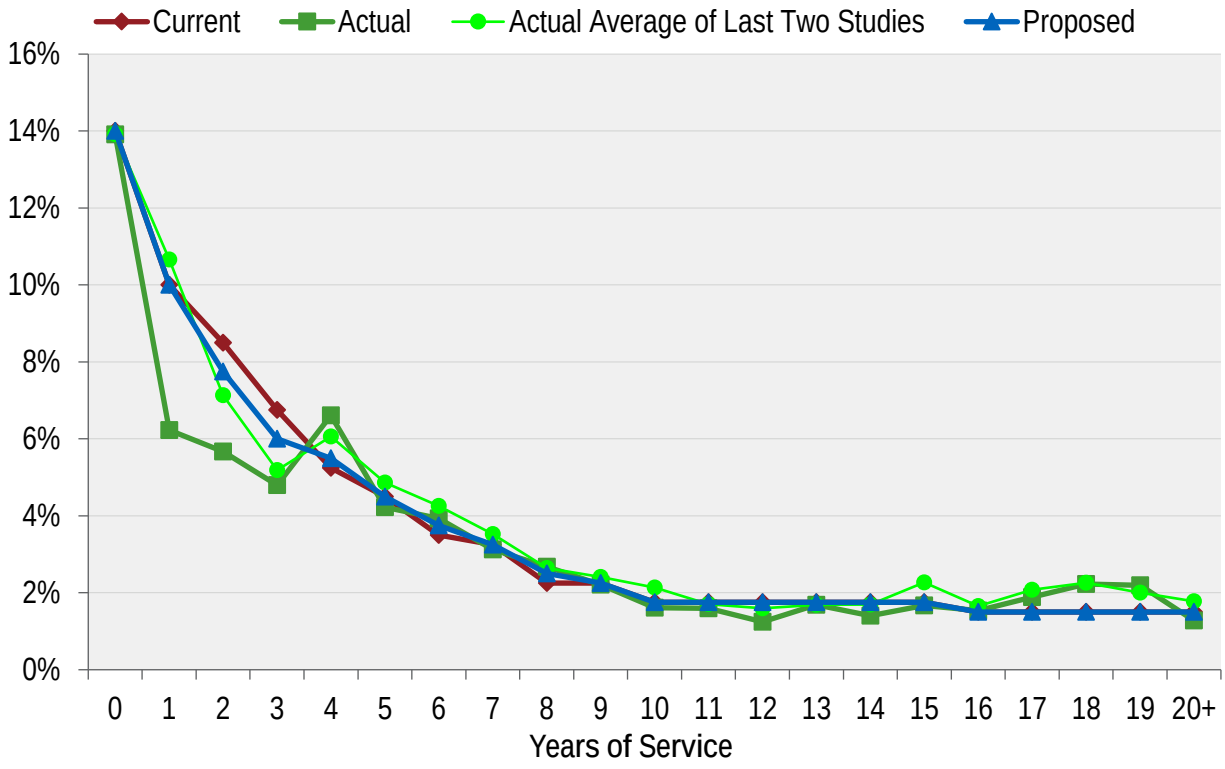


CHART 2: MERIT AND PROMOTIONAL SALARY INCREASE RATES SAFETY MEMBERS



IV. Demographic Assumptions

A. Retirement Rates

The age at which a member retires from service (i.e., who did not retire on a disability pension) will affect both the amount and duration of the benefits that will be paid to that member as well as the period over which funding must take place. Following prior practice, we have continued to use age as a predictor as to when a member would retire from OCERS. Subsequent to our last experience study, we were asked to consider whether other factors such as service could be a better predictor in determining when a member would retire. We have reviewed the retirement experience using service and documented in the following sub-section why we would not recommend a change to use service at this time.

The System's current retirement rates for the non-CalPEPRA Plans[20] are separated into:

(1) General Enhanced

(2) General Non-Enhanced[21]

(3) General SJC (2.0% @ 57 under §31676.12)

(4) Safety Law Enforcement (3.0% @ 50 under §31664.1)

(5) Safety Law Enforcement (3.0% @ 55 under §31664.2)

(6) Safety Fire (3.0% @ 50 under §31664.1)

(7) Safety Fire (3.0% @ 55 under §31664.2)

(8) Safety Probation (3.0% @ 50 under §31664.1)

For members who are covered under the CalPEPRA Plans, the retirement rates are separated into:

(1) CalPEPRA General

(2) CalPEPRA Safety Probation

(3) CalPEPRA Safety Law Enforcement

(4) CalPEPRA Safety Fire

The tables on the following pages show the observed service retirement rates for each of the above non-CalPEPRA categories based on the actual experience over the past three years. The observed service retirement rates were determined by comparing those members who actually retired from service to those eligible to retire from service. This same methodology is followed throughout this report and was described in Section II. Also shown are the current rates assumed and the rates we propose:

[20] CalPEPRA or California Public Employees' Pension Reform Act of 2013 imposed lower benefit tiers for General and Safety members together with other changes.

[21] These assumptions are also used for the CalPEPRA 1.62% @ 65 formula (§31676.01).

	Rate of Retirement (%)					
	General Enhanced			General Non-Enhanced		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
Under 49	0.00	0.00	0.00	0.00	0.00	0.00
49*	0.00	55.56**	30.00	0.00	100.00***	25.00
50	2.50	2.69	2.50	2.50	1.42	2.00
51	2.00	1.92	2.00	2.50	0.00	2.00
52	2.00	2.98	2.50	2.50	0.58	2.00
53	2.00	2.67	2.50	2.50	3.47	2.75
54	5.00	7.46	5.50	2.50	3.61	2.75
55	15.00	15.11	15.00	3.00	3.80	3.25
56	10.00	9.73	10.00	3.50	3.98	3.50
57	10.00	9.20	10.00	5.00	6.09	5.50
58	10.00	11.51	11.00	5.00	6.84	5.50
59	11.00	10.78	11.00	7.00	5.50	6.50
60	12.00	13.28	12.00	9.00	9.47	9.25
61	12.00	11.35	12.00	10.00	17.16	12.00
62	15.00	12.75	14.00	16.00	16.94	16.00
63	16.00	13.79	16.00	16.00	12.28	16.00
64	16.00	16.83	16.00	18.00	16.82	18.00
65	21.00	26.80	22.00	21.00	24.72	22.00
66	22.00	21.75	22.00	26.00	32.84	28.00
67	23.00	23.81	23.00	21.00	26.32	24.00
68	23.00	21.67	23.00	21.00	30.23	24.00
69	23.00	16.67	23.00	21.00	10.00	20.00
70	40.00	19.67	25.00	30.00	26.67	20.00
71	40.00	15.31	25.00	30.00	29.63	25.00
72	40.00	7.41	25.00	30.00	15.38	25.00
73	40.00	13.70	25.00	30.00	37.50	25.00
74	40.00	20.75	25.00	30.00	14.29	25.00
75 & Over	100.00	21.85	100.00	100.00	30.00	100.00

* *These rates are applicable to General members with 30 or more years of service.*

** *Based on 5 members who retired during the last 3 years.*

*** *Based on 1 member who retired during the last 3 years.*

As shown above, we are recommending slight increases in the retirement rates at early ages and decreases in the retirement rates at later ages for General Enhanced members and overall slight increases in the retirement rates for General Non-Enhanced members.

Chart 3 that follows later in this section compares actual experience with the current and proposed rates of retirement for General Enhanced members and Chart 4 has the same data for General Non-Enhanced members.

	Rate of Retirement (%)					
	Safety Law Enforcement (31664.1)*			Safety Fire (31664.1)**		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
49***	10.00	16.39	12.00	0.00	1.56	2.00
50	16.00	20.30	18.00	6.00	4.60	5.00
51	16.00	20.57	18.00	8.00	6.15	7.00
52	16.00	16.91	17.00	9.00	10.13	9.50
53	16.00	18.49	17.00	10.00	12.00	10.50
54	22.00	17.20	22.00	16.00	7.23	15.00
55	22.00	22.06	22.00	19.00	14.49	18.00
56	20.00	13.64	20.00	20.00	21.43	20.00
57	20.00	25.81	20.00	23.00	14.63	21.00
58	20.00	22.73	20.00	30.00	25.58	28.00
59	26.00	25.00	26.00	30.00	26.09	28.00
60	45.00	18.18	35.00	45.00	20.00	30.00
61	45.00	26.32	35.00	45.00	11.11	30.00
62	45.00	40.00	40.00	45.00	18.18	35.00
63	45.00	28.57	40.00	45.00	25.00	35.00
64	45.00	40.00	40.00	45.00	0.00	35.00
65 & Over	100.00	43.75	100.00	100.00	0.00	100.00

* *Retirement rate is 100% after a Safety Law Enforcement member accrues a benefit of 100% of final average earnings.*

** *Retirement rate is currently assumed at 100% after a Safety Fire member accrues a benefit of 100% of final average earnings. However, we are recommending removing this assumption as we only observed a 20% retirement rate for those Safety Fire members who accrued a benefit of 100% of final average earnings during the last three years.*

*** *These rates are applicable to Safety members with 20 or more years of service.*

As shown above, we are recommending slight increases in the retirement rates at early ages and decreases in the retirement rates at later ages for Safety Law Enforcement (3.0% @ 50 under §31664.1) members and decreases overall in the retirement rates for Safety Fire (3.0% @ 50 under §31664.1) members.

Chart 5 that follows later in this section compares actual experience with the current and proposed rates of retirement for Safety Law Enforcement (3.0% @ 50 under §31664.1) members and Chart 6 has the same data for Safety Fire (3.0% @ 50 under §31664.1) members.

	Rate of Retirement (%)		
	Safety Probation (31664.1)*		
Age	Current Rate	Actual Rate	Proposed Rate
49	0.00	2.86	0.00
50	3.00	6.90	3.25
51	3.00	3.70	3.25
52	4.00	8.51	4.25
53	4.00	4.26	4.25
54	6.00	13.16	7.00
55	11.00	14.71	12.00
56	11.00	9.38	12.00
57	17.00	21.43	18.00
58	20.00	17.39	18.00
59	20.00	14.29	18.00
60	20.00	23.81	20.00
61	20.00	7.69	20.00
62	25.00	33.33	25.00
63	50.00	30.00	40.00
64	50.00	20.00	40.00
65 & Over	100.00	33.33	100.00

* *Retirement rate is 100% after a Safety Probation member accrues a benefit of 100% of final average earnings.*

As shown above, we are recommending slight increases in the retirement rates at early ages and decreases in the retirement rates at later ages for Safety Probation members.

Chart 7 that follows later in this section compares actual experience with the current and proposed rates of retirement for Safety Probation members.

For General SJC under (2.0% @ 57 under §31676.12), Safety Law Enforcement (3.0% @ 55 under §31664.2) and Safety Fire (3.0% @ 55 under §31664.2), we do not have credible experience from the past three years to propose new rates based on actual retirement from members of the newer plans. However, we are recommending lowering some of the rates at later ages currently used for those plans to commensurate with the overall later retirement assumptions that we observed and are recommending from the other older plans.

	Rate of Retirement (%)					
	General SJC (31676.12)		Safety Law Enforcement (31664.2)*		Safety Fire (31664.2)**	
Age	Current Rate	Proposed Rate	Current Rate	Proposed Rate	Current Rate	Proposed Rate
50	3.00	3.00	11.50	11.50	8.00	8.00
51	3.00	3.00	12.00	12.00	10.00	10.00
52	3.00	3.00	12.70	12.70	11.00	11.00
53	3.00	3.00	17.90	17.90	12.00	12.00
54	3.00	3.00	18.80	18.80	14.00	14.00
55	4.00	4.00	30.70	30.70	24.00	24.00
56	5.00	5.00	20.00	20.00	23.00	23.00
57	6.00	6.00	20.00	20.00	27.00	27.00
58	7.00	7.00	25.00	25.00	27.00	27.00
59	9.00	9.00	30.00	30.00	36.00	36.00
60	11.00	11.00	100.00	40.00	100.00	40.00
61	13.00	13.00	100.00	40.00	100.00	40.00
62	15.00	15.00	100.00	40.00	100.00	40.00
63	15.00	15.00	100.00	40.00	100.00	40.00
64	20.00	20.00	100.00	40.00	100.00	40.00
65	20.00	20.00	100.00	100.00	100.00	100.00
66	24.00	24.00	100.00	100.00	100.00	100.00
67	24.00	24.00	100.00	100.00	100.00	100.00
68	24.00	24.00	100.00	100.00	100.00	100.00
69	24.00	24.00	100.00	100.00	100.00	100.00
70	100.00	50.00	100.00	100.00	100.00	100.00
71	100.00	50.00	100.00	100.00	100.00	100.00
72	100.00	50.00	100.00	100.00	100.00	100.00
73	100.00	50.00	100.00	100.00	100.00	100.00
74	100.00	50.00	100.00	100.00	100.00	100.00
75 & Over	100.00	100.00	100.00	100.00	100.00	100.00

* *Retirement rate is 100% after a Safety Law Enforcement member accrues a benefit of 100% of final average earnings.*

** *Retirement rate is currently assumed at 100% after a Safety Fire member accrues a benefit of 100% of final average earnings. However, we are recommending removing this assumption to be consistent to what we proposed for the Non-CalPEPRA Safety Fire members covered under §31664.1.*

Chart 8 compares the current rates with the proposed rates of retirement for General SJC under (2.0% @ 57 under §31676.12). Chart 9 has the same data for Safety Law Enforcement (3.0% @ 55 under §31664.2). Chart 10 has the same data for Safety Fire (3.0% @ 55 under §31664.2).

Note that effective January 1, 2013, new CalPEPRA formulas were implemented for new General and Safety tiers. For these new formulas, we do not have credible experience from the past three years to propose new rates based on actual retirement from members of the newer plans. However, we have lowered our recommended rates for CalPEPRA General and Safety formulas at later ages so that those rates will remain comparable to the proposed retirement rates we are recommending for the non-CalPEPRA General and Safety formulas.

	Rate of Retirement (%)							
	CalPEPRA – General		CalPEPRA – Safety Probation*		CalPEPRA – Safety Law Enforcement*		CalPEPRA – Safety Fire**	
Age	Current Rate	Proposed Rate	Current Rate	Proposed Rate	Current Rate	Proposed Rate	Current Rate	Proposed Rate
50	0.00	0.00	2.50	2.50	11.00	11.00	6.50	6.00
51	0.00	0.00	2.50	2.50	11.50	11.50	8.00	7.00
52	4.00	4.00	3.00	3.00	12.00	12.00	9.00	9.00
53	1.50	1.50	3.00	3.00	16.00	16.00	10.00	10.00
54	1.50	1.50	5.50	5.50	17.00	17.00	12.00	11.50
55	2.50	2.50	10.00	10.00	28.00	28.00	21.00	21.00
56	3.50	3.50	10.00	10.00	18.00	18.00	20.00	20.00
57	5.50	5.50	15.00	15.00	17.50	17.50	22.00	22.00
58	7.50	7.50	20.00	20.00	22.00	22.00	25.00	25.00
59	7.50	7.50	20.00	20.00	26.00	26.00	31.50	30.00
60	7.50	7.50	100.00	40.00	100.00	40.00	100.00	40.00
61	7.50	7.50	100.00	40.00	100.00	40.00	100.00	40.00
62	14.00	14.00	100.00	40.00	100.00	40.00	100.00	40.00
63	14.00	14.00	100.00	40.00	100.00	40.00	100.00	40.00
64	14.00	14.00	100.00	40.00	100.00	40.00	100.00	40.00
65	18.00	18.00	100.00	100.00	100.00	100.00	100.00	100.00
66	22.00	22.00	100.00	100.00	100.00	100.00	100.00	100.00
67	23.00	23.00	100.00	100.00	100.00	100.00	100.00	100.00
68	23.00	23.00	100.00	100.00	100.00	100.00	100.00	100.00
69	23.00	23.00	100.00	100.00	100.00	100.00	100.00	100.00
70	30.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00
71	30.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00
72	30.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00
73	30.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00
74	30.00	25.00	100.00	100.00	100.00	100.00	100.00	100.00
75 & Over	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* *Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings.*

** *Retirement rate is currently assumed at 100% after a Safety Fire member accrues a benefit of 100% of final average earnings. However, we are recommending removing this assumption to be consistent to what we proposed for the Non-CalPEPRA Safety Fire members.*

For ages where we are extending the retirement rates in the two tables above, we did not reduce the retirement rates to the level used for the older plans with credible experience since the current rates for those plans are already less than 100%.

Chart 11 compares the current rates with the proposed rates of retirement for CalPEPRA General members. Chart 12 has the same data for CalPEPRA Safety Probation members. Chart 13 has the same data for CalPEPRA Safety Law Enforcement members. Chart 14 has the same data for CalPEPRA Safety Fire members.

Use of Age-Based Versus Service-Based Retirement Assumptions

We have also looked into the desirability of developing and applying the retirement assumptions based on service instead of age at retirement. The table below is based on a high-level review by combining the retirement experience for all OCERS General members covered under various formulas and all OCERS Safety members covered under various formulas. For General members, the actual retirement experience shows relatively higher retirement rates for members immediately upon reaching the minimum age or service requirement for a retirement benefit (i.e., attaining age 70 regardless of service or attaining age 50 with 10 or more years of retirement service credit) whereas from 10 years of service to 25 years of service, the retirement rates are very flat. For Safety members, the retirement rates are very volatile with no discernable pattern for members with less than 25 years of service.

The above analyses can be improved if we introduce age as additional variable to use in summarizing the experience. This is exactly the case for CalPERS as their retirement assumptions are developed and applied based on both a member's age and service. We believe CalPERS is able to develop retirement assumptions based on both age and service because it is a significantly larger entity with more exposures and decrements, allowing them to break down the experience into smaller groups. If we were to split the experience for OCERS by age and service, we do not believe we would have as much reliable experience to make credible recommended retirement assumptions.

	Rate of Retirement (%)	
Years of Service	Actual Rate - General Members	Actual Rate - Safety Members
0 - 4	0.00	0.00
5 - 9	47.59	100.00
10 – 14	6.64	8.11
15 – 19	6.75	8.54
20 – 14	8.63	4.29
25 – 19	11.87	15.59
30 – 14	18.57	31.77
35 – 39	29.17	20.59
40 & over	29.17	0.00

Deferred Vested Members

In prior valuations, deferred vested General and Safety members were assumed to retire at age 58 and 53, respectively. The average age at retirement over the current three years period in this experience study was 58.8 for General and 53.1 for Safety. We recommend increasing the assumption for General members from age 58 to age 59 and maintaining the current assumption for Safety members at age 53.

For members who terminate with less than five years of service after January 1, 2003 and are not vested, we assume they would retire at age 70 for both General and Safety if they decide to leave their contributions on deposit as permitted by §31629.5.

Reciprocity

It is currently assumed that 20% of future General and 30% of future Safety deferred vested members would go on to work for a reciprocal system and receive 4.25% compensation increases for General and 5.00% for Safety per annum from termination until their date of retirement. Based on the actual experience that 13% of General and 23% of Safety members went on to work for a reciprocal system as of December 31, 2016, we recommend decreasing the reciprocity assumption for General members from 20% to 15% and decreasing the reciprocity assumption for Safety members from 30% to 25%. Based on our ultimate recommended merit and promotional salary increase assumption of 1.00% for General and 1.50% for Safety (and our recommended economic assumptions), we propose that a 4.50% (i.e., 3.00% inflation plus 0.50% "across the board" plus 1.00% merit and promotional) for General and 5.00% (i.e., 3.00% inflation plus 0.50% "across the board" plus 1.50% merit and promotional) salary increase assumption be utilized to anticipate salary increases (under the reciprocal system) from termination from OCERS to the expected date of retirement.

Survivor Continuance Under Unmodified Option

In prior valuations, it was assumed that 75% of all active male members and 50% of all active female members who selected the unmodified option would be married or have an eligible domestic partner when they retired. According to the experience of members who retired during the last three years, about 72% of all male members and 55% of all female members were married or had a domestic partner at retirement. We recommend continuing the assumptions that 75% of active male members will be married or have a domestic partner when they retire and increasing the assumption that 50% of active female members will be married or have a domestic partner when they retire to 55%.

Since the value of the survivor's continuance benefit is dependent on the survivor's age and sex, we must also have assumptions for the age and sex of the survivor. Based on the experience during the three-year period, we believe that it is reasonable to continue to assume a three-year age difference for the survivors age as compared to the member's age. Since the majority of survivors are expected to be of the opposite sex, even with the inclusion of domestic partners, we will continue to assume that the survivor's sex is the opposite of the member.

The proposed assumption for the age of the survivor and recommended assumption are shown below. These assumptions will continue to be monitored in future experience studies.

Survivor Ages – Current Assumptions			
Beneficiary Sex	Survivor's Age as Compared to Member's Age		
	Current Assumption	Actual Age Difference	Recommended Assumption
Male	3 years older	2.8 years older	No change
Female	3 years younger	2.5 years younger	No change

CHART 3: RETIREMENT RATES
GENERAL ENHANCED MEMBERS

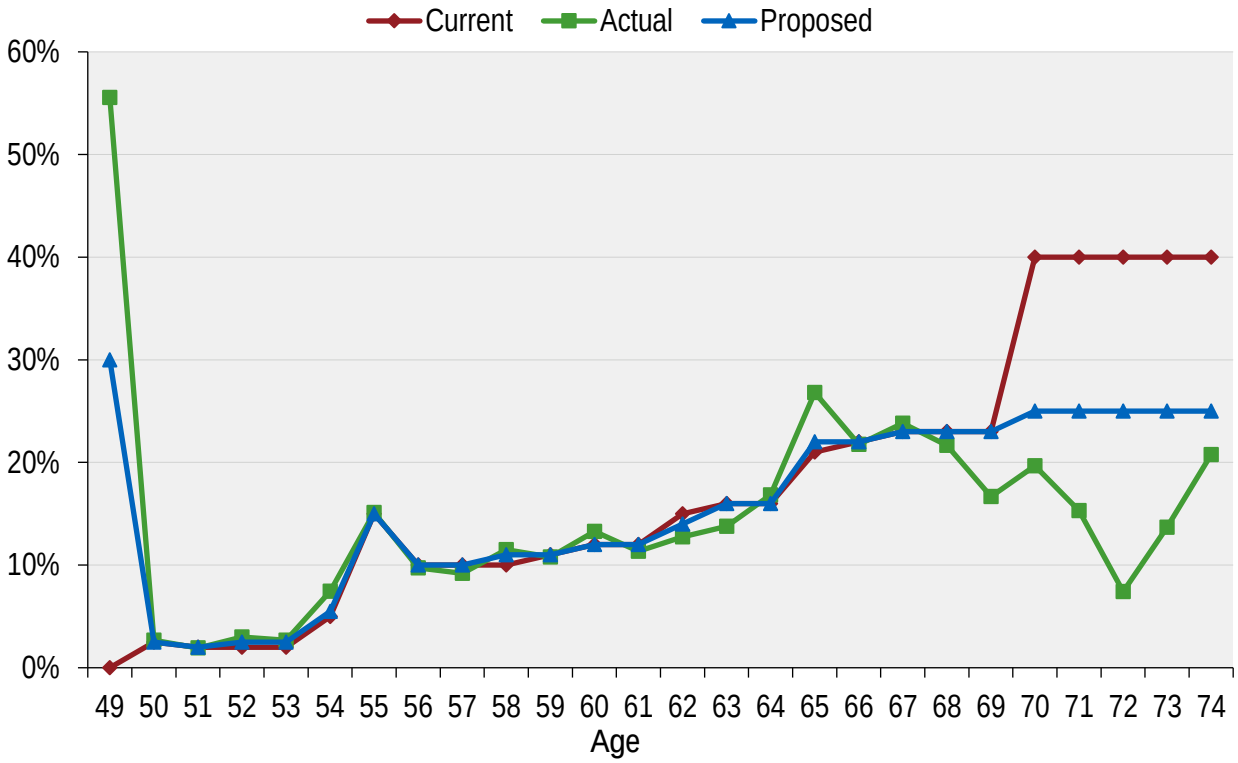


CHART 4: RETIREMENT RATES
GENERAL NON-ENHANCED MEMBERS

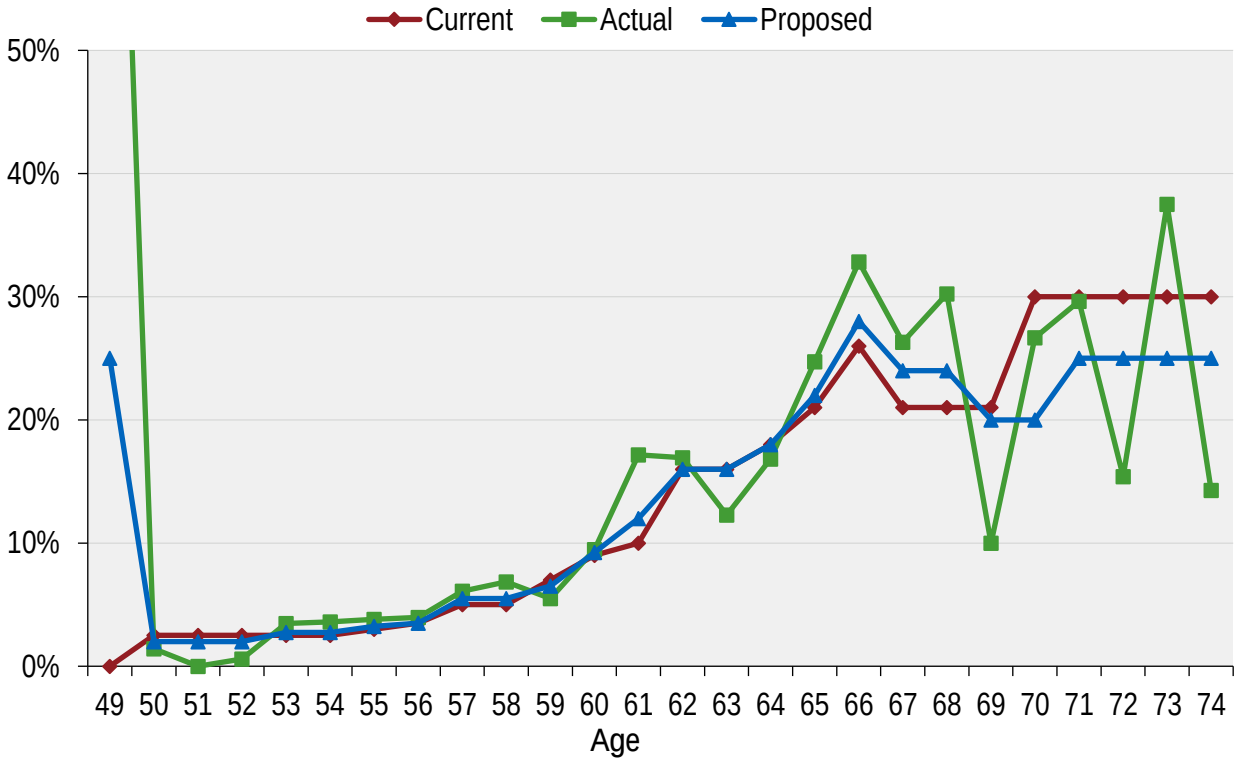


CHART 5: RETIREMENT RATES
SAFETY LAW ENFORCEMENT MEMBERS (31664.1)

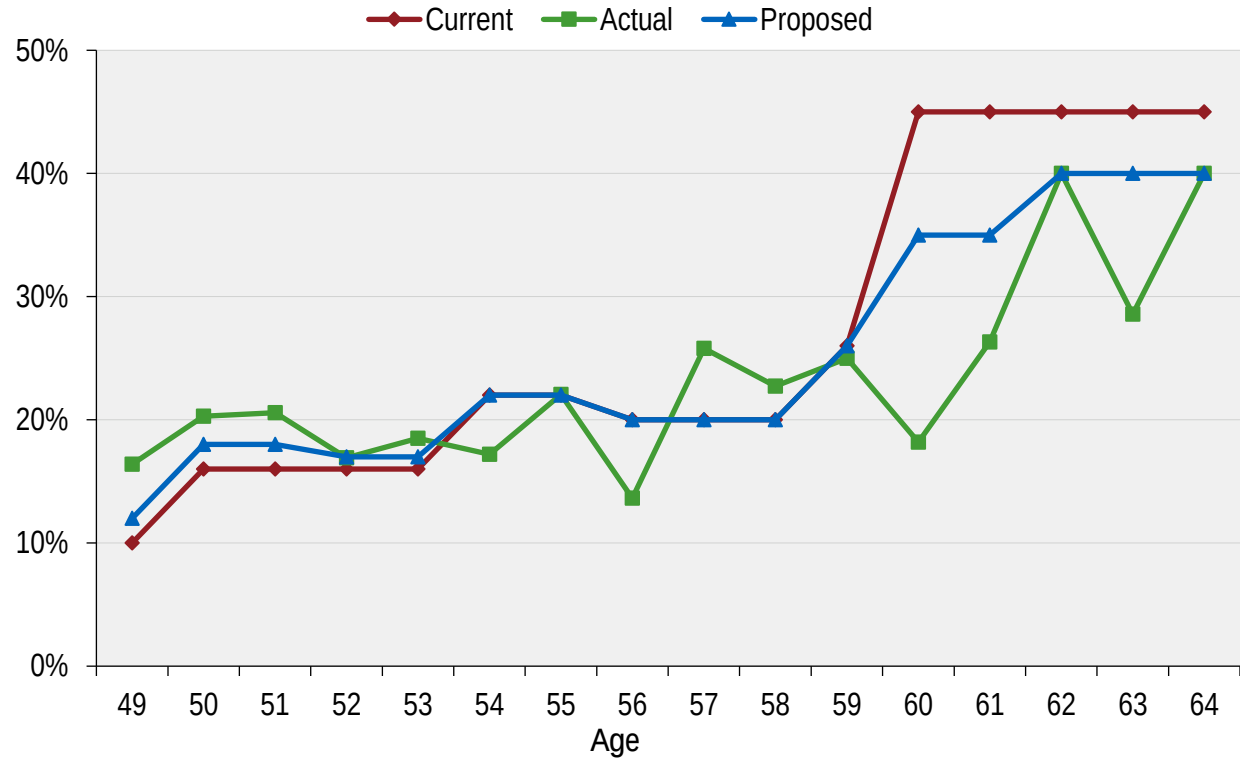


CHART 6: RETIREMENT RATES
SAFETY FIRE AUTHORITY MEMBERS (31664.1)

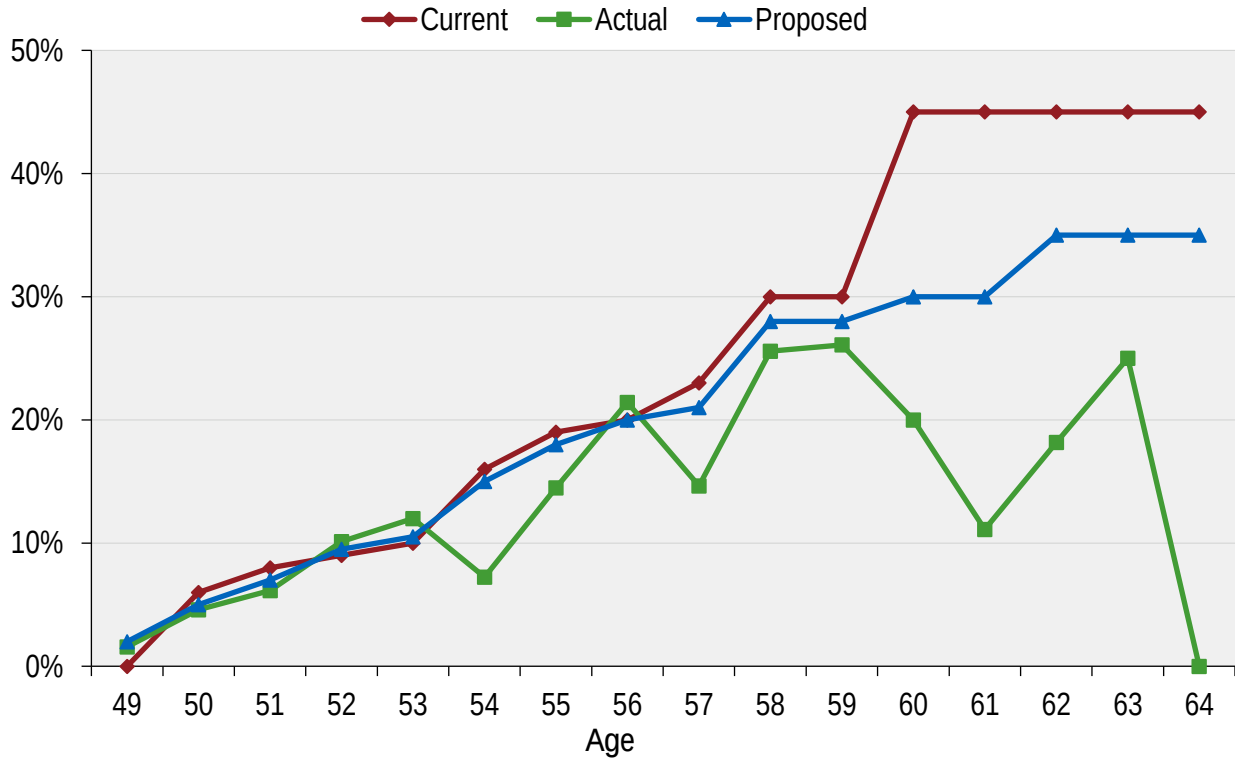


CHART 7: RETIREMENT RATES
SAFETY PROBATION MEMBERS (31664.1)

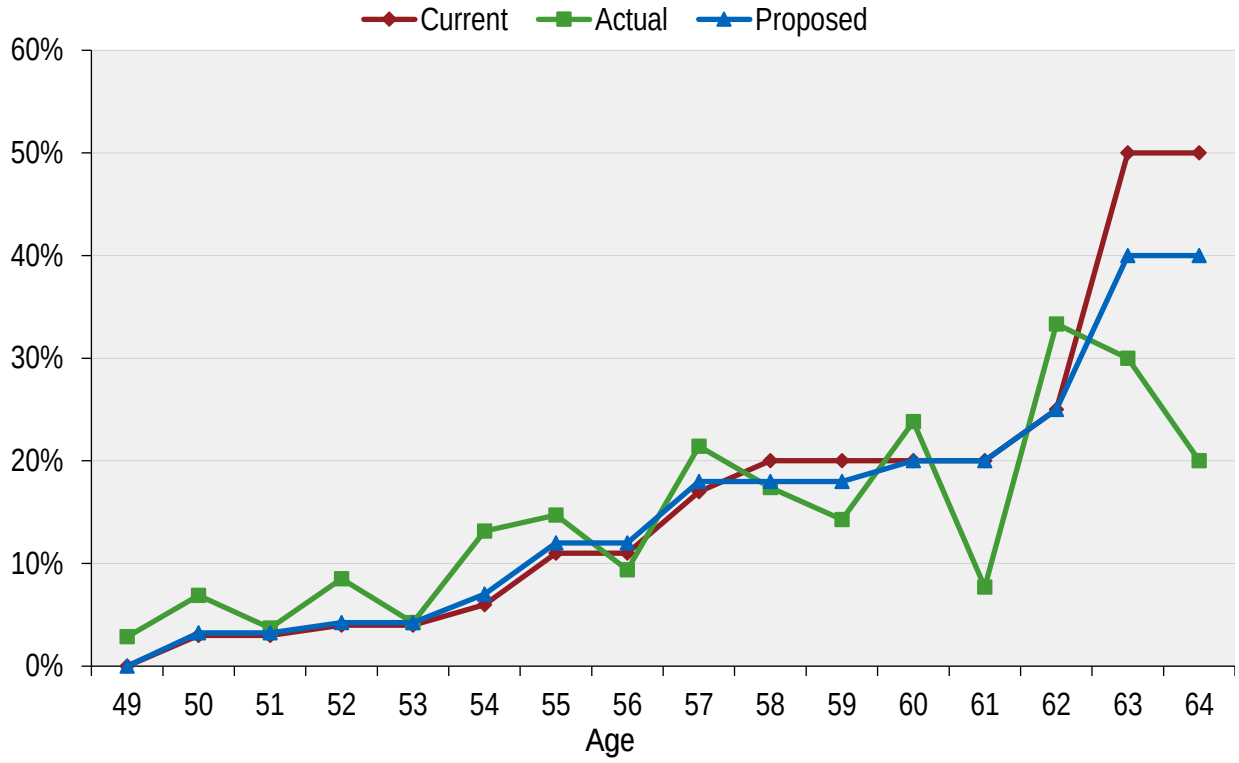


CHART 8: RETIREMENT RATES
GENERAL SJC MEMBERS (31676.12)

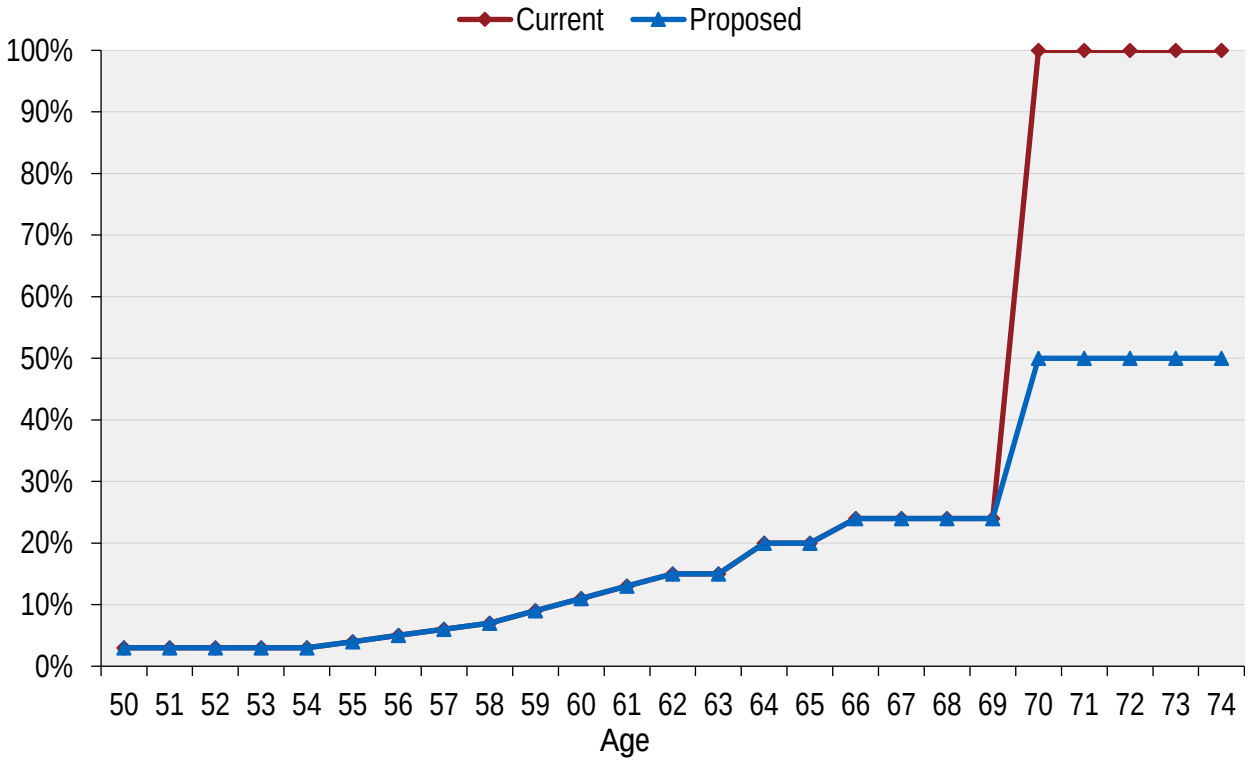


CHART 9: RETIREMENT RATES
SAFETY LAW ENFORCEMENT MEMBERS (31664.2)

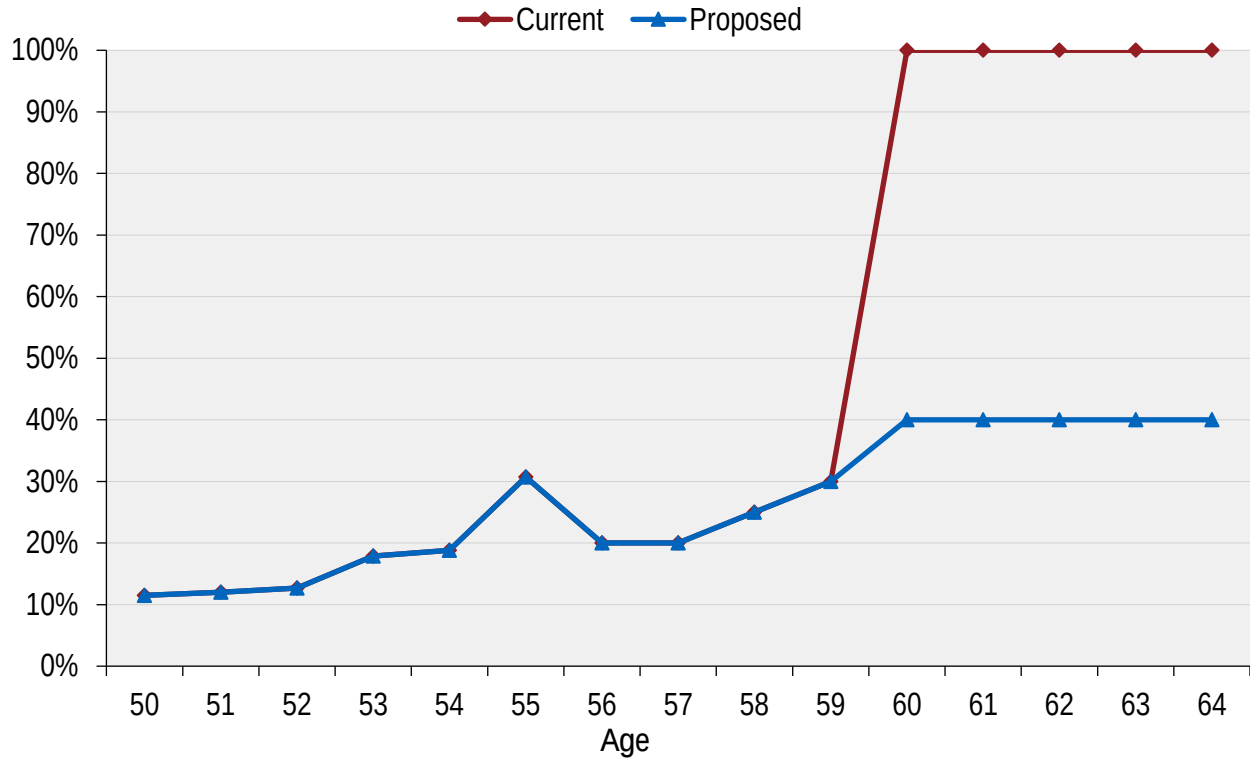


CHART 10: RETIREMENT RATES
SAFETY FIRE AUTHORITY MEMBERS (31664.2)

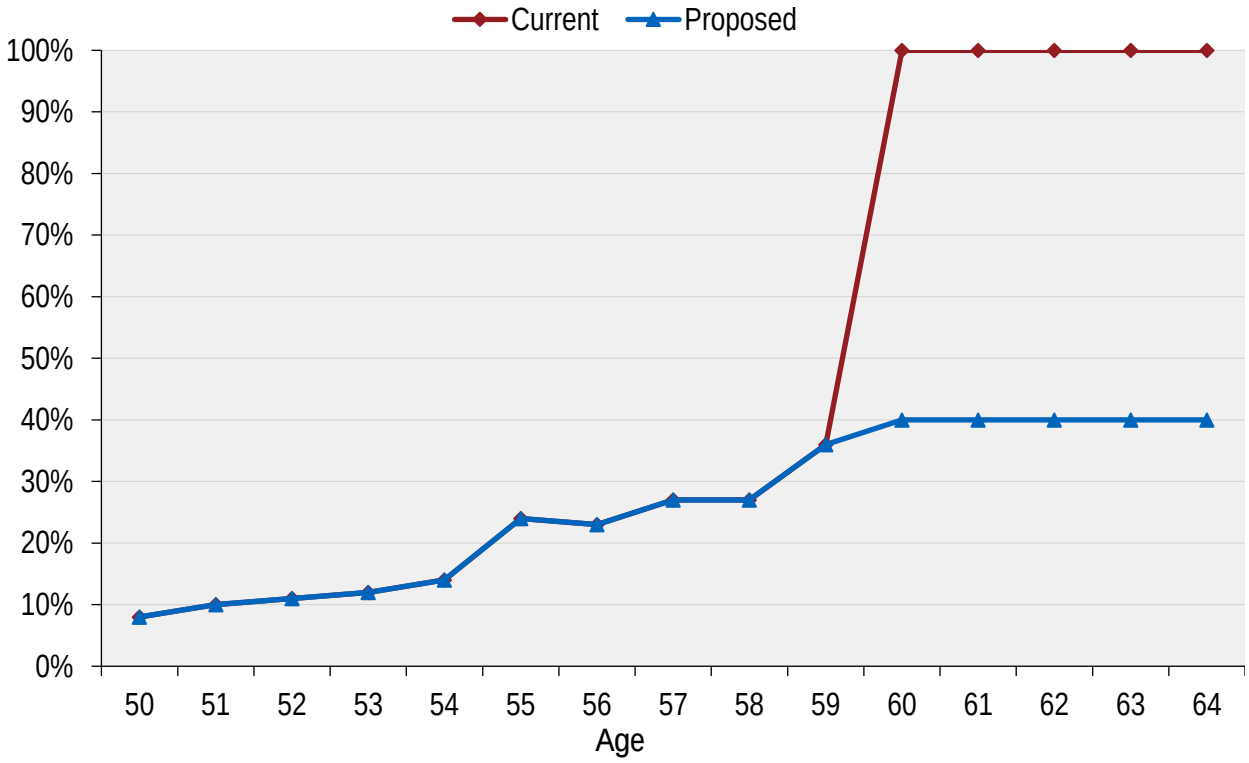


CHART 11: RETIREMENT RATES
CALPEPRA GENERAL MEMBERS

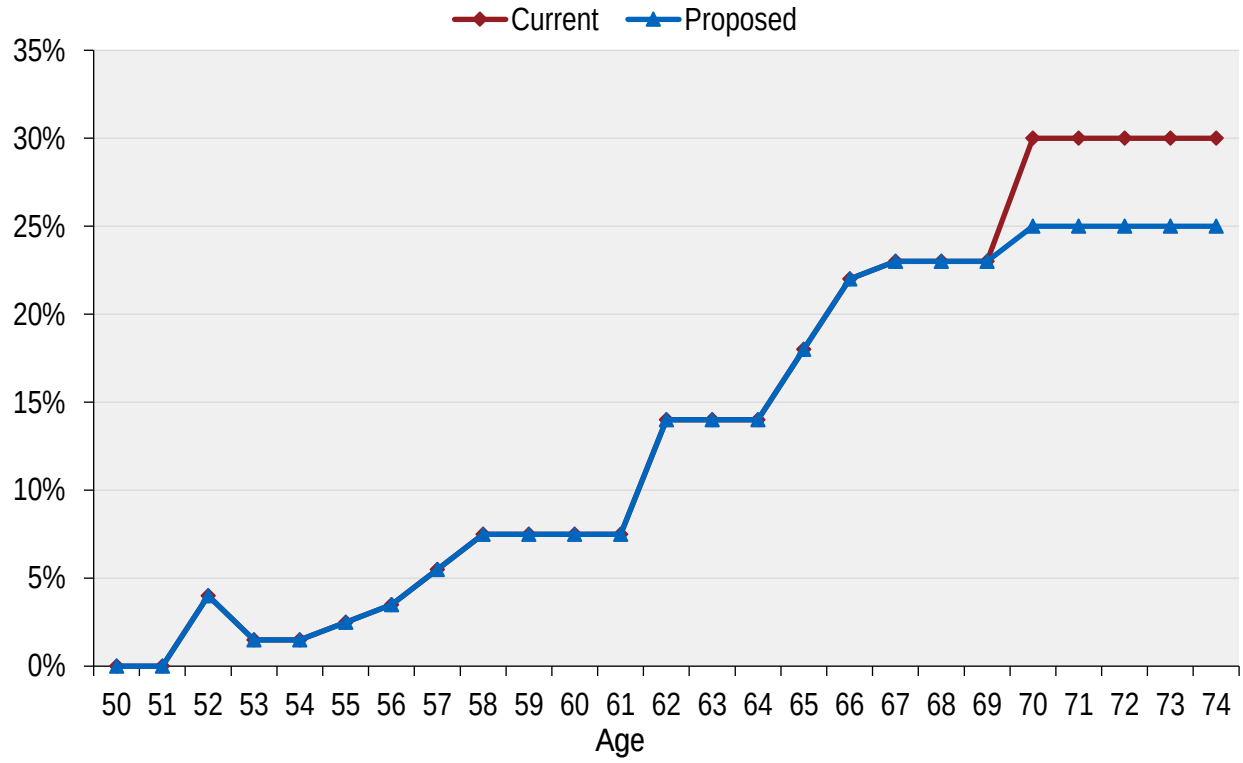


CHART 12: RETIREMENT RATES
CALPEPRA SAFETY PROBATION MEMBERS

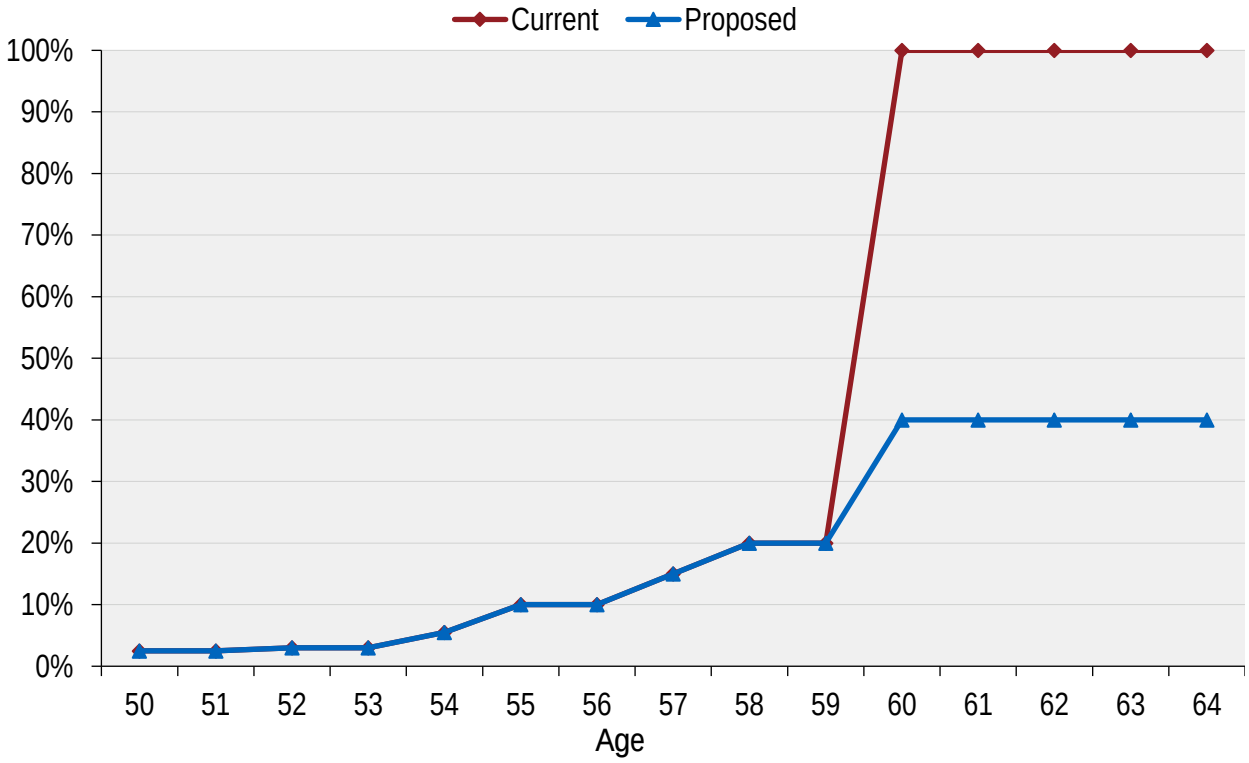


CHART 13: RETIREMENT RATES
CALPEPRA SAFETY LAW ENFORCEMENT MEMBERS

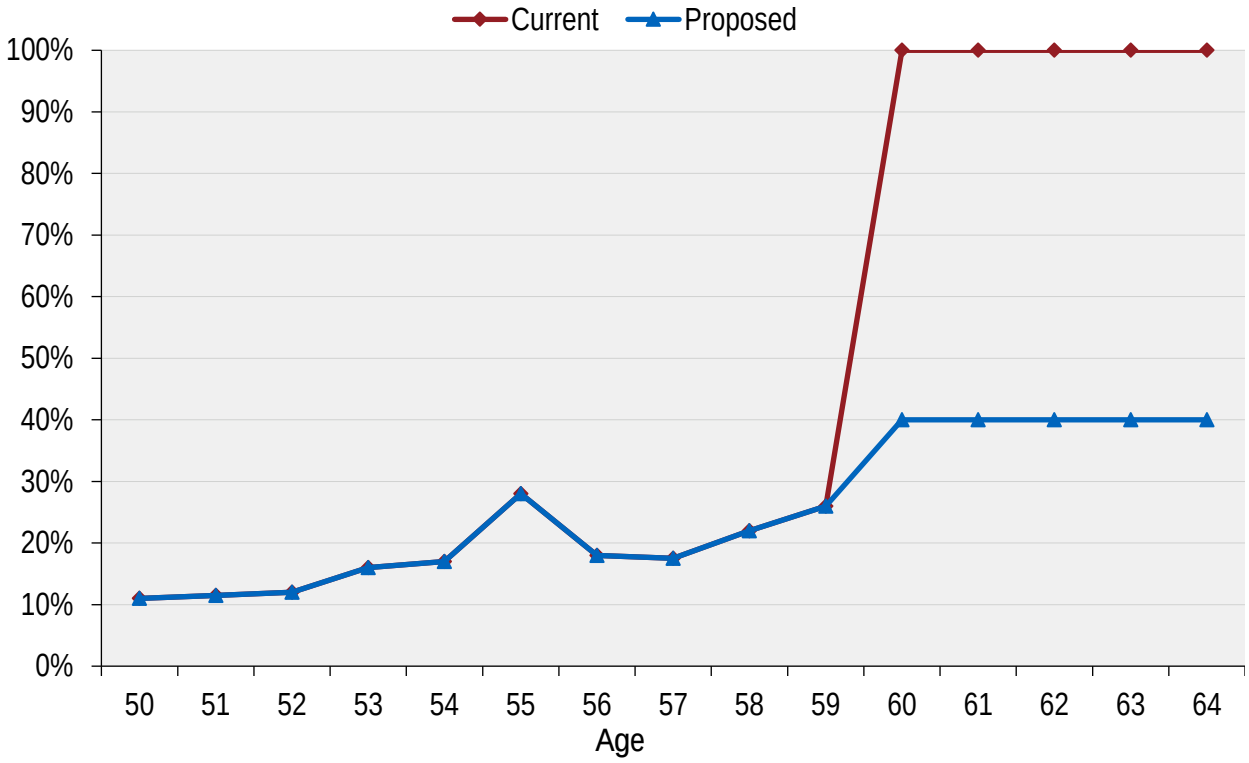
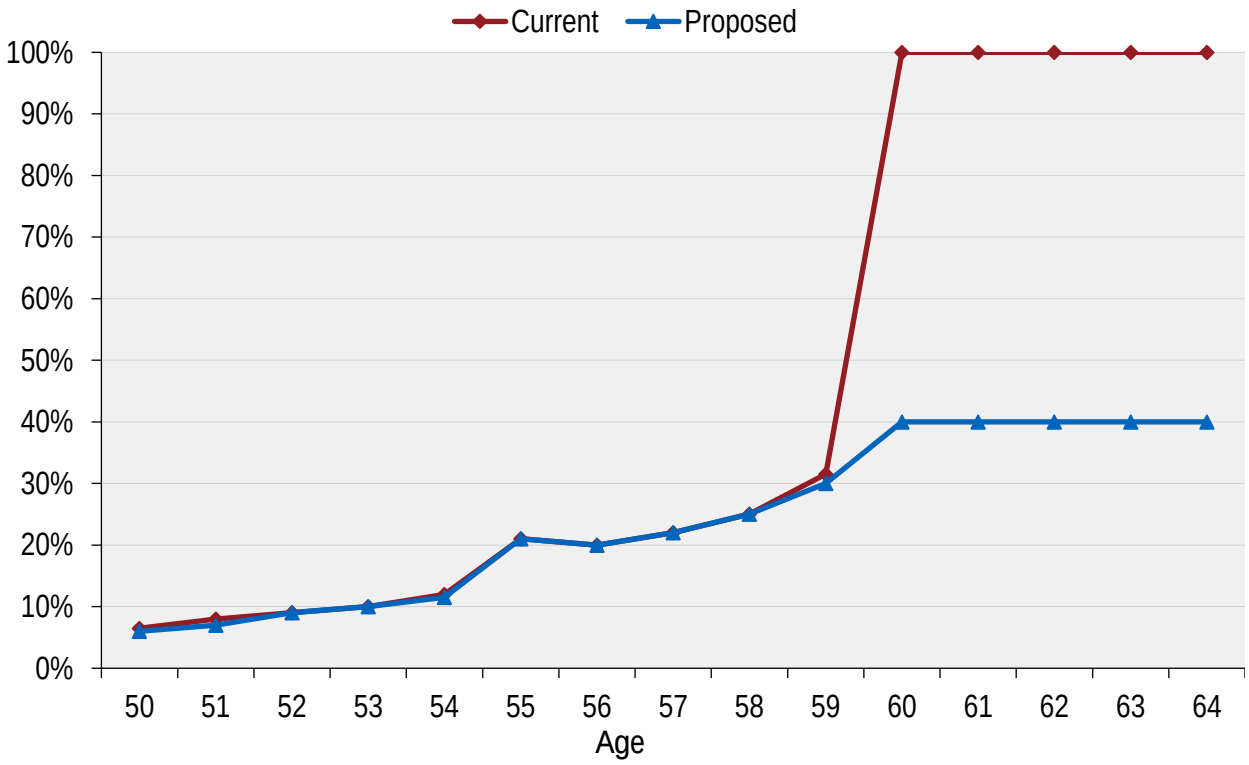


CHART 14: RETIREMENT RATES
CALPEPRA SAFETY FIRE AUTHORITY MEMBERS



B. Mortality Rates - Healthy

The "healthy" mortality rates project the life expectancy of a member who retires from service (i.e., who did not retire on a disability pension). Also, the "healthy" pre-retirement mortality rates project what proportion of members will die before retirement. For General members, the table currently being used for post-service retirement mortality rates is the RP-2000 Combined Healthy Mortality Table (separate tables for males and females) projected with Scale BB to 2020 with no age adjustments. For Safety members, the table currently being used for post-service retirement mortality rates is the RP-2000 Combined Healthy Mortality Table (separate tables for males and females) projected with Scale BB to 2020 with ages set back two years. All General and Safety beneficiaries are assumed to have the same mortality of a General member of the opposite sex who has taken a service (non-disabled) retirement.

The Society of Actuaries (SOA) has published the RP-2014 family of mortality tables and associated mortality improvement scales. Within that family of mortality tables, there are mortality rates developed for annuitants on a "headcount" weighted basis that weight all retirees at the same age the same way without regard to the level of benefits those annuitants are receiving from a retirement plan. Mortality rates are also developed for annuitants on a "benefit" weighted basis, with higher credibility assigned to experience from annuitants receiving larger benefits. The headcount-weighted basis is the more common practice currently and is the approach used by Segal in the past for its California public system clients (including OCERS) and by other public sector actuaries in California.

As for the mortality improvement scales, they can be applied in one of two ways. Historically, the more common application is to use a "static" approach to anticipate a fixed level of mortality improvement for all annuitants receiving benefits from a retirement plan. This is in contrast to a "generational" approach where each future year has its own mortality table that reflects the forecasted improvements, using the published improvement scales. While the static approach is still used by some of Segal's California public system clients, as well as CalPERS, the "generational" approach is the emerging practice within the actuarial profession.

A generational mortality table provides dynamic projections of mortality experience for each cohort of retirees. For example, the mortality rate for someone who is 65 next year will be slightly less than for someone who is 65 this year. In general, using generational mortality anticipates increases in the cost of the Plan over time as participants' life expectancies are projected to increase. This is in contrast to updating a static mortality assumption with each experience study as we have proposed in prior experience studies.

The SOA is in the process of collecting data from public sector plans so that they can develop mortality tables based on public sector experience comparable to the RP-2014 mortality tables developed using data collected from private and multi-employer plans. Furthermore, after publishing the two-dimensional MP-2014 life expectancy improvement scale, the SOA replaced it with the two-dimensional MP-2015 life expectancy improvement scales to remove some of the conservatism built into the MP-2014 scale and to better reflect the most recent data of mortality improvement from the Social Security Administration. We understand that the Retirement Plans Experience Committee of the Society of Actuaries (RPEC) intends to publish annual updates to their mortality improvement scales. Improvement scale MP-2016 is the latest improvement scale available.

We recommend that given the trend in the retirement industry to move towards generational mortality, it would be reasonable for the Board to adopt the Headcount-Weighted RP-2014 mortality table (adjusted for OCERS experience), and project the mortality improvement generationally using the MP-2016 mortality improvement scale. Once the SOA has included data from public sector plans in developing the new tables, we will also include a discussion with the Board on whether to consider the benefit weighted mortality rates in a future experience study.

As an illustration of the relative effect of these approaches, we have provided in the table below the approximate change in the total employer and member contribution rates based on the different approaches to build in margin for future mortality improvements.

	Employer and Member Contribution Rate Impact Combined
Headcount Weighted RP-2014 Family of Tables – Static Approach with Increased Margin*	3.5% of payroll
Benefit Weighted RP-2014 Family of Tables – Static Approach without Increased Margin	5.1% of payroll
Headcount Weighted RP-2014 Family of Tables – Generational Approach	4.3% of payroll

* *Includes an increased margin of 20% to anticipate the move towards a "generational" approach.*

In order to use more actual OCERS experience in our analysis, we have used experience for a nine-year period by using data from the current (from January 1, 2014 to December 31, 2016) and the last two (from January 1, 2011 to December 31, 2013 and January 1, 2008 to December 31, 2010) experience study periods to study this assumption. We have continued to examine the mortality experience with all beneficiaries included since combining General healthy retirees and all General and Safety beneficiaries would provide more exposures and would increase the credibility of the results.

Pre-Retirement Mortality

In prior experience studies, the pre-retirement mortality rates for active members were set equal to the post-retirement mortality rates for retirees since the actual number of deaths among active members was not large enough to provide a statistically credible analysis. However, this approach is not compatible with our current proposal because the post-retirement RP-2014 Healthy Annuitant table does not include rates for ages below 50.

From the RP-2014 family of tables, we recommend that pre-retirement mortality follow the Headcount-Weighted RP-2014 Employee Mortality Table (separate tables for males and females) times 80%, projected generationally with the two-dimensional scale MP-2016. The 80% scaling factor is to account for the lower incidences of observed pre-retirement death on the combined General and Safety workforce relative to the standard table.

Currently, our assumption is that all General member pre-retirement deaths are non-service connected. For Safety, 90% of pre-retirement deaths are assumed to be non-service connected and the other 10% are assumed to be service connected. Based on actual experience during the last three years (with 100% non-service connected deaths for General and 90% non-service connected deaths for Safety), we recommended maintaining the current assumption for both General and Safety members.

Post- Retirement Mortality (Service Retirements)

Among all retired members, the actual deaths compared to the expected deaths under the current assumptions for the last nine years is shown in the table below. We also show the deaths under proposed assumptions. In prior years we have generally set the mortality assumption using a static mortality projection so that actual deaths will be at least 10% greater than those assumed. As noted above, we are recommending the use of a generational mortality table rather than static mortality. A generational mortality table incorporates a more explicit assumption for future mortality improvement. Accordingly, the goal is to start with a mortality table that closely matches the current experience (without a margin for future mortality improvement), and then reflect mortality improvement by projecting lower mortality rates in future years. That is why the current actual to expected ratios shown in the table below for General (including all beneficiaries) and Safety are 98% and 97%, respectively. In future years these ratios should remain around 100%, as long as actual mortality improved at the same rates as anticipated in the generational mortality tables. The actual deaths compared to the expected deaths under the current and proposed assumptions for the last nine years are as follows:

	General Members – Healthy			Safety Members - Healthy		
Gender	**Current Expected Deaths**	**Actual Deaths**	**Proposed Expected Deaths**	**Current Expected Deaths**	**Actual Deaths**	**Proposed Expected Deaths**
Male	913	921	1,000	115	126	130
Female	1,029	1,081	1,098	10	11	11
Total	**1,942**	**2,002**	**2,098**	**125**	**137**	**141**
Actual / Expected	103%		95%	110%		97%

	All Beneficiaries – Healthy		
Gender	**Current Expected Deaths**	**Actual Deaths**	**Proposed Expected Deaths**
Male	135	179	139
Female	440	475	468
Total	**575**	**654**	**607**
Actual / Expected	114%		108%

	General Members and All Beneficiaries – Healthy			Safety Members - Healthy		
Gender	**Current Expected Deaths**	**Actual Deaths**	**Proposed Expected Deaths**	**Current Expected Deaths**	**Actual Deaths**	**Proposed Expected Deaths**
Male	1,048	1,100	1,139	115	126	130
Female	1,469	1,556	1,566	10	11	11
Total	**2,517**	**2,656**	**2,705**	**125**	**137**	**141**
Actual / Expected	106%		98%	110%		97%

For General service retirees and all beneficiaries, the ratio of actual to expected deaths was 106% during the nine-year period. We recommend updating the current table to the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) with no age adjustments. This will bring the current actual to expected ratio to 98%. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016.

For Safety service retirees, the ratio of actual to expected deaths was 110% during the nine-year period. We recommend updating the current table to the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) with ages set back four years. This will bring the current actual to expected ratio to 97%. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016.

All of this is consistent with ASOP 35 as we anticipate expected future improvement in life expectancy using the generational approach.

Chart 15 compares actual to expected deaths for General members and all beneficiaries under the current and proposed assumptions over the last nine years. Experience shows that there were more deaths than predicted by the current table.

Chart 16 has the same comparison for Safety members. Experience shows that there were more deaths than predicted by the current table.

Chart 17 shows the life expectancies (i.e. expected future lifetime) under the current and the proposed tables for General members and all beneficiaries.

Chart 18 shows the same information for Safety members.

The expected deaths (Charts 15 and 16) and life expectancies (Charts 17 and 18) under the proposed generational mortality table are based on mortality rates from 2014 which is the base year of the table. In practice, life expectancies will be assumed to increase based on applying the mortality improvement scale.

Comparison to CalPERS' Mortality Table

Following prior practice, we have continued to use the mortality tables published by the SOA but adjusted to reflect OCERS' mortality experience in recommending the post-retirement mortality tables. Subsequent to our last experience study, we were asked whether or not it could have been appropriate to start with the mortality tables used by CalPERS for their participating employers and members and modify them for use at OCERS. We have addressed that question in this section.

When comparing OCERS' mortality experience over the past nine years against the CalPERS mortality table with no age adjustment, the actual to expected ratios are 115% for General members (including beneficiaries), 96% for Safety members and 114% when combining both General and Safety members. The reason why the actual and expected ratios differed significantly between General and Safety members is that CalPERS does not develop separate mortality tables between different membership classes (i.e., General and Safety) for members who retired from service retirement.

It is our understanding from conversations with CalPERS staff that CalPERS is considering moving towards using different mortality tables for General and Safety members in their valuations at some future time. In addition, they are also considering moving to a generational approach to anticipate future mortality improvements which is our understanding of the reason why they are currently considering about a 20% margin in selecting their mortality assumptions. After taking the above factors into account, we believe that the tables we have proposed (using the SOA mortality tables as a starting point) provide a better predictor for mortality experience for OCERS.

Mortality Table for Member Contributions, Optional Forms of Payment and Reserves

There are administrative reasons why a generational mortality table is more difficult to implement for determining age-based member contribution rates, optional forms of payment and reserves. One emerging practice is to approximate the use of a generational mortality table by the use of a static table with projection of the mortality improvement over a period that is close to the duration of the benefit payments for active members. We would recommend the use of this approximation.

We recommend that the mortality table used for determining contributions for General members be updated to a blended table based on the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females), projected 20 years with the two-dimensional mortality improvement scale MP-2016, weighted 40% male and 60% female. This is based on the proposed valuation mortality table for General members and the actual gender distribution of General members. For all beneficiaries, we recommend the same tables as General members but weighted 60% male and 40% female.

We also recommend an update to the mortality table for Safety members to be the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females), projected 20 years with the two-dimensional mortality improvement scale MP-2016 set back four years, weighted 80% male and 20% female. This is based on the proposed mortality table for Safety members and the actual gender distribution for the current Safety members.

CHART 15: POST-RETIREMENT DEATHS
NON – DISABLED GENERAL MEMBERS AND ALL BENEFICIARIES
(JANUARY 1, 2008 THROUGH DECEMBER 31, 2016)

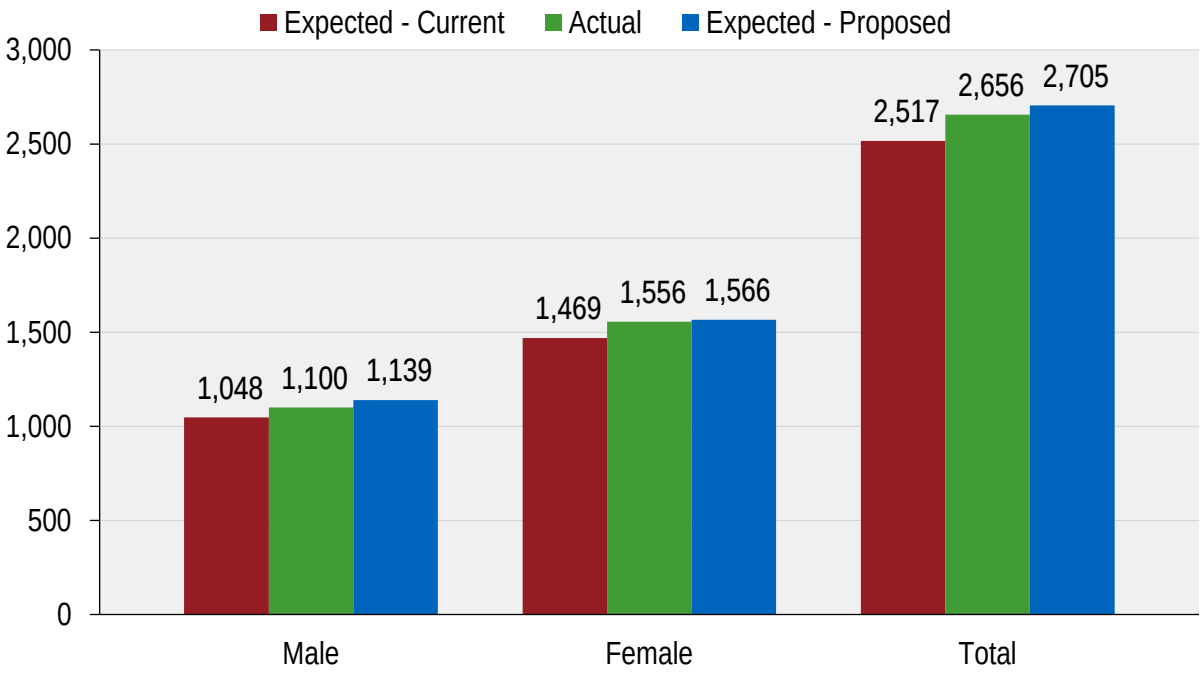


CHART 16: POST-RETIREMENT DEATHS
NON – DISABLED SAFETY MEMBERS
(JANUARY 1, 2008 THROUGH DECEMBER 31, 2016)

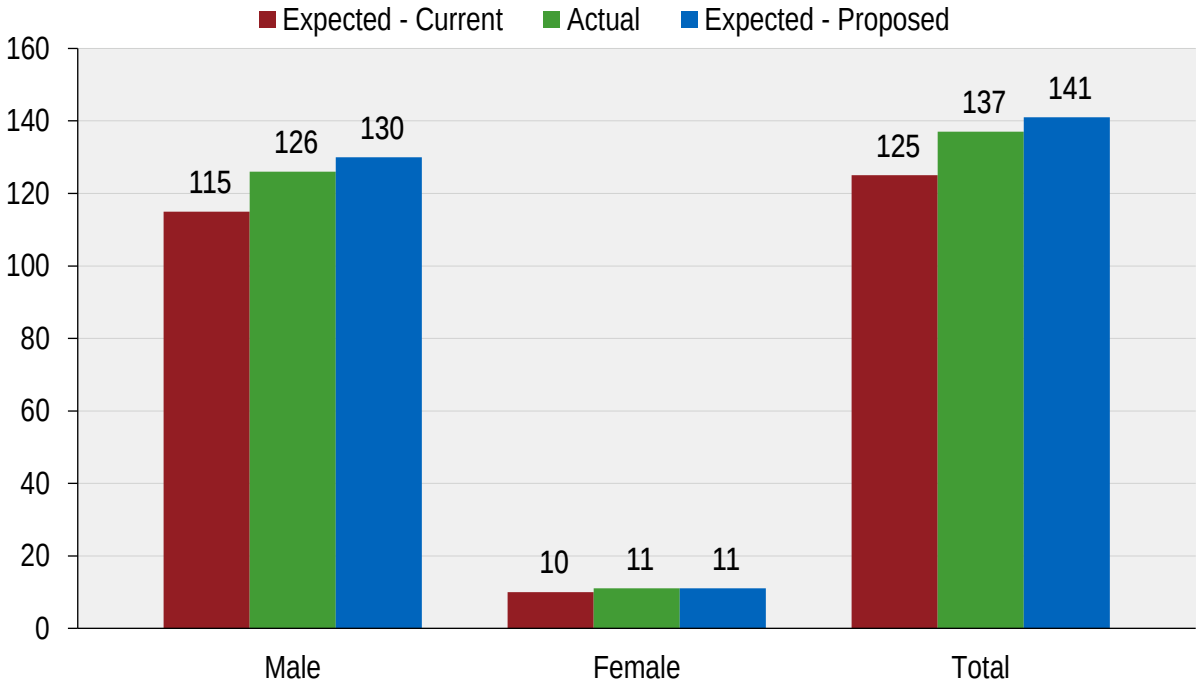


CHART 17: LIFE EXPECTANCIES
NON – DISABLED GENERAL MEMBERS AND BENEFICIARIES

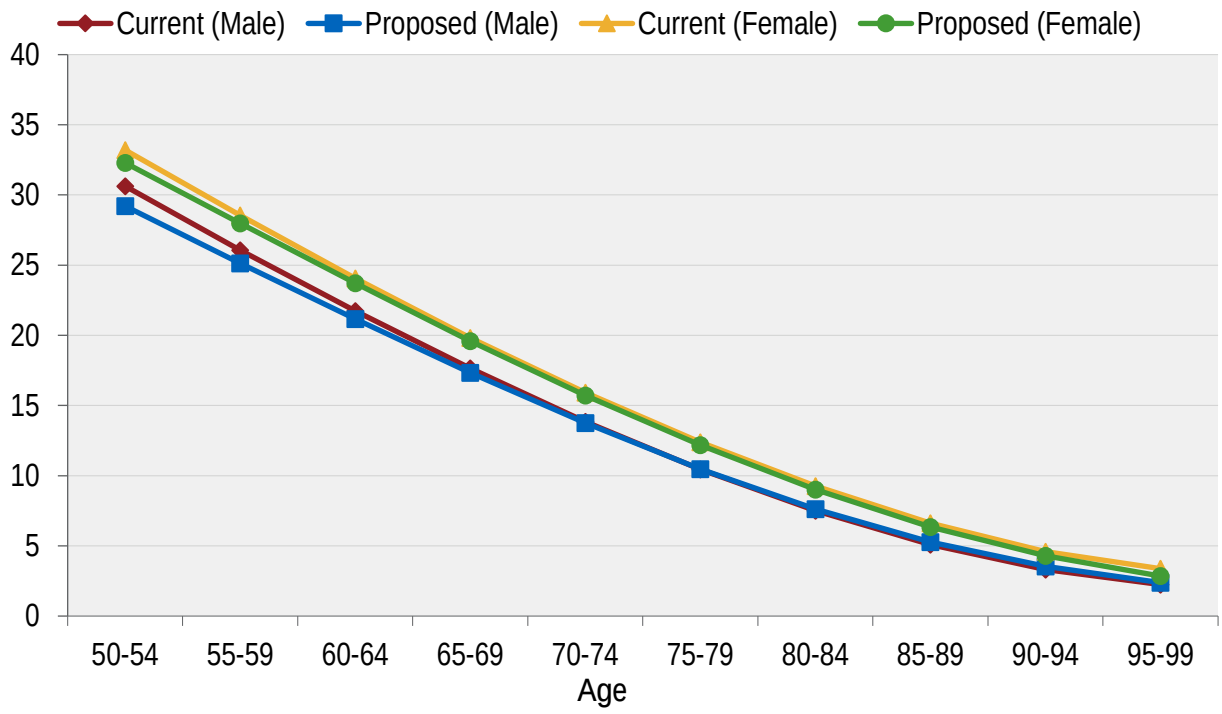
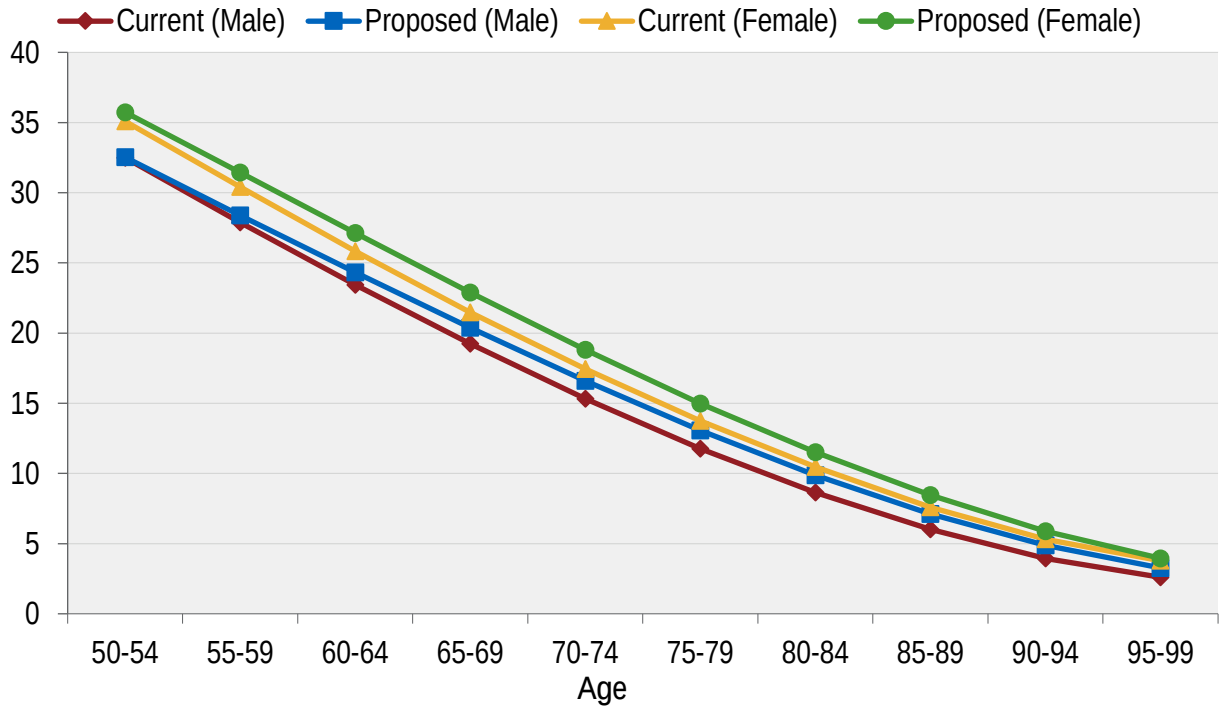


CHART 18: LIFE EXPECTANCIES
NON – DISABLED SAFETY MEMBERS



C. Mortality Rates - Disabled

Since mortality rates for disabled members can vary from those of healthy members, a different mortality assumption is often used. For General members, the table currently being used is the RP-2000 Combined Healthy Mortality Table, projected with scale BB to 2020, set forward six years for males and set forward three years for females. For Safety members, the table currently being used is the RP-2000 Combined Healthy Mortality Table, projected with scale BB to 2020.

The number of actual deaths compared to the number expected under the current and proposed assumption for the last nine years are as provided in the table below.

	General - Disabled			Safety - Disabled		
Gender	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	124	122	121	37	52	48
Female	73	93	97	3	1	5
Total	**197**	**215**	**218**	**40**	**53**	**53**
Actual / Expected	109%		99%	132%		100%

Based on the actual experience from the last nine years, we recommend changing the mortality table for General disabled members to the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) set forward five years. This will bring the current actual to expected ratio to 99%. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016.

Likewise, based on the actual experience, we recommend changing the mortality table for Safety disabled members to the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females). This will bring the current actual to expected ratio to 100%. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016.

Chart 19 compares actual to expected deaths under both the current and proposed assumptions for disabled General members over the last nine years. Experience shows that there were more deaths than predicted by the current table.

Chart 20 has the same comparison for Safety members. Experience shows that there were more deaths than predicted by the current table.

Chart 21 shows the life expectancies under both the current and proposed tables for General members.

Chart 22 shows the same information for Safety members.

CHART 19: POST-RETIREMENT DEATHS
DISABLED GENERAL MEMBERS

(JANUARY 1, 2008 THROUGH DECEMBER 31, 2016)

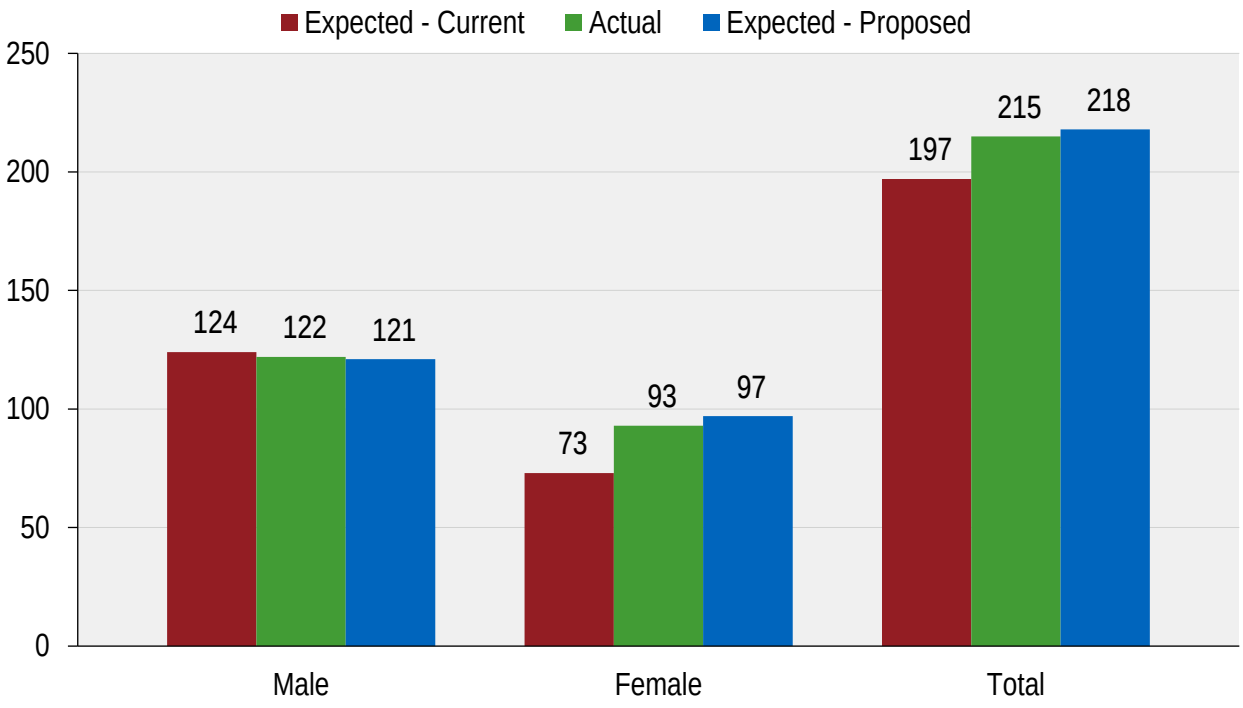


CHART 20: POST-RETIREMENT DEATHS
DISABLED SAFETY MEMBERS

(JANUARY 1, 2008 THROUGH DECEMBER 31, 2016)

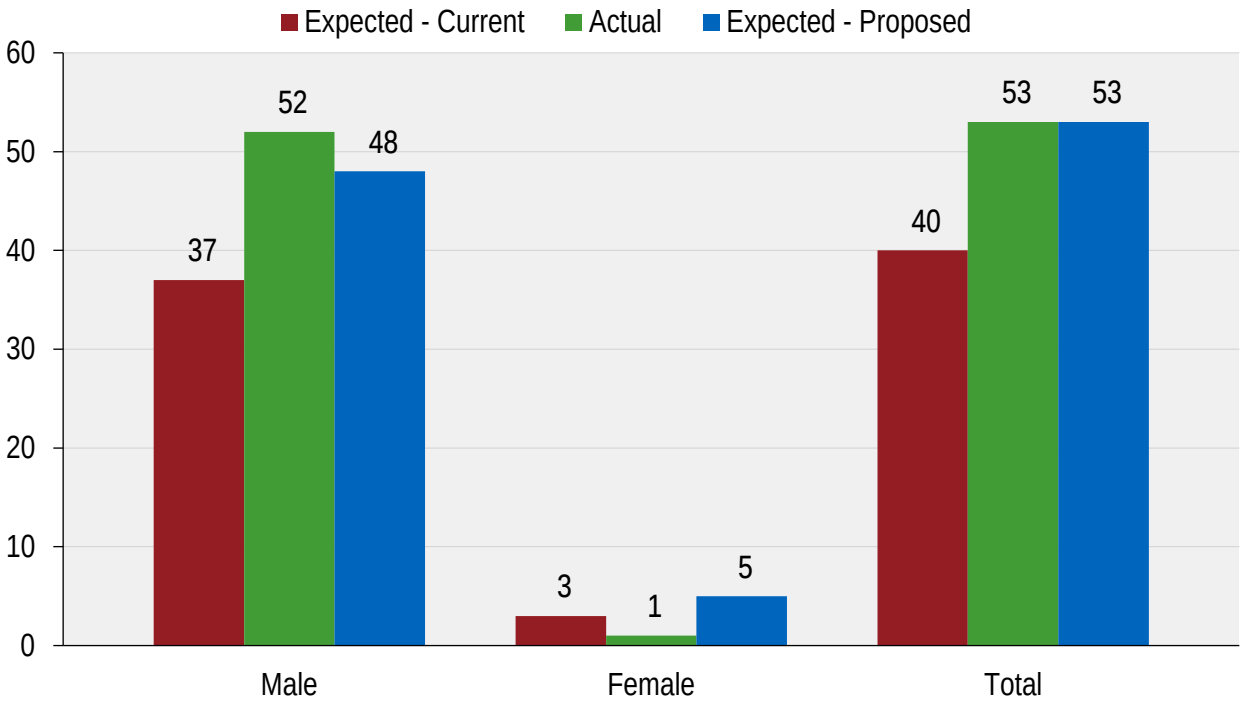


CHART 21: LIFE EXPECTANCIES
DISABLED GENERAL MEMBERS

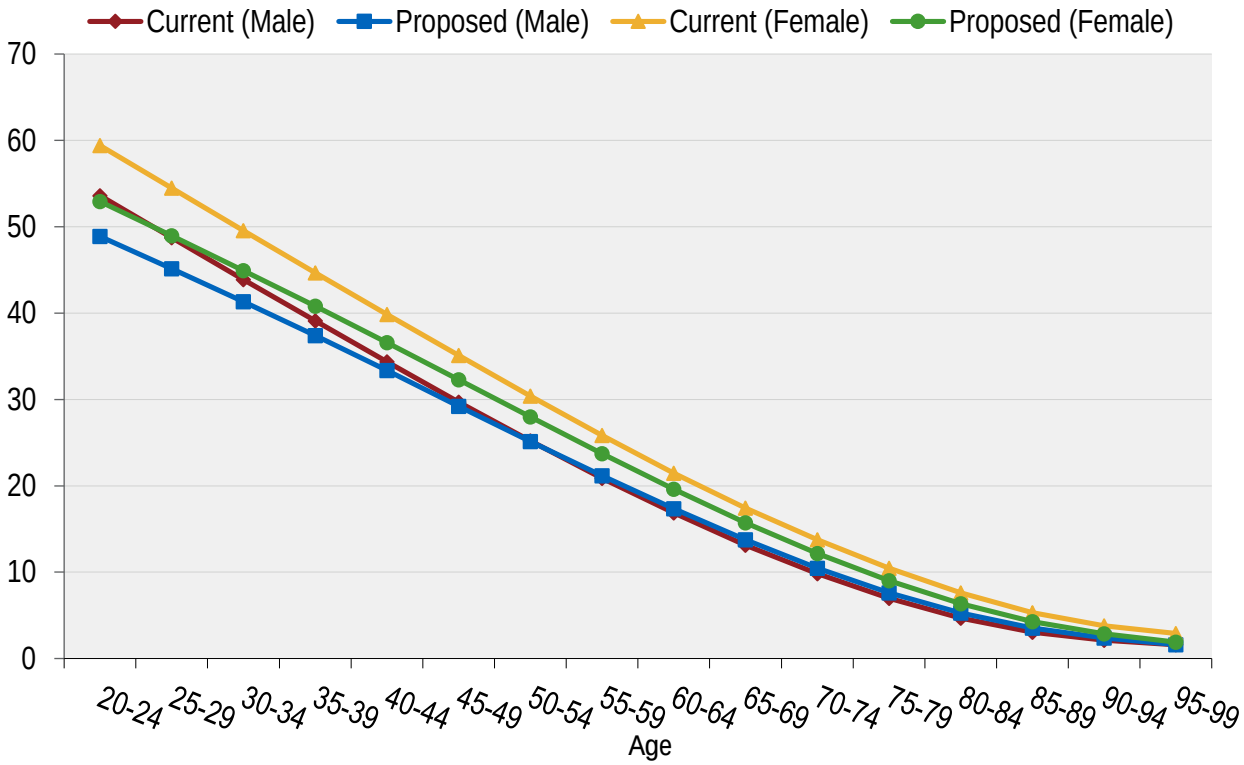
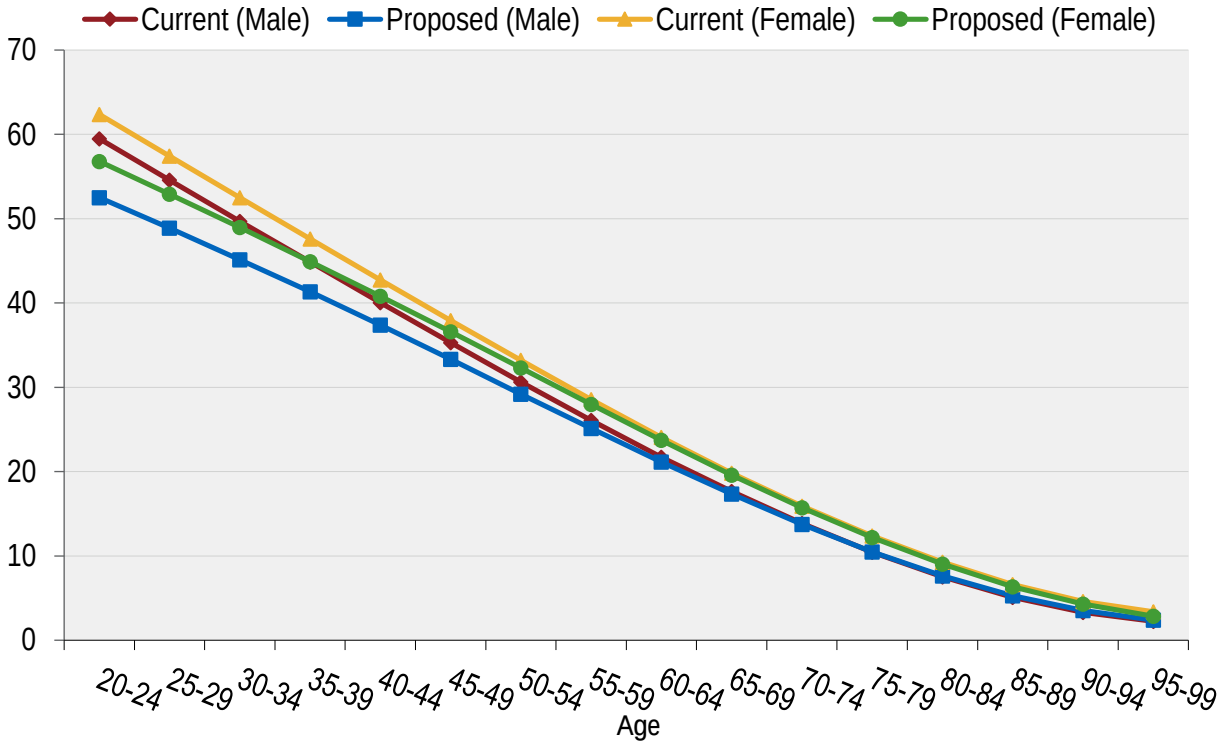


CHART 22: LIFE EXPECTANCIES
DISABLED SAFETY MEMBERS



D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Under the current assumptions there is an overall incidence of termination assumed, combined with assumptions, based on the plan membership and years of service. There is also another set of assumptions to anticipate the percentage of members who will withdraw their contributions and members who will leave their contributions on deposit and receive a deferred vested benefit.

We have developed rates for the following four groups: (1) General All Other, (2) General OCTA, (3) Safety Law Enforcement and Fire and (4) Safety Probation. The termination experience over the last three years is shown by years of service in the following tables. We also show the current and proposed assumptions.

	Termination Rate (%)					
	General All Other			General OCTA		
Years of Service	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
Less than 1	11.00	11.13	11.00	17.50	18.29	17.50
1	8.00	6.93	7.50	13.50	7.73	11.00
2	7.00	6.17	6.50	10.50	6.63	9.00
3	5.00	5.05	5.00	10.00	3.96	8.50
4	4.00	6.26	4.50	9.00	1.69	7.50
5	3.75	5.70	4.25	7.00	10.00	7.00
6	3.50	4.25	3.75	5.00	2.33	4.50
7	3.00	3.62	3.25	5.00	2.48	4.00
8	2.75	3.51	3.00	4.00	2.91	3.50
9	2.50	2.87	2.75	3.50	2.50	3.00
10	2.25	2.56	2.50	3.50	2.83	3.00
11	2.00	2.00	2.00	3.50	1.37	3.00
12	2.00	1.79	2.00	3.00	3.57	3.00
13	1.75	1.94	1.75	3.00	0.76	2.50
14	1.75	1.01	1.50	3.00	2.42	2.50
15	1.75	1.27	1.40	3.00	2.82	2.50
16	1.50	0.95	1.30	3.00	0.00	2.00
17	1.50	1.00	1.20	2.75	1.04	1.80
18	1.50	0.67	1.10	2.75	2.86	1.60
19	1.50	0.75	1.00	2.75	1.79	1.40
20 or more	1.25	0.41	0.90	1.75	0.63	1.20

	Termination Rate (%)					
	Safety Law and Fire			Safety Probation		
Years of Service	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
Less than 1	4.00	6.28	4.50	16.00	10.00	14.00
1	3.00	1.06	2.50	13.00	15.15	13.00
2	2.00	1.83	2.00	10.00	10.00	10.00
3	1.00	2.67	1.50	6.00	0.00	5.00
4	1.00	1.52	1.25	4.00	0.00	4.00
5	1.00	0.00	1.00	3.50	10.00	3.50
6	0.95	1.83	0.95	3.00	0.00	2.75
7	0.90	0.24	0.90	2.50	0.91	2.00
8	0.85	0.23	0.85	2.25	1.83	2.00
9	0.80	0.86	0.80	2.00	0.00	1.75
10	0.75	1.20	0.75	1.75	2.83	1.75
11	0.65	1.36	0.65	1.75	0.00	1.50
12	0.60	0.88	0.60	1.50	0.54	1.25
13	0.50	0.00	0.55	1.25	0.50	1.00
14	0.50	0.32	0.50	1.00	0.56	0.75
15	0.50	0.00	0.45	1.00	1.26	0.75
16	0.50	0.00	0.40	1.00	0.00	0.75
17	0.50	0.67	0.35	0.50	0.00	0.25
18	0.50	0.00	0.30	0.50	0.00	0.25
19	0.50	0.00	0.25	0.50	0.00	0.25
20 or more	0.25	0.08	0.20	0.50	0.00	0.25

Chart 23 compares actual to expected terminations over the past three years for both the current and proposed assumptions for General All Other, General OCTA, Safety Law Enforcement and Fire and Safety Probation members.

Chart 24 shows the actual termination rates over the past three years compared to the current and proposed assumptions for General All Other members.

Chart 25-27 shows the same information as Chart 24, but for General OCTA, Safety Law and Fire and Safety Probation members.

Based upon the recent experience, we have decreased the termination rates overall for General All Other members, General OCTA members, Safety Law and Fire members and Safety Probation members.

The following table shows the currently assumed, actual and proposed assumed percentages for members who withdraw their contributions. In the past, for the four membership categories just discussed, there was a separate assumption for members with fewer than five years of service versus those with five or more years of service. Based on the experience observed during the past three years, we are recommending a more detailed assumption for members with five or more years of service. The assumed percentages for members who leave their contributions on deposit and receive a deferred vested benefit is equal to 100% minus the percentage of those assumed to withdraw.

	Election for Withdrawal of Contributions					
	General All Other			General OCTA		
Years of Service	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
0-4	40%	25%	35%	45%	33%	40%
5-9	25%	31%	30%	35%	33%	35%
10-14	25%	27%	25%	35%	28%	30%
15 or more	25%	18%	20%	35%	13%	20%

	Election for Withdrawal of Contributions					
	Safety Law and Fire			Safety Probation		
Years of Service	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
0-4	20%	12%	20%	40%	20%	25%
5-9	20%	55%	20%	30%	0%	25%
10-14	20%	11%	20%	30%	0%	25%
15 or more	20%	25%	20%	30%	50%	25%

CHART 23: ACTUAL NUMBER OF TERMINATIONS COMPARED TO EXPECTED

(JANUARY 1, 2014 THROUGH DECEMBER 31, 2016)

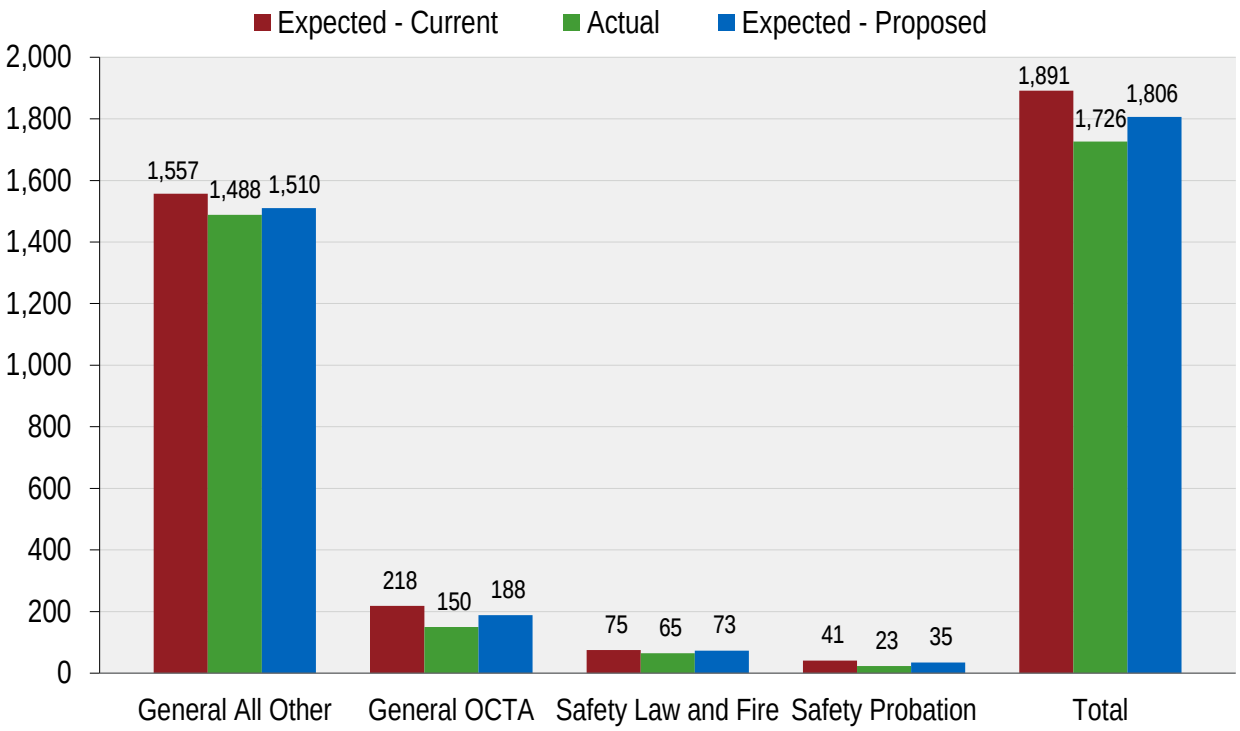


CHART 24: TERMINATION RATES GENERAL ALL OTHER MEMBERS

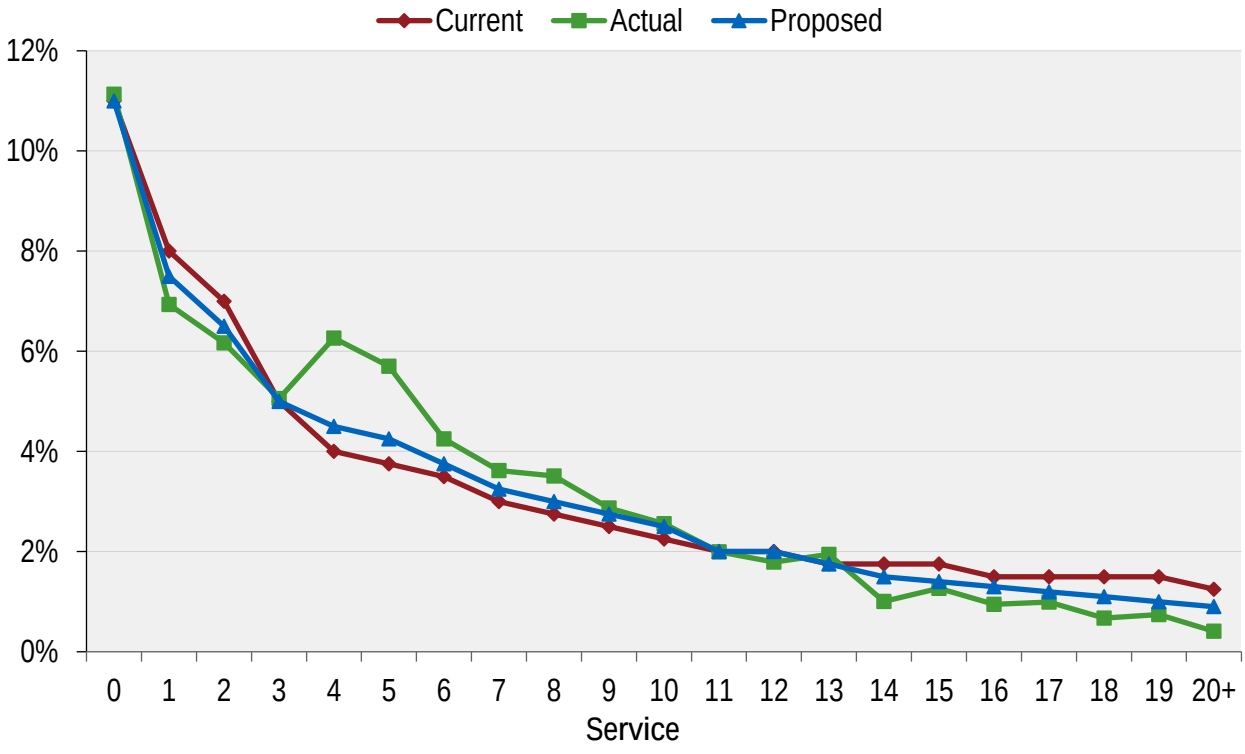


CHART 25: TERMINATION RATES
GENERAL OCTA MEMBERS

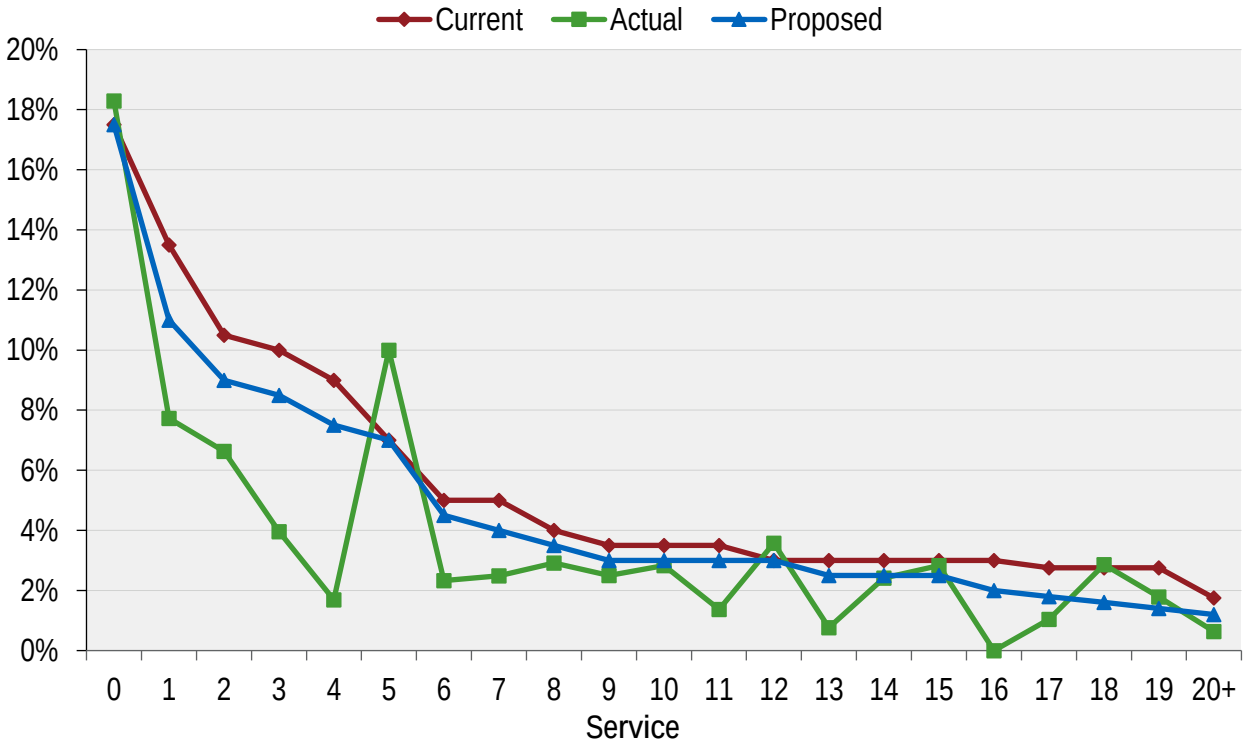


CHART 26: TERMINATION RATES
SAFETY LAW AND FIRE MEMBERS

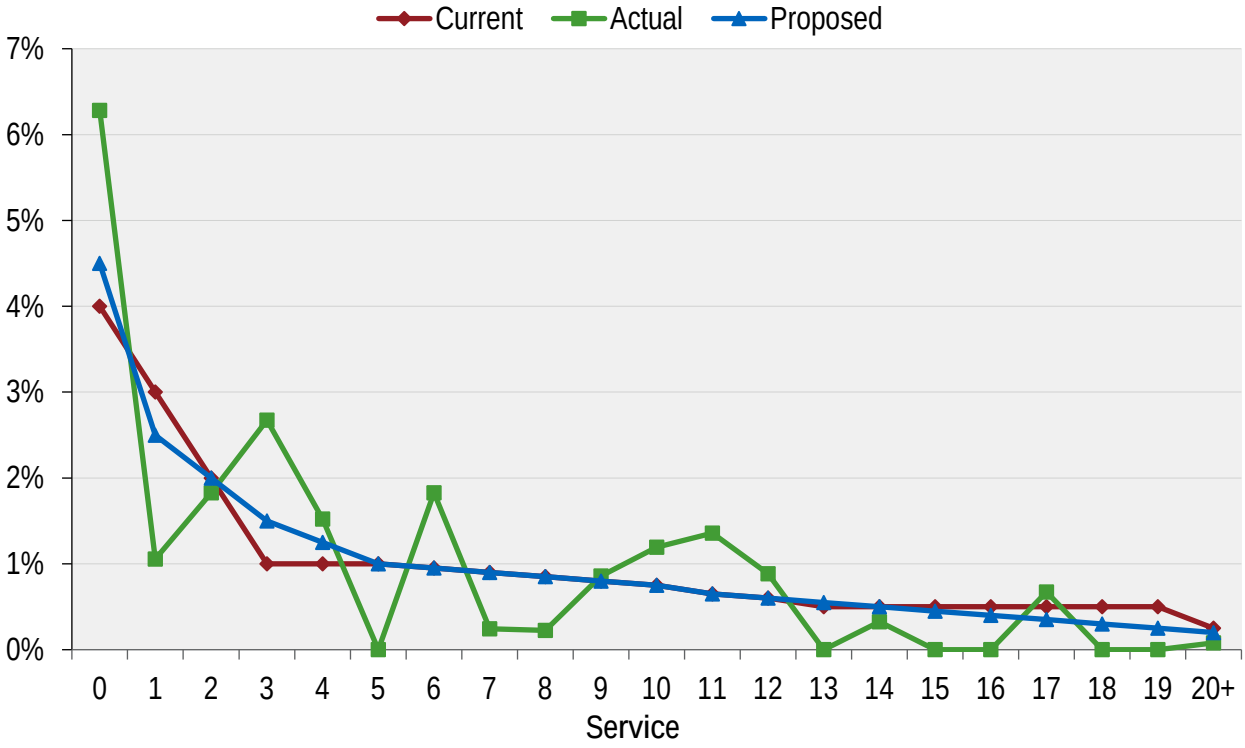
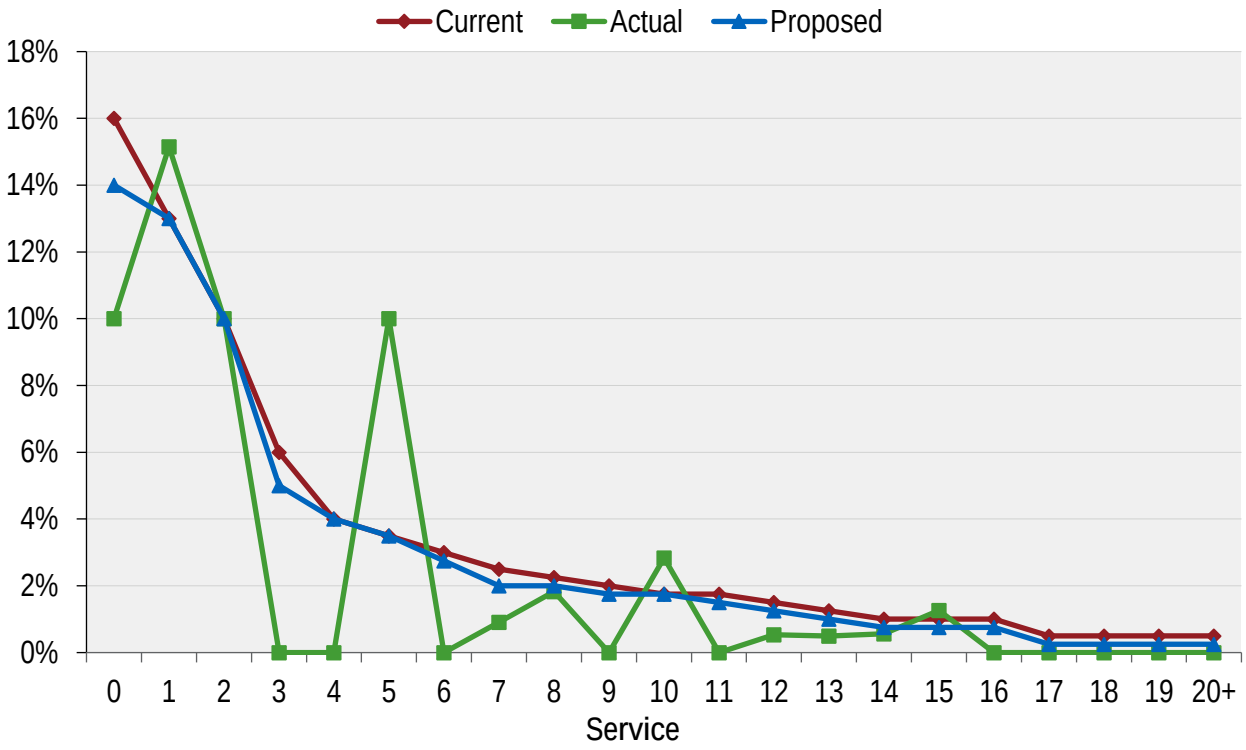


CHART 27: TERMINATION RATES
SAFETY PROBATION MEMBERS



E. Disability Incidence Rates

When a member becomes disabled, he or she may be entitled to at least a 50% pension (service connected disability), or a pension that depends upon the member's years of service (non-service connected disability). The following summarizes the actual incidence of combined service and non-service connected disabilities over the past three years compared to the current and proposed assumptions for both service connected and non-service connected disability incidence:

	Disability Incidence Rate (%)					
	General All Other			General OCTA		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 – 24	0.00	0.00	0.00	0.00	0.00	0.00
25 – 29	0.00	0.03	0.00	0.00	0.00	0.00
30 – 34	0.01	0.00	0.01	0.05	0.00	0.05
35 – 39	0.05	0.05	0.05	0.30	0.00	0.30
40 – 44	0.10	0.09	0.10	0.40	0.00	0.40
45 – 49	0.12	0.16	0.15	0.45	0.91	0.45
50 – 54	0.15	0.19	0.20	0.50	0.24	0.50
55 – 59	0.20	0.37	0.25	0.90	0.72	0.75
60 – 64	0.35	0.28	0.35	1.75	1.54	1.60
65 – 69	0.35	0.24	0.35	1.75	0.53	1.60

	Disability Incidence Rate (%)					
	Safety Law and Fire			Safety Probation		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 – 24	0.00	0.00	0.00	0.00	0.00	0.00
25 – 29	0.02	0.00	0.02	0.05	0.00	0.05
30 – 34	0.05	0.00	0.05	0.10	0.00	0.10
35 – 39	0.20	0.15	0.20	0.10	0.16	0.10
40 – 44	0.30	0.07	0.25	0.10	0.48	0.15
45 – 49	0.50	0.49	0.50	0.20	0.65	0.25
50 – 54	1.20	1.98	1.50	0.20	0.40	0.30
55 – 59	2.50	3.70	3.00	0.25	0.67	0.50
60 – 64	7.00	5.45	6.00	0.00	0.00	0.00
65 – 69	0.00	7.32	7.00	0.00	0.00	0.00

Chart 28 compares the actual number of service connected and non-service connected disabilities over the past three years to that expected under both the current and proposed assumptions. The proposed disability rates were adjusted to reflect the past three years experience.

Chart 29 shows actual disablement rates, compared to the assumed and proposed rates for General All Other members. Charts 30-32 graph the same information as Chart 29, but for General OCTA, Safety Law and Fire and Safety Probation members.

The following table shows the currently assumed, actual and proposed assumed percentages for service versus non-service connected disability for the groups.

	Service vs. Non-Service Connected Disability			
	Disablements Receiving Service Connected Disability			Disablements Receiving Non-Service Connected Disability
	Current Assumption	Actual Percentage	Proposed Assumption	Proposed Assumption
General All Other	55%	61%	60%	40%
General OCTA	65%	68%	65%	35%
Safety Law and Fire	100%	100%	100%	0%
Safety Probation	100%	67%	75%	25%

CHART 28: ACTUAL NUMBER OF DISABILITIES COMPARED TO EXPECTED

(JANUARY 1, 2014 THROUGH DECEMBER 31, 2016)

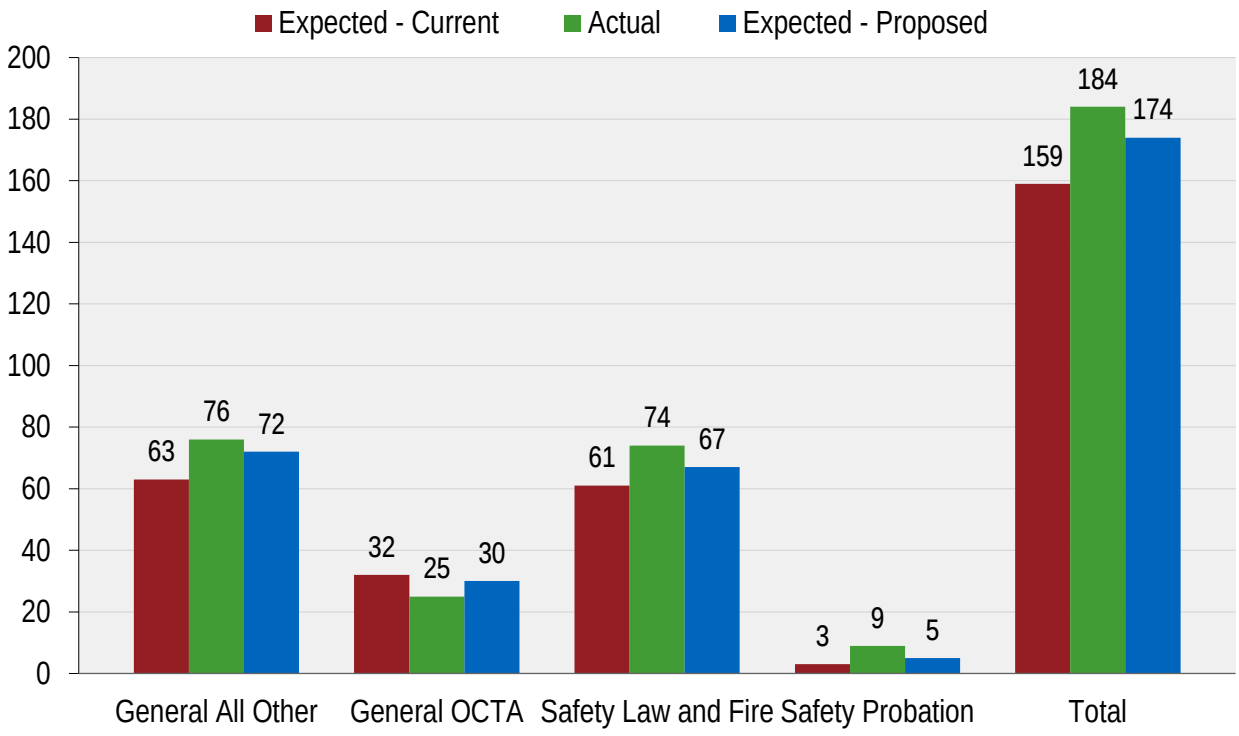


CHART 29: DISABILITY INCIDENCE RATES
GENERAL ALL OTHER MEMBERS

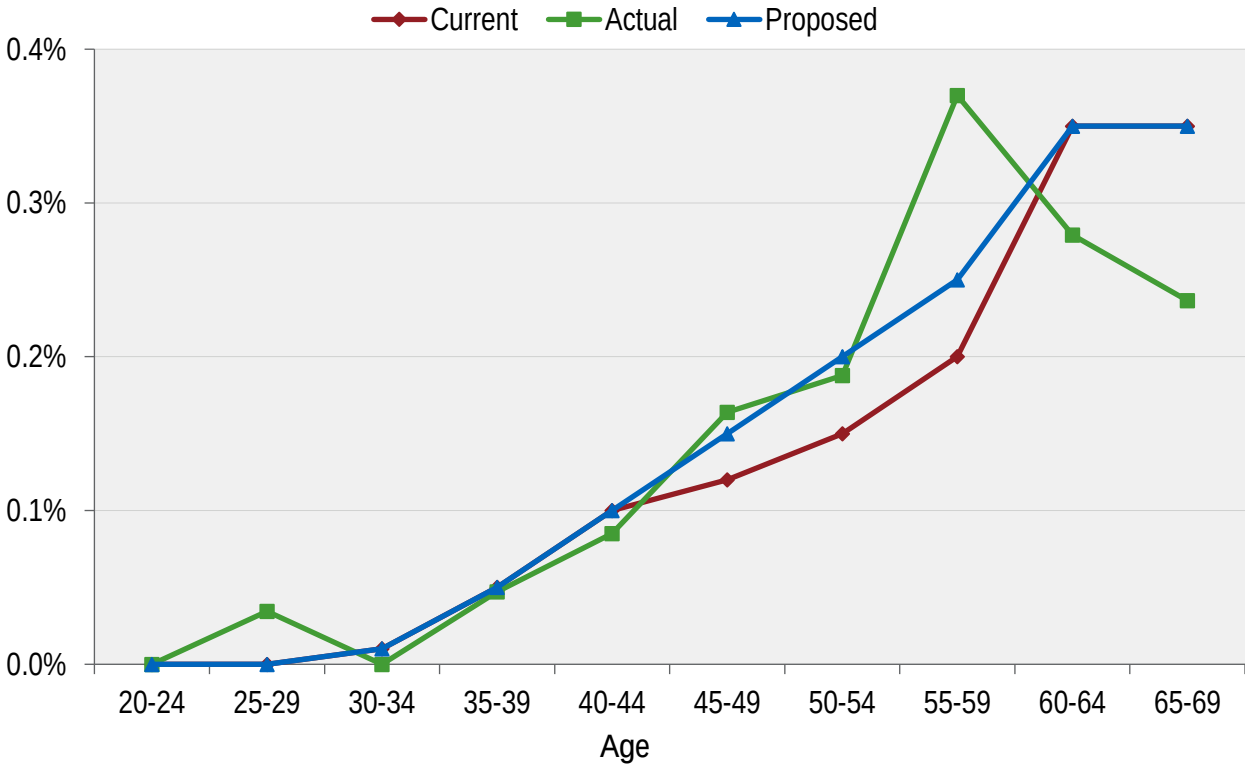


CHART 30: DISABILITY INCIDENCE RATES
GENERAL OCTA MEMBERS

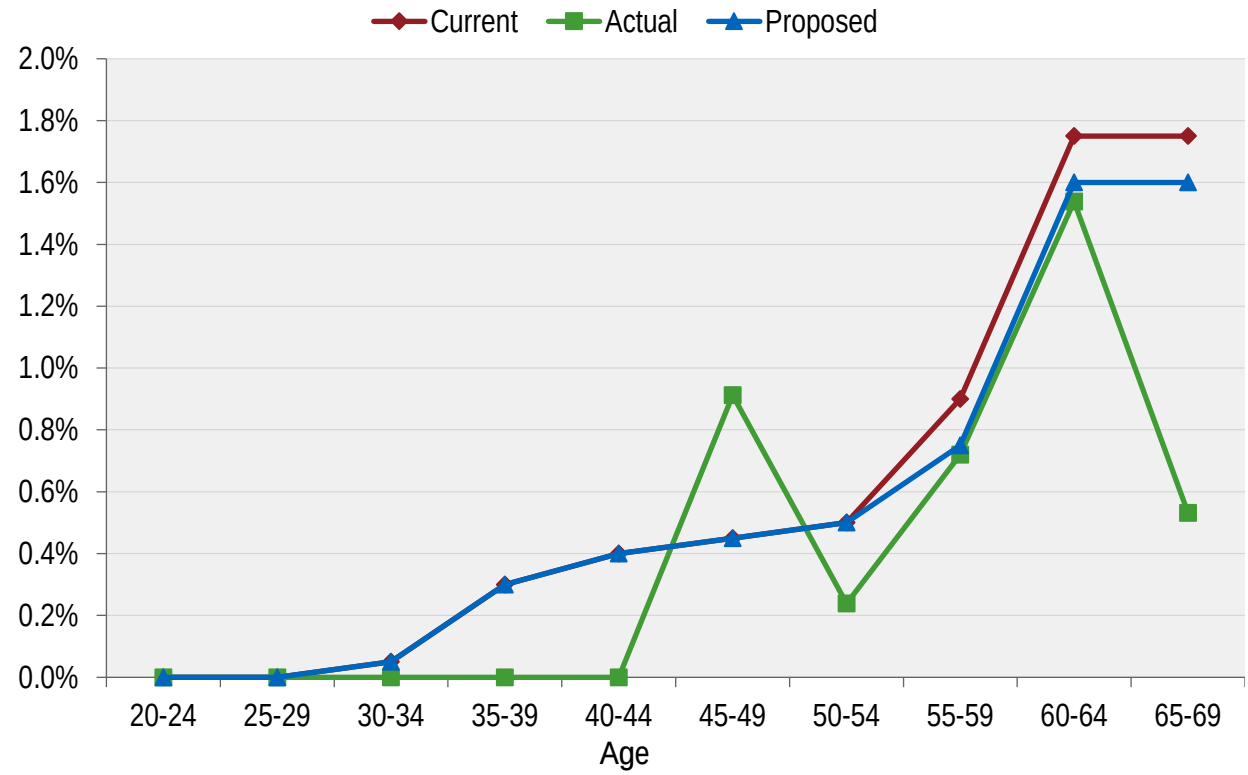


CHART 31: DISABILITY INCIDENCE RATES
SAFETY LAW AND FIRE MEMBERS

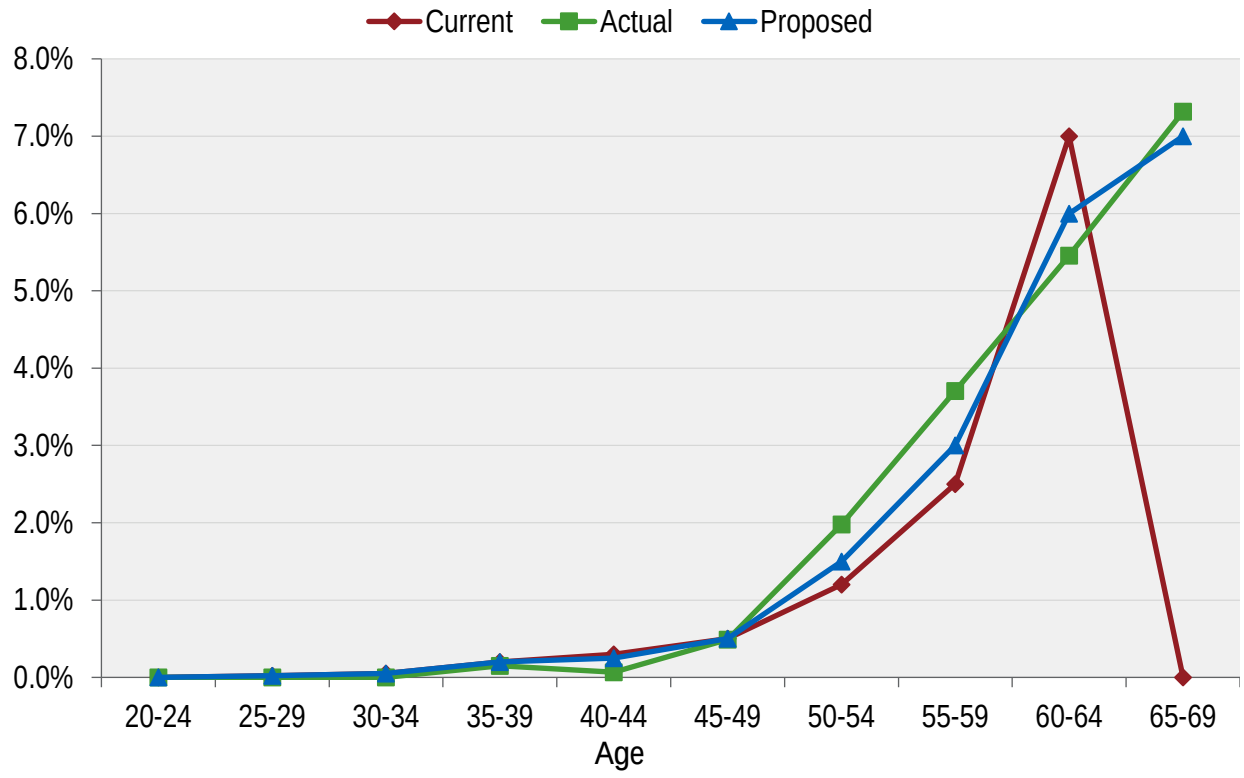
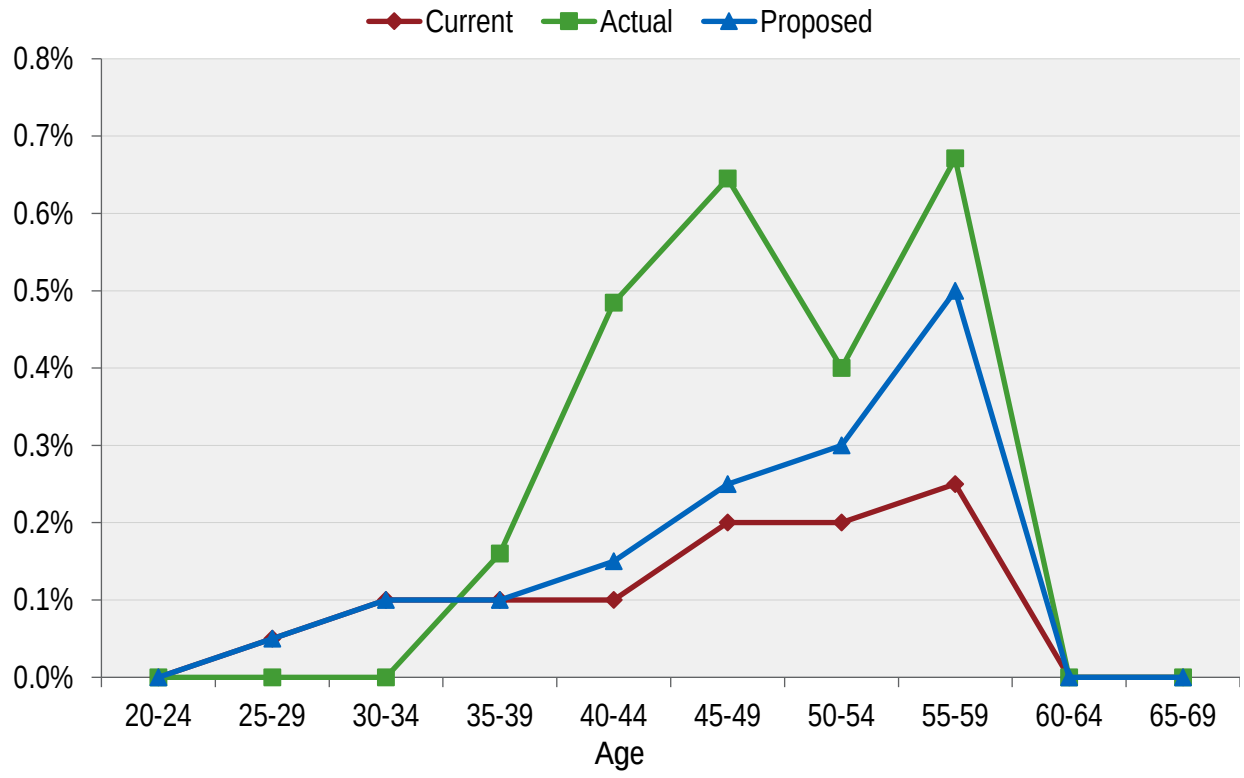


CHART 32: DISABILITY INCIDENCE RATES
SAFETY PROBATION MEMBERS



F. Additional Cashouts

In response to the California Court ruling in the Ventura cases, several additional pay elements were included as Earnable Compensation.[22] These additional pay elements fall into two categories:

- Ongoing Pay Elements – Those that are expected to be received relatively uniformly over a member's employment years; and
- Terminal Pay Elements – Those that are expected to be received only during the member's final average earnings pay period.

The first category is recognized in the actuarial calculations by virtue of being included in the current pay of active members. The second category requires a separate actuarial assumption to anticipate its impact on a member's retirement benefit.

In this study, we have been provided with final average salaries determined by OCERS before ("FAS – Base")[23] as well as after ("FAS – Final")[24] including the terminal pay elements for members who retired during the last three years. We have studied the impact of including these pay elements by taking the ratio of "FAS – Final" to "FAS – Base". Members covered under CalPEPRA plans are not eligible to receive leave cashouts.

The current and recommended additional cashout assumptions are provided in the following table:

	Final One Year Salary			Final Three Year Salary		
Membership	Current Assumption	Actual Rate	Proposed Assumption	Current Assumption	Actual Rate	Proposed Assumption
General Members	3.50%	2.46%	3.00%	2.80%	2.85%	2.80%
Safety Probation	3.80%	5.98%	3.80%	2.80%	3.43%	3.40%
Safety Law Enforcement	5.20%	6.63%	5.20%	4.70%	4.59%	4.60%
Safety Fire	2.00%	0.00%	2.00%	2.00%	1.65%	1.70%

Note that we have maintained the current cashout assumptions for Safety members from "Final One Year Salary" plans due to the low level of actual experience that we observed during the last three years.

[22] We understand that these amounts would only be applicable for legacy members enrolled in the non-CalPEPRA plans.

[23] Per OCERS, this is calculated by the System using base earnable salary plus those reported pensionable pay items (regularly included in the annual actuarial valuation) based on the highest system-calculated FAS period.

[24] Per OCERS, this is equal to "FAS – Base" plus all eligible pensionable pay items that had not been formerly transmitted to OCERS from the employer.

V. Cost Impact

The tables below show the changes in the average employer and member contribution rates due to the recommended and alternative assumption changes as if they were applied to the December 31, 2016 actuarial valuation.

Cost Impact of Recommended Assumptions		
Change in Costs	Contribution Rate	Estimated Annual Dollar Amount in Thousands*
Total Normal Cost	3.68%	$65,260
Member Normal Cost	1.61%	$28,559
Employer Normal Cost	2.07%	$36,701
Employer UAAL Payments	5.87%	$103,710
Total for Employer	7.94%	$140,411

* *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

Cost Impact of Alternative 1 Assumptions (7.00% Investment Return Assumption & 2.75% Inflation)		
Change in Costs	Contribution Rate	Estimated Annual Dollar Amount in Thousands*
Total Normal Cost	1.88%	$32,321
Member Normal Cost	0.77%	$13,232
Employer Normal Cost	1.11%	$19,089
Employer UAAL Payments	3.53%	$61,450
Total for Employer	4.64%	$80,539

* *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

Cost Impact of Alternative 2 Assumptions (6.75% Investment Return Assumption & 2.75% Inflation)		
Change in Costs	Contribution Rate	Estimated Annual Dollar Amount in Thousands*
Total Normal Cost	3.77%	$65,566
Member Normal Cost	1.59%	$27,567
Employer Normal Cost	2.18%	$37,999
Employer UAAL Payments	5.84%	$102,078
Total for Employer	8.02%	$140,077

* *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

The breakdown of the contribution impacts due only to the recommended demographic assumption changes (as recommended in Section IV of this report) and the contribution rate impacts (after implementing the demographic assumption changes) due to the recommended and alternative economic assumption changes (as recommended in Section III of this report), as well as the changes in funded status, are summarized in the following table.

Cost Impact			
	Recommended (7.00% Return & 3.00% Inflation)	**Alternative 1 (7.00% Return & 2.75% Inflation)**	**Alternative 2 (6.75% Return & 2.75% Inflation)**
Impact on Employer			
Change due to demographic assumptions	3.94%	3.94%	3.94%
Change due to economic assumptions	4.00%	0.70%	4.08%
Total change in employer rate	7.94%	4.64%	8.02%
Total estimated change in annual dollar amount ($000s)	$140,411	$80,539	$140,077
Impact on Member			
Change due to demographic assumptions	0.57%	0.57%	0.57%
Change due to economic assumptions	1.04%	0.20%	1.02%
Total change in member rate	1.61%	0.77%	1.59%
Total estimated change in annual dollar amount ($000s)	$28,559	$13,232	$27,567
Impact on UAAL and Funded Percentage			
Change in UAAL	$1,404 million	$763 million	$1,385 million
Change in funded percentage	From 73.1% to 67.7%	From 73.1% to 70.1%	From 73.1% to 67.9%

Considered separately, the changes in economic assumptions accounted for about one-half of the overall cost impact to the plan. Of the various economic assumption changes, the most significant cost impact is from the investment return assumption change. Of the various demographic assumption changes, the most significant cost impact is from the mortality assumption change.

We have also analyzed in the tables below the average employer and member contribution rate impacts by rate groups due to the recommended assumption changes as if they were applied to the December 31, 2016 actuarial valuation.

Increases in Employer Contribution Rates (% of Payroll) under Recommended Assumptions				
Rate Group	**Normal Cost**	**UAAL**	**Total**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	1.87%	3.49%[2]	5.36%	$4,462
Rate Group #2 (County et al.)	1.92%	5.50%	7.42%	$79,640
Rate Group #3 (OCSD)	1.77%	1.06%[3]	2.83%	$1,865
Rate Group #5 (OCTA)	2.02%	5.03%	7.05%	$7,393
Rate Group #9 (TCA)	1.53%	3.22%	4.75%	$325
Rate Group #10 (OCFA)	1.90%	4.42%	6.32%	$1,698
Rate Group #11 (Cemetery)	1.77%	2.71%[4]	4.48%	$63
Rate Group #12 (Law Library)	1.60%	4.39%	5.99%	$71
Rate Group #6 (Probation)	3.20%	9.16%	12.36%	$8,054
Rate Group #7 (Law Enforcement)	2.67%	9.45%	12.12%	$26,599
Rate Group #8 (Fire Authority)	2.09%	6.31%	8.40%	$10,241
Total All Rate Groups Combined	**2.07%**	**5.87%**	**7.94%**	**$140,411**

[1] *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

[2] *Before adjusting for UAAL allotted to U.C.I and Department of Education.*

[3] *The UAAL for Rate Group #3 after reflecting the recommended assumptions has been partially offset by the OCSD UAAL Deferred Account of $34,067,000 as of December 31, 2016. If Rate Group #3 had not been overfunded prior to the changes in assumptions and if the OCSD UAAL Account was not available to offset the change in UAAL due to the changes in assumptions, the UAAL Contribution rate impact due to the changes in assumptions would have been 5.36% of payroll.*

[4] *If Rate Group #11 had not been overfunded prior to the changes in assumptions, the UAAL contribution rate impact due to the changes in assumptions would have been 4.36% of payroll.*

Increases in Average Member Contribution Rates (% of Payroll) under Recommended Assumptions				
Rate Group	**Current**	**Proposed**	**Difference**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	8.62%	10.19%	1.57%	$1,310
Rate Group #2 (County et al.)	11.10%	12.58%	1.48%	$15,943
Rate Group #3 (OCSD)	11.52%	12.98%	1.46%	$967
Rate Group #5 (OCTA)	9.35%	10.71%	1.36%	$1,434
Rate Group #9 (TCA)	10.08%	11.43%	1.35%	$93
Rate Group #10 (OCFA)	11.03%	12.59%	1.56%	$420
Rate Group #11 (Cemetery)	8.87%	10.26%	1.39%	$20
Rate Group #12 (Law Library)	13.06%	14.49%	1.43%	$17
Rate Group #6 (Probation)	15.53%	17.81%	2.28%	$1,486
Rate Group #7 (Law Enforcement)	16.39%	18.46%	2.07%	$4,540
Rate Group #8 (Fire Authority)	15.44%	17.35%	1.91%	$2,329
Total All Rate Groups Combined	**12.01%**	**13.62%**	**1.61%**	**$28,559**

[1] *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

We have also analyzed in the tables below the average employer and member contribution rate impacts by rate groups due to the Alternative 1 (7.00% investment return and 2.75% inflation) assumption changes as if they were applied to the December 31, 2016 actuarial valuation.

Increases in Employer Contribution Rates (% of Payroll) under Alternative 1 Assumptions				
Rate Group	**Normal Cost**	**UAAL**	**Total**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	1.18%	2.30%[2]	3.48%	$2,866
Rate Group #2 (County et al.)	1.08%	3.41%	4.49%	$47,504
Rate Group #3 (OCSD)	0.97%	0.00%[3]	0.97%	$628
Rate Group #5 (OCTA)	1.37%	3.22%	4.59%	$4,756
Rate Group #9 (TCA)	0.88%	1.96%	2.84%	$191
Rate Group #10 (OCFA)	1.08%	2.62%	3.70%	$973
Rate Group #11 (Cemetery)	1.01%	0.99%[4]	2.00%	$28
Rate Group #12 (Law Library)	0.86%	2.83%	3.69%	$44
Rate Group #6 (Probation)	1.93%	5.84%	7.77%	$4,980
Rate Group #7 (Law Enforcement)	1.12%	5.50%	6.62%	$14,169
Rate Group #8 (Fire Authority)	0.63%	3.10%	3.73%	$4,400
Total All Rate Groups Combined	**1.11%**	**3.53%**	**4.64%**	**$80,539**

(1) *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

(2) *Before adjusting for UAAL allotted to U.C.I and Department of Education.*

(3) *The UAAL for Rate Group #3 after reflecting the recommended assumptions has been offset by the OCSD UAAL Deferred Account of $34,067,000 as of December 31, 2016. If Rate Group #3 had not been overfunded prior to the changes in assumptions and if the OCSD UAAL Account was not available to offset the change in UAAL due to the changes in assumptions, the UAAL Contribution rate impact due to the changes in assumptions would have been 2.81% of payroll.*

(4) *If Rate Group #11 had not been overfunded prior to the changes in assumptions, the UAAL contribution rate impact due to the changes in assumptions would have been 2.56% of payroll.*

Increases in Average Member Contribution Rates (% of Payroll) under Alternative 1 Assumptions				
Rate Group	**Current**	**Proposed**	**Difference**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	8.62%	9.56%	0.94%	$767
Rate Group #2 (County et al.)	11.10%	11.85%	0.75%	$7,864
Rate Group #3 (OCSD)	11.52%	12.26%	0.74%	$477
Rate Group #5 (OCTA)	9.35%	10.11%	0.76%	$784
Rate Group #9 (TCA)	10.08%	10.79%	0.71%	$48
Rate Group #10 (OCFA)	11.03%	11.86%	0.83%	$216
Rate Group #11 (Cemetery)	8.87%	9.59%	0.72%	$10
Rate Group #12 (Law Library)	13.06%	13.79%	0.73%	$9
Rate Group #6 (Probation)	15.53%	16.53%	1.00%	$627
Rate Group #7 (Law Enforcement)	16.39%	17.16%	0.77%	$1,598
Rate Group #8 (Fire Authority)	15.44%	16.16%	0.72%	$832
Total All Rate Groups Combined	**12.01%**	**12.78%**	**0.77%**	**$13,232**

(1) *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

We have also analyzed in the tables below the average employer and member contribution rate impacts by rate groups due to the Alternative 2 (6.75% investment return and 2.75% inflation) assumption changes as if they were applied to the December 31, 2016 actuarial valuation.

Increases in Employer Contribution Rates (% of Payroll) under Alternative 2 Assumptions				
Rate Group	**Normal Cost**	**UAAL**	**Total**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	1.92%	3.48%[2]	5.40%	$4,460
Rate Group #2 (County et al.)	2.01%	5.48%	7.49%	$79,313
Rate Group #3 (OCSD)	1.84%	1.00%[3]	2.84%	$1,851
Rate Group #5 (OCTA)	2.12%	4.99%	7.11%	$7,372
Rate Group #9 (TCA)	1.65%	3.26%	4.91%	$332
Rate Group #10 (OCFA)	1.99%	4.39%	6.38%	$1,691
Rate Group #11 (Cemetery)	1.87%	2.72%[4]	4.59%	$64
Rate Group #12 (Law Library)	1.71%	4.43%	6.14%	$72
Rate Group #6 (Probation)	3.40%	9.17%	12.57%	$8,102
Rate Group #7 (Law Enforcement)	2.87%	9.39%	12.26%	$26,520
Rate Group #8 (Fire Authority)	2.32%	6.27%	8.59%	$10,300
Total All Rate Groups Combined	**2.18%**	**5.84%**	**8.02%**	**$140,077**

(1) *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

(2) *Before adjusting for UAAL allotted to U.C.I and Department of Education.*

(3) *The UAAL for Rate Group #3 after reflecting the recommended assumptions has been partially offset by the OCSD UAAL Deferred Account of $34,067,000 as of December 31, 2016. If Rate Group #3 had not been overfunded prior to the changes in assumptions and if the OCSD UAAL Account was not available to offset the change in UAAL due to the changes in assumptions, the UAAL Contribution rate impact due to the changes in assumptions would have been 5.31% of payroll.*

(4) *If Rate Group #11 had not been overfunded prior to the changes in assumptions, the UAAL contribution rate impact due to the changes in assumptions would have been 4.38% of payroll.*

Increases in Average Member Contribution Rates (% of Payroll) under Alternative 2 Assumptions				
Rate Group	**Current**	**Proposed**	**Difference**	**Estimated Dollar Amounts[1] (in 000s)**
Rate Group #1 (non-OCTA, non-OCSD)	8.62%	10.20%	1.58%	$1,298
Rate Group #2 (County et al.)	11.10%	12.59%	1.49%	$15,733
Rate Group #3 (OCSD)	11.52%	13.00%	1.48%	$960
Rate Group #5 (OCTA)	9.35%	10.71%	1.36%	$1,408
Rate Group #9 (TCA)	10.08%	11.41%	1.33%	$90
Rate Group #10 (OCFA)	11.03%	12.59%	1.56%	$412
Rate Group #11 (Cemetery)	8.87%	10.24%	1.37%	$19
Rate Group #12 (Law Library)	13.06%	14.50%	1.44%	$17
Rate Group #6 (Probation)	15.53%	17.66%	2.13%	$1,361
Rate Group #7 (Law Enforcement)	16.39%	18.33%	1.94%	$4,160
Rate Group #8 (Fire Authority)	15.44%	17.21%	1.77%	$2,109
Total All Rate Groups Combined	**12.01%**	**13.60%**	**1.59%**	**$27,567**

(1) *Based on December 31, 2016 projected annual payrolls as determined under each set of assumptions.*

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.25%, net of investment expenses and administration expenses.
Member Contribution Crediting Rate:	5.00%, compounded semi-annually.
Consumer Price Index:	Increase of 3.00% per year, retiree COLA increases due to CPI subject to a 3.0% maximum change per year.
Payroll Growth:	Inflation of 3.00% per year plus "across the board" real salary increases of 0.50% per year.
Increase in Section 7522.10 Compensation Limit:	Increase of 3.00% per year from the valuation date.

Individual Salary Increases[1]

Annual Rate of Compensation Increase (%) Inflation: 3.00% per year; plus "across the board" salary increases of 0.50% per year; plus the following merit and promotional increases:		
Years of Service	**General**	**Safety**
Less than 1	10.00	14.00
1	7.25	10.00
2	6.00	8.50
3	4.75	6.75
4	4.00	5.25
5	3.25	4.50
6	2.25	3.50
7	2.00	3.25
8	1.50	2.25
9	1.25	2.25
10	1.25	1.75
11	1.25	1.75
12	1.25	1.75
13	1.25	1.75
14	1.25	1.75
15	1.25	1.75
16	0.75	1.50
17	0.75	1.50
18	0.75	1.50
19	0.75	1.50
20 and Over	0.75	1.50

[1] In addition to the individual salary increase assumptions, we have applied an average two hours of additional salary annually for leap-year salary adjustment.

Demographic Assumptions

Mortality Rates – Healthy

- **General Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020
- **Safety Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020 with ages set back two years

Mortality Rates – Disabled

- **General Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020 with ages set forward six years for males and set forward three years for females
- **Safety Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020

Mortality Rates – Beneficiaries

- Beneficiaries are assumed to have the same mortality as a General Member of the opposite sex who is receiving a service (non-disability) retirement

The mortality tables shown above were determined to contain about a 10% margin to reflect future mortality improvement, based on a review of the mortality experience as of the measurement date.

Member Contribution Rates

- **General Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020 weighted, 40% male and 60% female
- **Safety Members:** RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2020 with ages set back two years, weighted 80% male and 20% female

Mortality Rates Before Retirement

	Rate (%)			
	General		Safety	
Age	Male	Female	Male	Female
25	0.04	0.02	0.04	0.02
30	0.04	0.02	0.04	0.02
35	0.07	0.04	0.06	0.04
40	0.10	0.07	0.09	0.06
45	0.14	0.11	0.12	0.09
50	0.20	0.16	0.18	0.14
55	0.34	0.25	0.27	0.21
60	0.59	0.41	0.48	0.33
65	1.00	0.76	0.82	0.60

All General pre-retirement deaths are assumed to be non-service connected. For Safety, 90% of pre-retirement deaths are assumed to be non-service connected. The other 10% are assumed to be service connected

Disability Incidence Rates

	Rate (%)			
Age	General All Other[1]	General OCTA[2]	Safety Law & Fire[3]	Safety Probation[3]
20	0.00	0.00	0.00	0.00
25	0.00	0.00	0.01	0.03
30	0.01	0.03	0.04	0.08
35	0.03	0.20	0.14	0.10
40	0.08	0.36	0.26	0.10
45	0.11	0.43	0.42	0.16
50	0.14	0.48	0.92	0.20
55	0.18	0.74	1.98	0.23
60	0.29	1.41	5.20	0.10

1 *55% of General All Other disabilities are assumed to be service connected disabilities. The other 45% are assumed to be non-service connected.*

2 *65% of General OCTA disabilities are assumed to be service connected disabilities. The other 35% are assumed to be non-service connected.*

3 *100% of Safety Law Enforcement, Fire and Probation disabilities are assumed to be service connected disabilities.*

Termination Rates

	Rate (%)			
Years of Service	General All Other[1]	General OCTA[2]	Safety Law & Fire[3]	Safety Probation[4]
0	11.00	17.50	4.00	16.00
1	8.00	13.50	3.00	13.00
2	7.00	10.50	2.00	10.00
3	5.00	10.00	1.00	6.00
4	4.00	9.00	1.00	4.00
5	3.75	7.00	1.00	3.50
6	3.50	5.00	0.95	3.00
7	3.00	5.00	0.90	2.50
8	2.75	4.00	0.85	2.25
9	2.50	3.50	0.80	2.00
10	2.25	3.50	0.75	1.75
11	2.00	3.50	0.65	1.75
12	2.00	3.00	0.60	1.50
13	1.75	3.00	0.50	1.25
14	1.75	3.00	0.50	1.00
15	1.75	3.00	0.50	1.00
16	1.50	3.00	0.50	1.00
17	1.50	2.75	0.50	0.50
18	1.50	2.75	0.50	0.50
19	1.50	2.75	0.50	0.50
20 +	1.25	1.75	0.25	0.50

[1] *40% of all terminated members with less than 5 years of service and 25% of all terminated members with 5 or more years of service will choose a refund of contributions.*

[2] *45% of all terminated members with less than 5 years of service and 35% of all terminated members with 5 or more years of service will choose a refund of contributions.*

[3] *20% of all terminated members with less than 5 years of service and 20% of all terminated members with 5 or more years of service will choose a refund of contributions.*

[4] *40% of all terminated members with less than 5 years of service and 30% of all terminated members with 5 or more years of service will choose a refund of contributions.*

Retirement Rates

Age	Rate (%)							
	General			Safety				
	Enhanced	Non-Enhanced[1]	SJC (31676.12)	Law (31664.1)[2]	Law (31664.2)[2]	Fire (31664.1)[2]	Fire (31664.2)[2]	Probation[2]
49	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
50	2.5	2.5	3.0	16.0	11.5	6.0	8.0	3.0
51	2.0	2.5	3.0	16.0	12.0	8.0	10.0	3.0
52	2.0	2.5	3.0	16.0	12.7	9.0	11.0	4.0
53	2.0	2.5	3.0	16.0	17.9	10.0	12.0	4.0
54	5.0	2.5	3.0	22.0	18.8	16.0	14.0	6.0
55	15.0	3.0	4.0	22.0	30.7	19.0	24.0	11.0
56	10.0	3.5	5.0	20.0	20.0	20.0	23.0	11.0
57	10.0	5.0	6.0	20.0	20.0	23.0	27.0	17.0
58	10.0	5.0	7.0	20.0	25.0	30.0	27.0	20.0
59	11.0	7.0	9.0	26.0	30.0	30.0	36.0	20.0
60	12.0	9.0	11.0	45.0	100.0	45.0	100.0	20.0
61	12.0	10.0	13.0	45.0	100.0	45.0	100.0	20.0
62	15.0	16.0	15.0	45.0	100.0	45.0	100.0	25.0
63	16.0	16.0	15.0	45.0	100.0	45.0	100.0	50.0
64	16.0	18.0	20.0	45.0	100.0	45.0	100.0	50.0
65	21.0	21.0	20.0	100.0	100.0	100.0	100.0	100.0
66	22.0	26.0	24.0	100.0	100.0	100.0	100.0	100.0
67	23.0	21.0	24.0	100.0	100.0	100.0	100.0	100.0
68	23.0	21.0	24.0	100.0	100.0	100.0	100.0	100.0
69	23.0	21.0	24.0	100.0	100.0	100.0	100.0	100.0
70	40.0	30.0	100.0	100.0	100.0	100.0	100.0	100.0
71	40.0	30.0	100.0	100.0	100.0	100.0	100.0	100.0
72	40.0	30.0	100.0	100.0	100.0	100.0	100.0	100.0
73	40.0	30.0	100.0	100.0	100.0	100.0	100.0	100.0
74	40.0	30.0	100.0	100.0	100.0	100.0	100.0	100.0
75	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] *These assumptions are also used for the CalPEPRA 1.62% @ 65 formula (Plan T and Plan W).*

[2] *Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings.*

Retirement Rates (continued)

	Rate (%)			
	General	Safety		
Age	CalPEPRA 2.5% @ 67	CalPEPRA Probation Formula[1]	CalPEPRA Law Formula[1]	CalPEPRA Fire Formula[1]
50	0.0	2.5	11.0	6.5
51	0.0	2.5	11.5	8.0
52	4.0	3.0	12.0	9.0
53	1.5	3.0	16.0	10.0
54	1.5	5.5	17.0	12.0
55	2.5	10.0	28.0	21.0
56	3.5	10.0	18.0	20.0
57	5.5	15.0	17.5	22.0
58	7.5	20.0	22.0	25.0
59	7.5	20.0	26.0	31.5
60	7.5	100.0	100.0	100.0
61	7.5	100.0	100.0	100.0
62	14.0	100.0	100.0	100.0
63	14.0	100.0	100.0	100.0
64	14.0	100.0	100.0	100.0
65	18.0	100.0	100.0	100.0
66	22.0	100.0	100.0	100.0
67	23.0	100.0	100.0	100.0
68	23.0	100.0	100.0	100.0
69	23.0	100.0	100.0	100.0
70	30.0	100.0	100.0	100.0
71	30.0	100.0	100.0	100.0
72	30.0	100.0	100.0	100.0
73	30.0	100.0	100.0	100.0
74	30.0	100.0	100.0	100.0
75	100.0	100.0	100.0	100.0

[1] *Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings*

<table>
<tr><td>Retirement Age and Benefit for Deferred Vested Members:</td><td>For deferred vested members, we make the following retirement assumption:
General Age: 58
Safety Age: 53
We assume that 20% of future General and 30% of future Safety deferred vested members are reciprocal. For reciprocals, we assume 4.25% compensation increases for General and 5.00% for Safety per annum.</td></tr>
<tr><td>Liability Calculation for Current Deferred Vested Members:</td><td>Liability for a current deferred vested member is calculated based on salary, service, and eligibility for reciprocal benefit as provided by the Retirement System. For those members without salary information that have 3 or more years of service, we used an average salary. For those members without salary information that have less than 3 years of service or for those members without service information, we assumed a refund of account balance.</td></tr>
<tr><td>Future Benefit Accruals:</td><td>1.0 year of service per year of employment. There is no assumption to anticipate conversion of unused sick leave at retirement.</td></tr>
<tr><td>Unknown Data for Members:</td><td>Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.</td></tr>
<tr><td>Definition of Active Member:</td><td>All active members of OCERS as of the valuation date.</td></tr>
<tr><td>Form of Payment:</td><td>All members are assumed to elect the unmodified option at retirement.</td></tr>
<tr><td>Percent Married:</td><td>75% of male members and 50% of female members are assumed to be married at retirement or time of pre-retirement death.</td></tr>
<tr><td>Age of Spouse:</td><td>Female (or male) three years younger (or older) than spouse.</td></tr>
<tr><td>Additional Cashout Assumptions:</td><td><u>Non-CalPEPRA Formulas</u>
Additional compensation amounts are expected to be received during a member’s final average earnings period. The percentages used in this valuation are:
<table><tr><th></th><th>Final One Year Salary</th><th>Final Three Year Salary</th></tr><tr><td>General Members</td><td>3.50%</td><td>2.80%</td></tr><tr><td>Safety Probation</td><td>3.80%</td><td>2.80%</td></tr><tr><td>Safety Law Enforcement</td><td>5.20%</td><td>4.70%</td></tr><tr><td>Safety Fire</td><td>2.00%</td><td>2.00%</td></tr></table>The additional cashout assumptions are the same for service and disability retirements.

<u>CalPEPRA Formulas</u>
None</td></tr>
</table>

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.00%, net of investment expenses and administration expenses.
Member Contribution Crediting Rate:	5.00%, compounded semi-annually.
Consumer Price Index:	Increase of 3.00% per year, retiree COLA increases due to CPI subject to a 3.0% maximum change per year.
Payroll Growth:	Inflation of 3.00% per year plus "across the board" real salary increases of 0.50% per year.
Increase in Section 7522.10 Compensation Limit:	Increase of 3.00% per year from the valuation date.

Individual Salary Increases[1]

Annual Rate of Compensation Increase (%) Inflation: 3.00% per year; plus "across the board" salary increases of 0.50% per year; plus the following merit and promotional increases:		
Years of Service	**General**	**Safety**
Less than 1	9.00	14.00
1	7.25	10.00
2	6.00	7.75
3	5.00	6.00
4	4.00	5.50
5	3.50	4.50
6	2.50	3.75
7	2.25	3.25
8	1.75	2.50
9	1.50	2.25
10	1.50	1.75
11	1.50	1.75
12	1.50	1.75
13	1.50	1.75
14	1.50	1.75
15	1.50	1.75
16	1.00	1.50
17	1.00	1.50
18	1.00	1.50
19	1.00	1.50
20 and Over	1.00	1.50

[1] In addition to the individual salary increase assumptions, we have applied an average two hours of additional salary annually for leap-year salary adjustment.

Demographic Assumptions

Mortality Rates – Healthy

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, projected generationally with the two-dimensional MP-2016 projection scale
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set back four years, projected generationally with the two-dimensional MP-2016 projection scale

Mortality Rates – Disabled

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward five years, projected generationally with the two-dimensional MP-2016 projection scale
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, projected generationally with the two-dimensional MP-2016 projection scale

Mortality Rates – Beneficiaries

- Beneficiaries are assumed to have the same mortality as a General Member of the opposite sex who is receiving a service (non-disability) retirement

Pre-Retirement Mortality Rates

- **General and Safety Members:** Headcount-Weighted RP-2014 Employee Mortality Table times 80%, projected generationally with the two-dimensional MP-2016 projection scale

Member Contribution Rates

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females), projected 20 years with the two-dimensional mortality improvement scale MP-2016, weighted 40% male and 60% female
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females), projected 20 years with the two-dimensional mortality improvement scale MP-2016 set back four years, weighted 80% male and 20% female

The RP-2014 mortality tables and adjustments as shown above reflect the mortality experience as of the measurement date. The generational projection is a provision for future mortality improvement.

Mortality Rates Before Retirement

	Rate (%)	
Age	Male	Female
25	0.05	0.02
30	0.05	0.02
35	0.05	0.03
40	0.06	0.04
45	0.10	0.07
50	0.17	0.11
55	0.27	0.17
60	0.45	0.24
65	0.78	0.36
70	1.27	0.59

Note that generational projections beyond the base year (2014) are not reflected in the above mortality rates.

All General pre-retirement deaths are assumed to be non-service connected. For Safety, 90% of pre-retirement deaths are assumed to be non-service connected. The other 10% are assumed to be service connected.

Disability Incidence Rates

	Rate (%)			
Age	General All Other[1]	General OCTA[2]	Safety Law & Fire[3]	Safety Probation[4]
20	0.00	0.00	0.00	0.00
25	0.00	0.00	0.01	0.03
30	0.01	0.03	0.04	0.08
35	0.03	0.20	0.14	0.10
40	0.08	0.36	0.23	0.13
45	0.13	0.43	0.40	0.21
50	0.18	0.48	1.10	0.28
55	0.23	0.65	2.40	0.42
60	0.31	1.26	4.80	0.20

1 *60% of General All Other disabilities are assumed to be service connected disabilities. The other 40% are assumed to be non-service connected.*

2 *65% of General OCTA disabilities are assumed to be service connected disabilities. The other 35% are assumed to be non-service connected.*

3 *100% of Safety Law Enforcement and Fire disabilities are assumed to be service connected disabilities.*

4 *75% of Safety Probation disabilities are assumed to be service connected disabilities. The other 25% are assumed to be non-service connected.*

Termination Rates

	Rate (%)			
Years of Service	General All Other	General OCTA	Safety Law & Fire	Safety Probation
0	11.00	17.50	4.50	14.00
1	7.50	11.00	2.50	13.00
2	6.50	9.00	2.00	10.00
3	5.00	8.50	1.50	5.00
4	4.50	7.50	1.25	4.00
5	4.25	7.00	1.00	3.50
6	3.75	4.50	0.95	2.75
7	3.25	4.00	0.90	2.00
8	3.00	3.50	0.85	2.00
9	2.75	3.00	0.80	1.75
10	2.50	3.00	0.75	1.75
11	2.00	3.00	0.65	1.50
12	2.00	3.00	0.60	1.25
13	1.75	2.50	0.55	1.00
14	1.50	2.50	0.50	0.75
15	1.40	2.50	0.45	0.75
16	1.30	2.00	0.40	0.75
17	1.20	1.80	0.35	0.25
18	1.10	1.60	0.30	0.25
19	1.00	1.40	0.25	0.25
20 +	0.90	1.20	0.20	0.25

Proportion of Total Termination Assumed to Withdraw Contributions

	Election for Withdrawal of Contributions (%)			
Years of Service	General All Other	General OCTA	Safety Law and Fire	Safety Probation
0 – 4	35.0	40.0	20.0	25.0
5 – 9	30.0	35.0	20.0	25.0
10 – 14	25.0	30.0	20.0	25.0
15 or more	20.0	20.0	20.0	25.0

Retirement Rates

Age	Rate (%)							
	General			Safety				
	Enhanced	Non-Enhanced[1]	SJC (31676.12)	Law (31664.1)[2]	Law (31664.2)[2]	Fire (31664.1)	Fire (31664.2)	Probation[2]
48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	30.00	25.00	0.00	12.00	0.00	2.00	0.00	0.00
50	2.50	2.00	3.00	18.00	11.50	5.00	8.00	3.25
51	2.00	2.00	3.00	18.00	12.00	7.00	10.00	3.25
52	2.50	2.00	3.00	17.00	12.70	9.50	11.00	4.25
53	2.50	2.75	3.00	17.00	17.90	10.50	12.00	4.25
54	5.50	2.75	3.00	22.00	18.80	15.00	14.00	7.00
55	15.00	3.25	4.00	22.00	30.70	18.00	24.00	12.00
56	10.00	3.50	5.00	20.00	20.00	20.00	23.00	12.00
57	10.00	5.50	6.00	20.00	20.00	21.00	27.00	18.00
58	11.00	5.50	7.00	20.00	25.00	28.00	27.00	18.00
59	11.00	6.50	9.00	26.00	30.00	28.00	36.00	18.00
60	12.00	9.25	11.00	35.00	40.00	30.00	40.00	20.00
61	12.00	12.00	13.00	35.00	40.00	30.00	40.00	20.00
62	14.00	16.00	15.00	40.00	40.00	35.00	40.00	25.00
63	16.00	16.00	15.00	40.00	40.00	35.00	40.00	40.00
64	16.00	18.00	20.00	40.00	40.00	35.00	40.00	40.00
65	22.00	22.00	20.00	100.00	100.00	100.00	100.00	100.00
66	22.00	28.00	24.00	100.00	100.00	100.00	100.00	100.00
67	23.00	24.00	24.00	100.00	100.00	100.00	100.00	100.00
68	23.00	24.00	24.00	100.00	100.00	100.00	100.00	100.00
69	23.00	20.00	24.00	100.00	100.00	100.00	100.00	100.00
70	25.00	20.00	50.00	100.00	100.00	100.00	100.00	100.00
71	25.00	25.00	50.00	100.00	100.00	100.00	100.00	100.00
72	25.00	25.00	50.00	100.00	100.00	100.00	100.00	100.00
73	25.00	25.00	50.00	100.00	100.00	100.00	100.00	100.00
74	25.00	25.00	50.00	100.00	100.00	100.00	100.00	100.00
75	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

1 *These assumptions are also used for the CalPEPRA 1.62% @ 65 formula (Plan T and Plan W).*

2 *Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings.*

Retirement Rates (continued)

	Rate (%)			
	General	Safety		
Age	CalPEPRA 2.5% @ 67	CalPEPRA Probation Formula[1]	CalPEPRA Law Formula[1]	CalPEPRA Fire Formula
50	0.00	2.50	11.00	6.00
51	0.00	2.50	11.50	7.00
52	4.00	3.00	12.00	9.00
53	1.50	3.00	16.00	10.00
54	1.50	5.50	17.00	11.50
55	2.50	10.00	28.00	21.00
56	3.50	10.00	18.00	20.00
57	5.50	15.00	17.50	22.00
58	7.50	20.00	22.00	25.00
59	7.50	20.00	26.00	30.00
60	7.50	40.00	40.00	40.00
61	7.50	40.00	40.00	40.00
62	14.00	40.00	40.00	40.00
63	14.00	40.00	40.00	40.00
64	14.00	40.00	40.00	40.00
65	18.00	100.00	100.00	100.00
66	22.00	100.00	100.00	100.00
67	23.00	100.00	100.00	100.00
68	23.00	100.00	100.00	100.00
69	23.00	100.00	100.00	100.00
70	25.00	100.00	100.00	100.00
71	25.00	100.00	100.00	100.00
72	25.00	100.00	100.00	100.00
73	25.00	100.00	100.00	100.00
74	25.00	100.00	100.00	100.00
75	100.00	100.00	100.00	100.00

[1] *Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings*

Retirement Age and Benefit for Deferred Vested Members:	For deferred vested members, we make the following retirement assumption: General Age: 59 Safety Age: 53 We assume that 15% of future General and 25% of future Safety deferred vested members are reciprocal. For reciprocals, we assume 4.50% compensation increases for General and 5.00% for Safety per annum.
Liability Calculation for Current Deferred Vested Members:	Liability for a current deferred vested member is calculated based on salary, service, and eligibility for reciprocal benefit as provided by the Retirement System. For those members without salary information that have 3 or more years of service, we used an average salary. For those members without salary information that have less than 3 years of service or for those members without service information, we assumed a refund of account balance.
Future Benefit Accruals:	1.0 year of service per year of employment. There is no assumption to anticipate conversion of unused sick leave at retirement.
Unknown Data for Members:	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
Definition of Active Member:	All active members of OCERS as of the valuation date.
Form of Payment:	All members are assumed to elect the unmodified option at retirement.
Percent Married:	75% of male members and 55% of female members are assumed to be married at retirement or time of pre-retirement death.
Age of Spouse:	Female (or male) three years younger (or older) than spouse.
Additional Cashout Assumptions:	**Non-CalPEPRA Formulas** Additional compensation amounts are expected to be received during a member's final average earnings period. The percentages used in this valuation are: General Members: Final One Year Salary 3.00%; Final Three Year Salary 2.80% Safety Probation: Final One Year Salary 3.80%; Final Three Year Salary 3.40% Safety Law Enforcement: Final One Year Salary 5.20%; Final Three Year Salary 4.60% Safety Fire: Final One Year Salary 2.00%; Final Three Year Salary 1.70% The additional cashout assumptions are the same for service and disability retirements. **CalPEPRA Formulas** None

Segal Consulting

Orange County Employees Retirement System

2017 Actuarial Experience Study – 1st Presentation

August 21, 2017

Paul Angelo, FSA

Segal Consulting, San Francisco

5501436v2

Selection of Actuarial Assumptions

- New assumptions will be used in December 31, 2017 valuation
  - Sets contributions for 2019 – 2020 fiscal year
- Actuarial assumptions – two kinds
  - Demographic -- When benefits will be payable
  - Economic -- How assets, and salaries and benefits increase
- Objective, long term
- Recent experience of future expectations
  - Demographic: recent experience
  - Economic: not necessarily!
- System specific or not
  - All assumption are system specific except price inflation
- Consistency among assumptions
- Desired pattern of cost incidence
  - Good assumptions produce level cost
  - Beware “results based” assumptions![142/458]

Always remember

C + I = B + E

Contributions + Investment Income

equals

Benefit Payments + Expenses

- Actuarial valuation determines the current or “measured” cost, not the ultimate cost
- Assumptions and funding methods affect only the timing of costs

Demographic Assumptions

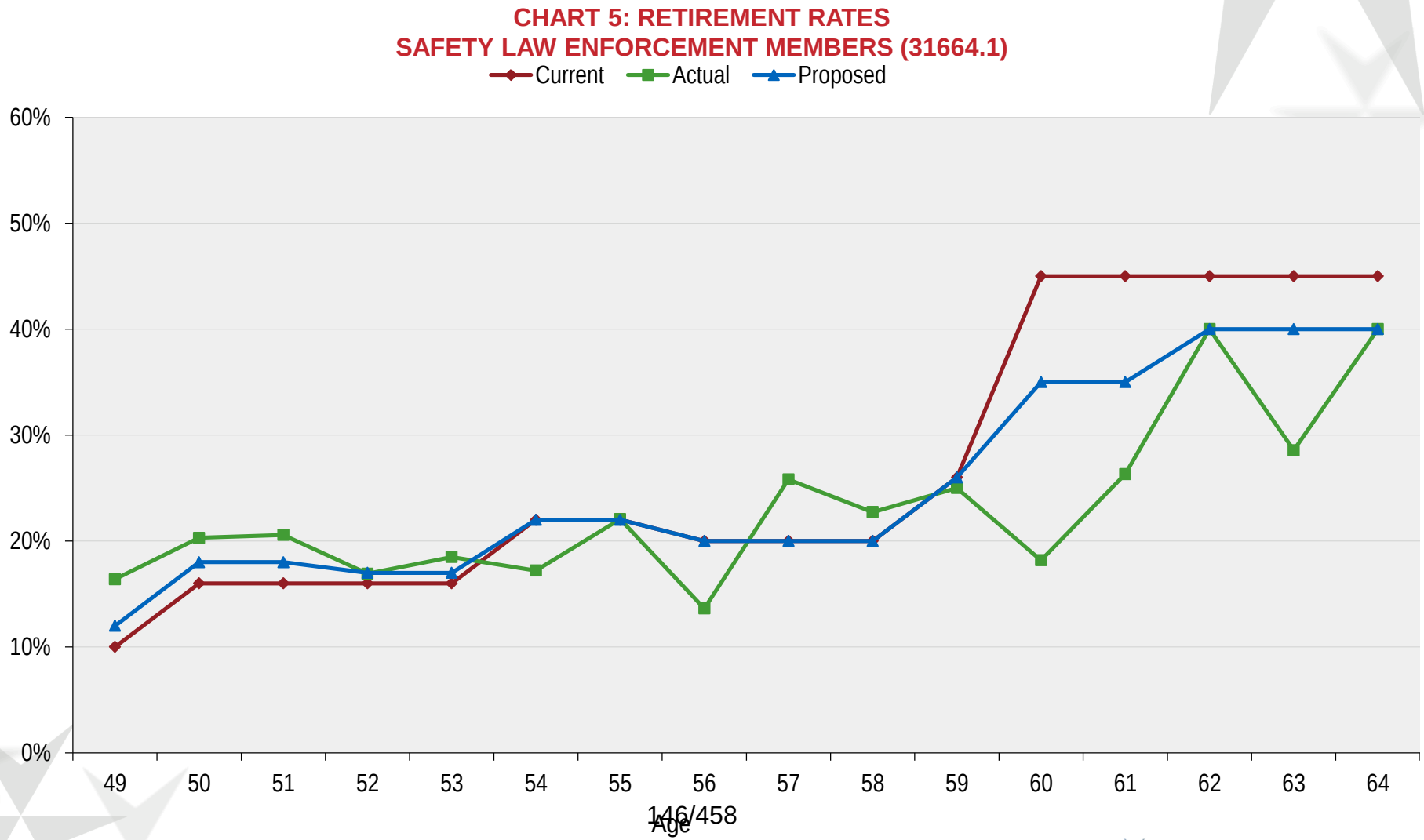
- Rates of “decrement”
  - Termination, mortality, disability, retirement
  - Termination
    - Withdrawal
    - Deferred vested
  - Mortality
    - Before and after retirement
    - Service, disability, beneficiary
- Percent married
- Member/spouse age difference
- Reciprocity
- Additional cashouts
- Assumptions can be distinct for General and Safety
  - Also for different Plans and different Rate Groups

Setting Demographic Assumptions

- To determine rates for each assumption we count the “decrements” and “exposures” for that event
  - Exposures = Number of employees who could have terminated, retired, etc.
  - Decrements = Number of employees who actually terminated, retired, etc.
  - This gives the “actual” decrement rates during the period
- Compare to the “current” assumed rates (or to expected number of decrements based on those current rates)
- Develop “proposed” new assumption based on both “current” assumption and recent “actual” experience
  - Weight the “actual” based on “credibility”

Setting Demographic Assumption – Retirement Rates

- Retirement Rates from Experience Study



Age-based vs Service-based Retirement Assumptions

- Looked into developing retirement assumptions based on service instead of age
  - No discernable pattern
  - Improved if age used as additional variable
- CalPERS uses both age and service
  - Significantly larger entity with more exposures and decrements
- Would not have as much reliable experience for OCERS to develop credible retirement assumptions by age and service

Recommendations - Demographic

- Retirement rates:
  - Maintain age-based assumptions
  - Overall, slight adjustments to retirement rates
- Termination rates:
  - Decrease in termination rates
  - Decrease assumption for how many members elect a refund
- Disability incidence:
  - Increase assumption overall
    - Decrease assumption for General OCTA members

Setting Demographic Assumptions – Mortality

Mortality Rates

- Longer life expectancies
- Mortality table
  - RP-2014: Headcount-Weighted vs. Benefit-Weighted
- The Society of Actuaries has published scales to estimate future mortality improvements:
  - Scale AA - Has been standard since around 2000
    - » Does not accurately reflect recent improvements in mortality
  - Scale BB - Interim standard scale issued in 2012
  - Scale MP-2014 – Issued in October 2014
  - Scale MP-2015 – Issued in October 2015
  - Scale MP-2016 – Issued in October 2016

Setting Demographic Assumptions – Mortality

- Two ways to use mortality improvement scales to project future mortality improvements: Static or Generational
- Static projection to a future year - reflect mortality at a future date, not as of today
  - Preferable to have a margin of around 20%
    - Actual deaths during the study period should be around 20% greater than the expected deaths
  - Current assumption
    - RP-2000 projected to 2020 with Scale BB
      - For General, no age adjustment for males or females
      - For Safety, ages are set back two years for males and females

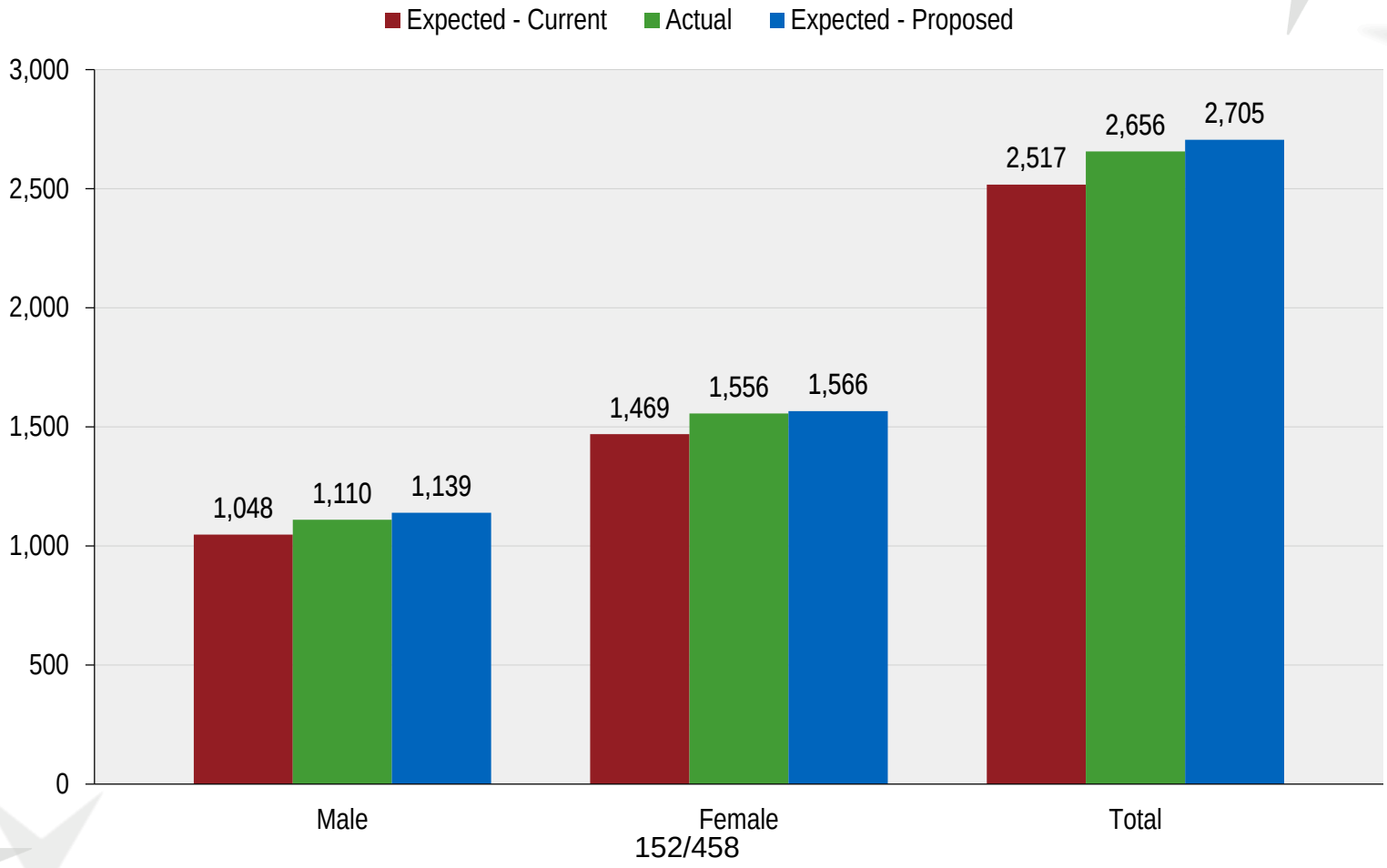
Recommended Demographic Assumptions – Mortality

- Recommend generational mortality
  - Use most recent SOA tables as a starting point
  - Each future year has its own mortality table that reflects the forecasted improvements at every age
    - Probability of dying depends not only on age and sex but also what year it is
    - Younger participants have more future mortality improvement built in than for older participants
    - Current year tables reflect recent actual experience, with no margin
  - Headcount-Weighted RP-2014, projected generationally using the two-dimensional Scale MP-2016
    - For General, no age adjustment for males or females
    - For Safety, ages are set back four years for males and females
- Exception for member contribution rates for legacy tiers, and determination of optional benefits and reserves
  - Use static projection for 20 years
    - Approximates generational mortality

Setting Demographic Assumptions – Mortality Rates

- Mortality Experience from Experience Study

CHART 15: POST-RETIREMENT DEATHS
NON-DISABLED GENERAL MEMBERS AND ALL BENEFICIARIES
(JANUARY 1, 2008 THROUGH DECEMBER 31, 2016)



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Comparison to CalPERS' Mortality Table

- CalPERS does not develop separate mortality tables for different membership classes (i.e., General and Safety)
  - OCERS experience differs between General and Safety
  - CalPERS is considering moving towards separate tables
- CalPERS is considering moving to generational approach
  - Currently considering a 20% margin in selecting mortality assumptions
- All this considered, recommend continuing to use SOA tables as starting point for OCERS mortality assumption

DISCUSSION

Economic Assumptions

- Price Inflation (CPI):
  - Investment Return, Salary Increases, COLAs
- Salary Increases
  - Wage inflation (or payroll growth)
    - Includes price inflation plus “across the board” real wage growth
  - Promotional & Merit: based on experience
- Investment Return (Investment Earnings)
  - Components include price inflation, real return and investment expenses
  - Generally based on passive returns

Current Economic Assumptions

- Last full review was for December 31, 2014 valuation
  - Price inflation (CPI): 3.00%
  - Wage inflation (includes price inflation plus real wage growth): 3.50%
    - So “across the board” real wage growth is 0.50%
  - Investment return: 7.25%
    - So net real return is 4.25%
    - Assumed return is net of investment and administrative expenses
- New assumptions will be used in December 31, 2017 valuation
  - Sets contributions for 2019 – 2020 fiscal year

Economic Assumptions – Recommended and Alternative

- Price inflation (CPI)
  - Maintain at 3.00%
    - Alternative: decrease from 3.00% to 2.75%
- Salary increases – by component
  - Maintain price inflation component at 3.00%
    - Alternative: decrease price inflation from 3.00% to 2.75%
  - Maintain “across the board” real wage growth at 0.50%
  - Total wage inflation maintained at 3.50%
    - Alternative: total wage inflation reduced from 3.50% to 3.25%
  - Merit and promotional: Slight increases overall for General and slight decreases overall for Safety
  - Net impact on assumed future salary increases
    - Slight increase for General and slight decrease for Safety
      - » Alternative: slight decrease for both General and Safety

Economic Assumptions – Recommended and Alternative

- Investment return – depends on inflation component
  - Recommended based on 3.00% inflation
    - Recommended: Decrease from 7.25% to 7.00%
      - Reduces net real return from 4.25% to 4.00%
  - Alternatives based on 2.75% inflation
    - Alternative 1: Decrease from 7.25% to 7.00%
      - Maintains net real return at 4.25%
    - Alternative 2: Decrease from 7.25% to 6.75%
      - Reduces net real return from 4.25% to 4.00%

Economic Assumptions – Recommended and Alternative

	12/31/2016 Valuation		Recommended		Alternative 1		Alternative 2	
	Investment Return	Payroll Growth	Investment Return	Payroll Growth	Investment Return	Payroll Growth	Investment Return	Payroll Growth
Price Inflation	3.00%	3.00%	3.00%	3.00%	2.75%	2.75%	2.75%	2.75%
Real Wages	n/a	0.50%*	n/a	0.50%*	n/a	0.50%*	n/a	0.50%*
Net Real Return	4.25%**	n/a	4.00%**	n/a	4.25%**	n/a	4.00%**	n/a
Total	7.25%**	3.50%*	7.00%**	3.50%*	7.00%**	3.25%*	6.75%**	3.25%*

* Assumed individual salaries increases also include "merit and promotion" component:
- Merit component varies by service
- For General, increase ultimate assumption from 0.75% to 1.00%
- For Safety, maintain ultimate assumption at 1.50%

** Return is net of investment and administrative expense

Price Inflation (CPI)

- Historical Consumer Price Index
  - Median 15-year moving average = 3.4%
  - Median 30-year moving average = 3.9%
  - Averages have been declining due to recent low inflation
- NASRA Survey
  - Median inflation assumption is 3.00%
- Social Security Intermediate Forecast = 2.60%
- Market based inflation expectations = 1.87% (June 2017)
- Recommend maintaining at 3.00%
  - Segal's 2017 recommended inflation for all our California public system clients
  - Assumed COLAs remain unchanged (3.00%)
  - Considered but do not recommend stochastic approach to COLA assumption
- Alternatively, decreasing inflation to 2.75% is also reasonable
  - Assumed COLAs reduced from 3.00% to 2.75%

Salary Increase Assumption - Recommended

- Three components
- Price inflation: maintain at 3.00%
  - Alternative: decrease from 3.00% to 2.75%
- "Across the board" real wage growth: maintain at 0.50%
  - Department of Labor: Annual State and Local Government real productivity increase: 0.6% - 0.9% over 10 - 20 years
- Promotional & Merit:
  - Based on years of service
  - General: 9.00% (0-1 years) to 1.00% (16+ years)
    - Small increases for some service categories
  - Safety: 14.00% (0-1 years) to 1.50% (16+ years)
    - Small decreases for some service categories
- Impact on total assumed future individual salary increases
  - Increase for General and decrease for Safety
    - Alternative: decrease for both General and Safety

Payroll Growth Assumption

- Active member payroll growth based on wage inflation
  - Assumes constant future active headcount
  - Used to project total payroll for UAAL amortization
- Includes price inflation and “across the board” real wage growth
  - Price inflation: maintain at 3.00%
    - Alternative: decrease from 3.00% to 2.75%
  - “Across the board” real wage growth: maintain at 0.50%
  - Total is maintained at 3.50%
    - Alternative: total is reduced from 3.50% to 3.25%

Investment Earnings Assumption

- Also called the discount rate, investment return
- Used for contribution requirements and financial reporting
- Affects timing of Plan cost
  - Lower assumed rate means higher current cost
  - Ultimately, actual earnings determine cost
    - **C + I = B + E**
  - "Can't pay benefits with assumed earnings!"

Setting the Earnings Assumption

- Four components
  - Inflation: consistent with salary increase and COLA assumption
  - Real returns by asset class
    - Weighted by asset allocation
  - Reduced by assumed investment and administrative expenses
  - Reduced by “risk adjustment”
    - Margin for adverse deviation
    - Expressed as confidence level above 50%

OCERS Earnings Assumption

Preview:
Components of Investment Return Assumption

	Current from 2014 Study	Current, Restated Expenses	Recommended	Alternative 1	Alternative 2
Assumed Inflation	3.00%	3.00%	3.00%	2.75%	2.75%
Portfolio Real Rate of Return	5.33%	5.33%	5.27%	5.27%	5.27%
Assumed Expenses	(0.60%)	(0.80%)	(0.80%)	(0.80%)	(0.80%)
Risk Adjustment	(0.48%)	(0.28%)	(0.47%)	(0.22%)	(0.47%)
Assumed Investment Return	7.25%	7.25%	7.00%	7.00%	6.75%
Confidence Level	56%	53%	55%	53%	55%

Real Returns by Asset Class

- Segal uses an average of 8 investment advisory firms retained by Segal public clients
  - Used results from Meketa for asset categories unique to OCERS
- Small decrease in real return is due to a combination of:
  - Changes in the target asset allocation (-0.08%)
  - Changes in real return assumptions in survey (-0.07%)
  - Interaction of these two changes (+0.09%)

OCERS Real Rate of Return

Asset Class	Target Allocation	Real Return	Weighted Return
Global Equity	35.0%	6.38%	2.23%
Core Bonds	13.0%	1.03%	0.13%
High Yield Bonds	4.0%	3.52%	0.14%
Bank Loan	2.0%	2.86%	0.06%
TIPS	4.0%	0.96%	0.04%
Emerging Market Debt	4.0%	3.78%	0.15%
Real Estate	10.0%	4.33%	0.43%
Core Infrastructure	2.0%	5.48%	0.11%
Natural Resources	10.0%	7.86%	0.79%
Risk Mitigation	5.0%	4.66%	0.23%
Mezzanine/Distressed Debts	3.0%	6.53%	0.20%
Private Equity	8.0%	9.48%	0.76%
Total	100.0%		5.27%

Survey of Investment Consultants

Arithmetic Real Rate of Return

	Target Allocation	Average	Meketa	Other 7 Investment Consultants						
Global Equity	35.00%	6.38%	7.11%					6.70%	6.30%	5.40%
Investment Grade Bonds	13.00%	1.03%	0.98%	1.40%	0.75%	1.00%	0.92%	0.80%	1.40%	1.00%
High Yield Bonds	4.00%	3.52%	4.18%		1.75%	3.52%	5.61%	2.95%	3.10%	3.50%
Bank Loans	2.00%	2.86%	3.40%			2.18%			3.00%	
TIPS	4.00%	0.96%	1.18%		0.90%			0.85%	0.60%	1.25%
Emerging Market Bonds[1]	4.00%	3.78%	3.99%	4.37%		4.01%	3.75%	2.60%	4.50%	3.25%
Real Estate	10.00%	4.33%	5.92%		3.25%	5.48%	4.25%	4.65%	3.00%	3.75%
Use Meketa's Return:										
Core Infrastructure	2.00%	5.48%	5.48%							
Natural Resources[2]	10.00%	7.86%	7.86%							
Risk Mitigation[3]	5.00%	4.66%	4.66%							
Mezzanine/Distressed Debts	3.00%	6.53%	6.53%							
Private Equity	8.00%	9.48%	9.48%							
Total With Asset Allocation for OCERS	**100.00%**	**5.27%**	**5.73%**							
Anticipated Inflation			2.60%	1.47%	2.25%	2.10%	3.25%	2.25%	2.10%	2.50%
Time Horizon (Years)			20	10	10	10	30	1	10	10 or more

[1] Emerging Market Bonds is a combination of Emerging Market Bonds (major) and Emerging Market Bonds (local).

[2] Natural Resources is a combination of Natural Resources (public) and Natural Resources (Private).

[3] Risk Mitigation is a combination of CTA Trend Following, System Risk Premia and Long Treasury.

Administrative and Investment Expenses ($000s)

Plan Year	Valuation Value of Assets[1]	Administrative Expenses	Investment Expenses	Administrative %	Investment %	Total %
2009	$7,748,380	$10,893	$34,819	0.14	0.45	0.69
2010	8,154,687	12,448	68,027[2]	0.15	0.83	0.98[2]
2011	8,672,592	15,479	39,023	0.18	0.45	0.63
2012	9,064,355	14,295	40,992	0.16	0.45	0.61
2013	9,469,208	14,904	38,759	0.16	0.41	0.57
2014	10,417,125	11,905	41,487	0.11	0.40	0.51
2015	11,449,911	12,521	54,532	0.11	0.48	0.59
2016	12,228,009	16,870	80,810[3]	0.14	0.66	0.80[3]
Last Experience Study Five-Year Average (2009-2013)				0.16	0.52	0.68
Current Experience Study Five-Year Average (2012-2016)				0.14	0.48	0.62

[1] As of the beginning of the plan year.
[2] Included some one-time expenses.
[3] **We understand that this increase reflects a change in how expenses are reported.**

- Based on this experience, we have increased the future total expense component from 0.60% to 0.80%.
  - For comparison purposes, we include 2014 analysis with restated expenses

Risk Adjustment Model and Confidence Level

- Compares OCERS' risk position over time
- Confidence level is a relative, not absolute measure
  - Can be reevaluated and reset for future comparisons
- Confidence level is based on standard deviation
  - Measure of volatility based on portfolio assumptions
- Results should be evaluated for reasonableness

Risk Adjustment Model and Confidence Level

- Most useful for comparing risk position over time
- Confidence level is based on standard deviation
  - Likelihood that actual average 15-year return will exceed investment return assumption

Year Ending December 31	Investment Return Assumption	Risk Adjustment	Confidence Level
2004-2007	7.75%	0.39%	56%
2008-2010	7.75%	0.80%	61%
2011	7.75%	-0.23%	<50%
2012-2013	7.25%	0.34%	55%
2014-2016	7.25%	0.48%	56%
2014-2016 (Restated)	7.25%	0.28%	53%
2017 (Recommended)	7.00%	0.47%	55%
2017 (Alternative 1)	7.00%	0.22%	53%
2017 (Alternative 2)	6.75%	0.47%	55%

OCERS Earnings Assumption

Components of Investment Return Assumption

	Current from 2014 Study	Current, Restated Expenses	Recommended	Alternative 1	Alternative 2
Assumed Inflation	3.00%	3.00%	3.00%	2.75%	2.75%
Portfolio Real Rate of Return	5.33%	5.33%	5.27%	5.27%	5.27%
Assumed Expenses	(0.60%)	(0.80%)	(0.80%)	(0.80%)	(0.80%)
Risk Adjustment	(0.48%)	(0.28%)	(0.47%)	(0.22%)	(0.47%)
Assumed Investment Return	7.25%	7.25%	7.00%	7.00%	6.75%
Confidence Level	56%	53%	55%	53%	55%

Investment Earnings Assumption - 2017

- Recommend: 7.00% with 3.00% inflation
  - Gives confidence level of 55%
  - Inflation maintained at 3.00%
  - Portfolio real return decreased slightly from 5.33% to 5.27%
  - Reported expenses increased from 0.60% to 0.80%
- Alternative 1: 7.00% return with 2.75% inflation
  - Confidence level (53%) consistent with 7.25% in 2014 with restated expenses
- Alternative 2: 6.75% return with 2.75% inflation
  - Confidence level (55%) slightly lower than for 7.25% in 2016 before restated expenses (56%)
- Segal would find any of these sets of assumptions to be reasonable

Investment Earnings Assumption - 2017

- Comparison with other systems
  - National median is 7.50% but continues to trend down nationwide
  - Most common for California county employees retirement systems
    - Nine systems have adopted 7.25%
  - Five California county employees retirement system have adopted 7.00% (Contra Costa, Fresno, Mendocino, Sacramento and Santa Barbara)
    - San Mateo is at 6.75% (with 2.50% inflation)
    - San Diego City system is at 7.00%
    - Both San Jose City systems are at 6.875%
  - CalPERS approved reduction from 7.50% to 7.00% over three years
  - CalSTRS approved reduction from 7.50% to 7.00% over two years

Anticipated Impact on Valuation Results

- Modeled as of December 31, 2016 for illustration

	Recommended (7.00% Return & 3.00% Inflation)	Alternative 1 (7.00% Return & 2.75% Inflation)	Alternative 2 (6.75% Return & 2.75% Inflation)
Impact on Average Employer Contributions			
Change due to demographic assumptions	3.94%	3.94%	3.94%
Change due to economic assumptions	4.00%	0.70%	4.08%
Total change in employer rate	7.94%	4.64%	8.02%
Total estimated change in annual dollar amount ($000s)	$140,411	$80,539	$140,077
Impact on Average Member Contributions			
Change due to demographic assumptions	0.57%	0.57%	0.57%
Change due to economic assumptions	1.04%	0.20%	1.02%
Total change in member rate	1.61%	0.77%	1.59%
Total estimated change in annual dollar amount ($000s)	$28,559	$13,232	$27,567
Impact on UAAL and Funded Percentage			
Change in UAAL	$1,404 million	$763 million	$1,385 million
Change in funded percentage	From 73.1% to 67.7%	From 73.1% to 70.1%	From 73.1% to 67.9%

Always remember

C + I = B + E

Contributions + Investment Income

equals

Benefit Payments + Expenses

- Actuarial valuation determines the current or “measured” cost, not the ultimate cost
- Assumptions and funding methods affect only the timing of costs

C

Orange County Fire Authority

Accelerated Pension Paydown Plan

OCERS Strategic Planning Workshop

September 13, 2017

Pension Paydown Plan

- **The OCFA Board adopted an Accelerated Pension Paydown Plan in September 2013 when the unfunded liability was $473.8M** (65% funded)

- **Accelerated Pension Paydown Plan was comprised of 3 strategies:**

  - ✓ **Allocate year-end fund balance available**

  - ✓ **Allocate savings from reduced pension formulas under PEPRA**

  - ✓ **Implement annual budget increases starting at $1M per year, and growing to $5M per year**

- **At that time, Segal Consulting estimated the Accelerated Pension Paydown Plan would fund OCFA's pension to 100% in 16 years**

Pension Paydown Plan

- **Today, less than 4 years from adoption of the Accelerated Pension Paydown Plan:**
  - ✓ **Additional strategies have been added to the Plan, further accelerating paydown**
  - ✓ **OCFA's unfunded pension liability has been reduced from $473.8M to $400.4M**
  - ✓ **OCFA's pension funding level has increased from 65% to 76.75%**
  - ✓ **The accelerated funding goal has been modified by the OCFA Board of Directors from 100% to 85%**

Pension Paydown Plan

- **The updated Accelerated Pension Paydown Plan was recently submitted to Segal for review, with a report issued in August 2017 indicating:**

  - ✓ **OCFA's accelerated payments are estimated to achieve the funding goal of 85% by December 2020** (assumes all other factors remain constant)

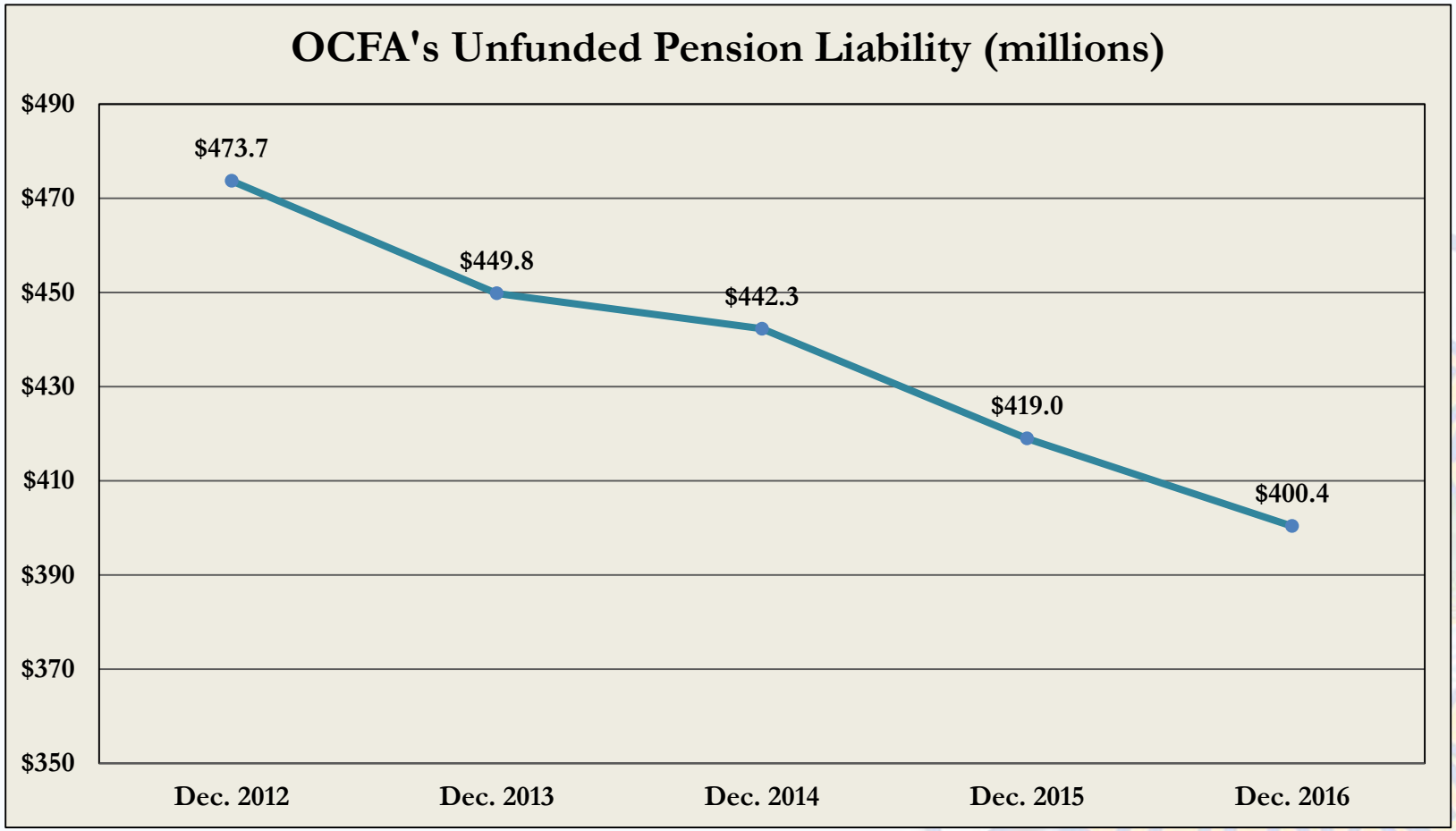
  - ✓ **If continued beyond the 85% goal, the accelerated payments are estimated to achieve 100% funding by December 2027**

  - ✓ ***OCFA's accelerated payments made during the last 4 years have produced interest savings totaling $11,466,202***

    - **2014 = $1,012,937**
    - **2015 = $2,084,402**
    - **2016 = $3,295,068**
    - **2017 = $4,285,036**

Pension Paydown Plan

UAAL trend since Sept 2013 implementation



Pension Paydown Plan
(the "Snowball Plan")

		Part A	Part B	Part C	Part D	Part E		
Years	Fiscal Year	FY-End Fund Balance Available	Annual Savings from Reduced Retirement Contribution Rates (PEPRA)	Budget Increase of $1M in 2016/17, Growing by $2M Annually to $15M	Apply $1M/year for 5 years from Surplus Workers' Comp. Reserves	Apply 50% of Annual General Fund Surplus	Annual Snowball Amount	Cumulative Accelerated Pension Payments
	13/14	3,000,000	2,500,000	-	-	-	5,500,000	5,500,000
	14/15	21,290,238	-	-	-	-	21,290,238	26,790,238
	15/16	12,609,380	2,802,122	-	-	-	15,411,502	42,201,740
	16/17	9,814,477	1,653,114	1,000,000	1,000,000	-	13,467,591	55,669,331
1	17/18	3,000,000	1,886,420	3,000,000	1,000,000	7,633,021	16,519,441	72,188,772
2	18/19	3,000,000	3,167,397	5,000,000	1,000,000	10,230,177	22,397,574	94,586,346
3	19/20	3,000,000	1,648,658	7,000,000	1,000,000	14,339,774	26,988,432	121,574,778
4	20/21	3,000,000	2,368,859	9,000,000	1,000,000	13,134,904	28,503,763	150,078,541
5	21/22	3,000,000	3,279,280	11,000,000	-	10,080,929	27,360,209	177,438,750
6	22/23	3,000,000	4,787,217	13,000,000	-	9,082,740	29,869,957	207,308,707
7	23/24	3,000,000	5,772,547	15,000,000	-	8,552,338	32,324,885	239,633,592
8	24/25	3,000,000	6,814,115	15,000,000	-	7,534,358	32,348,473	271,982,065
9	25/26	3,000,000	14,242,631	15,000,000	-	4,913,467	37,156,098	309,138,163
10	26/27	3,000,000	19,647,456	15,000,000	-	3,241,322	40,888,778	350,026,941
		76,714,095	**70,569,816**	**109,000,000**	**5,000,000**	**88,743,030**	**350,026,941**	

Payments above represent voluntary, accelerated payments towards UAAL. These are payments <u>in addition to</u> our annual required amortization payments, which range from $35-$40 million per year over the next five years.

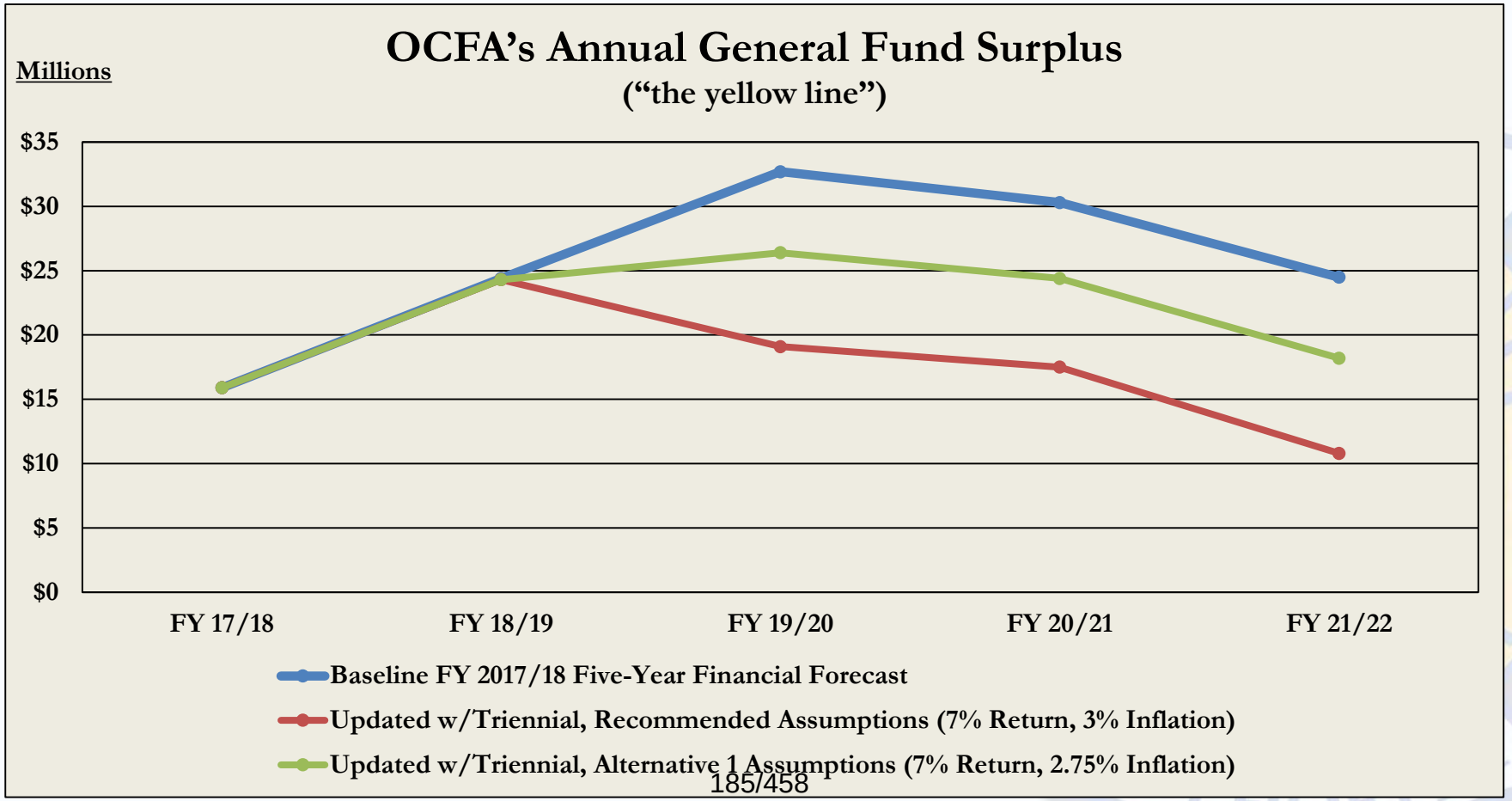
Pension Paydown Plan

OCFA's Five-Year Financial Forecast

OCFA Five-Year Forecast - Adopted FY 2017/18 Budget	PROJECTED FY 2017/18	PROJECTED FY 2018/19	PROJECTED FY 2019/20	PROJECTED FY 2020/21	PROJECTED FY 2021/22
GENERAL FUND REVENUES	**366,691,527**	**386,278,237**	**400,722,001**	**414,905,785**	**429,615,891**
GENERAL FUND EXPENDITURES					
New Positions for New Stations	-	1,983,798	2,023,590	5,711,081	13,480,803
Employee Salaries	197,923,786	205,522,271	209,218,612	213,740,732	218,369,639
Retirement - Regular Annual Payments	70,949,644	73,818,538	74,825,620	77,505,511	79,698,327
Retirement - Paydown of UAAL (PEPRA Rate Savings)	1,886,420	3,167,397	1,648,658	2,368,859	3,279,280
Retirement - Paydown of UAAL ($1M per Year from WC Surplus)	1,000,000	1,000,000	1,000,000	1,000,000	-
Retirement - Paydown of UAAL ($1M in 16/17, Incr by $2M/year)	3,000,000	5,000,000	7,000,000	9,000,000	11,000,000
Workers' Compensation Transfer out to Self-Insurance Fund	12,687,256	13,035,532	13,383,808	13,749,498	15,191,983
Health Insurance	27,551,288	28,591,360	30,281,361	32,081,906	34,001,126
Medicare	2,720,948	2,865,104	2,873,593	2,930,244	2,988,015
Salaries & Employee Benefits	317,719,342	334,983,999	342,255,242	358,087,832	378,009,174
Services & Supplies	32,533,611	29,620,153	29,063,653	28,953,653	28,943,653
New Station S&S Impacts	-	97,008	99,918	276,586	662,520
TOTAL GENERAL FUND EXPENDITURES	**350,252,953**	**364,701,160**	**371,418,813**	**387,318,071**	**407,615,347**
NET GENERAL FUND REVENUE	**16,438,574**	**21,577,076**	**29,303,188**	**27,587,714**	**22,000,544**
Incremental Increase in General Fund Contingency Reserve (10% of exp.)	1,172,531	1,116,723	623,639	1,317,906	1,838,686
GENERAL FUND SURPLUS / (DEFICIT)	**15,266,043**	**20,460,353**	**28,679,549**	**26,269,809**	**20,161,858**
Transfers to CIP from General Fund Surplus	7,633,021	10,230,177	14,339,774	13,134,904	10,080,929
Retirement Paydown of UAAL - 50% of General Fund Surplus	**7,633,021**	**10,230,177**	**14,339,774**	**13,134,904**	**10,080,929**

Triennial Study – Potential Impacts

- 50% of General Fund Surplus gets applied to the Accelerated Pension Paydown Plan.
- Triennial Study changes will increase OCFA's required retirement contributions, and decrease surplus funds available for accelerated pension payments.
- Below are impacts to OCFA's General Fund Surplus based on two scenarios from the Triennial Study.



Triennial Study – Potential Impacts

- **OCFA has planned for financial impacts from the Triennial Study**
- **Financial forecasts demonstrate that OCFA is prepared to manage impacts and remain financially healthy**
- **Only one component of our Accelerated Pension Paydown Plan will be impacted by the Triennial Study (50% of "the yellow line")**
- ***As a result of the Triennial Study, we anticipate:***
  - ✓ **OCFA's unfunded pension liability (UAAL) will increase**
  - ✓ **Fewer dollars will be applied to accelerated pension payments**
  - ✓ **The timeline for achieving the 85% funding goal will be delayed**
  - ✓ **Nonetheless, OCFA remains committed to the Accelerated Pension Paydown Plan**

Questions?

D

Operational Risk Management

ORANGE COUNTY OCERS EMPLOYEES RETIREMENT SYSTEM

September 13, 2017

Ver 5

Program Goal

1. Develop a common understanding of risks across multiple functions/departments so OCERS can manage risks cost-effectively and on an organizational-wide basis
2. Implement an operational risk management program that proactively supports OCERS mission, vision, and strategic plan

---

Today

Share summary information about Operational Risk Management ("ORM") and provide overview of the current project plan.

Operational Risk

What is Operational Risk? This is the risk of loss resulting from inadequate or failed internal processes, people, systems or external events. An Operational Risk Management process should help prevent or detect in advance an operational risk event, and help OCERS effectively meet regulatory and on-going operational obligations.

The **Vision** of an Operational Risk Management program is to proactively manage risks through our day-to-day processes allowing us to provide secure retirement and disability benefits with the highest standard of excellence.

The **Challenge** is to effectively manage and control the inter-related risks.

The **Solution** is to implement an effective risk management process that results in acceptance, mitigation, or avoidance of operational risks. **Risk management is everybody's responsibility!**

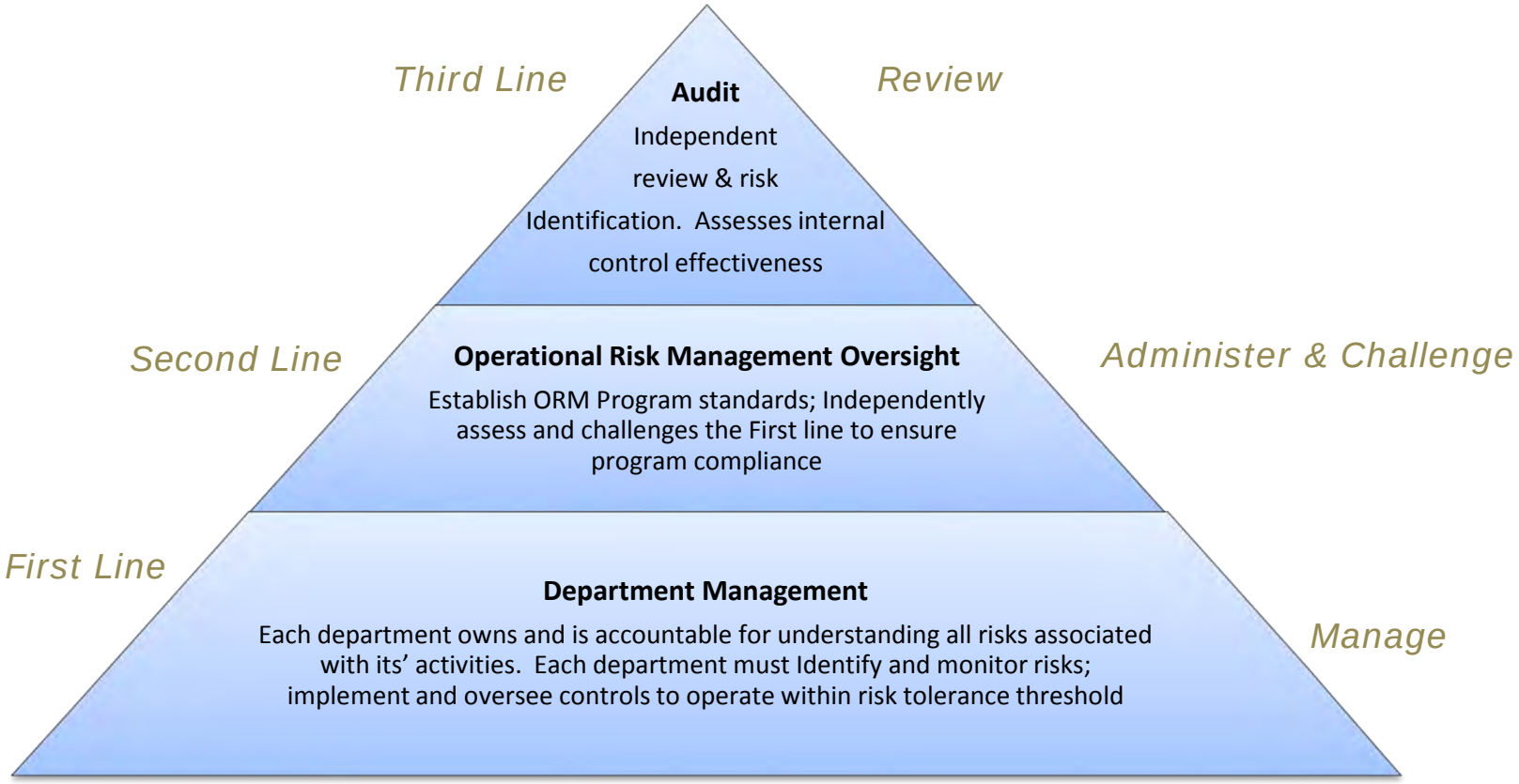
191/458 Note: Not investment risk

Benefits of an ORM Program

Risk Management programs help mitigate the impact that unplanned events will have on OCERS ability to achieve strategic goals and business initiatives. An effective ORM program will result in the following:

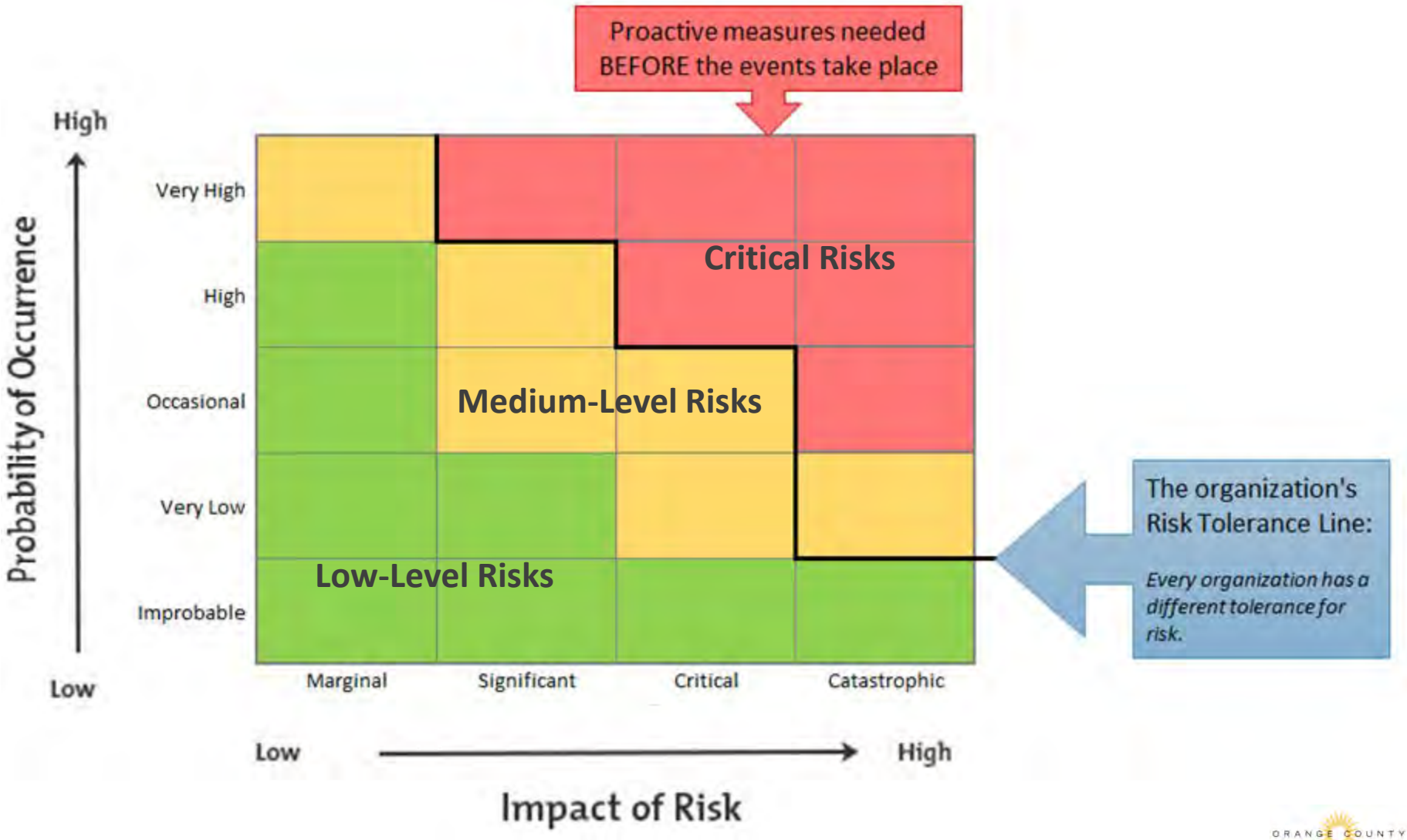
- Reduction of operational loss (dollars)
- Reduced exposure to future risks
- Reduced exposure to reputation loss
- Early detection of unlawful activities
- Improved response and recovery from unplanned or adverse events
- Increased awareness of compliance and regulatory requirements
- The creation of a more risk-focused culture

Risk Lines of Defense

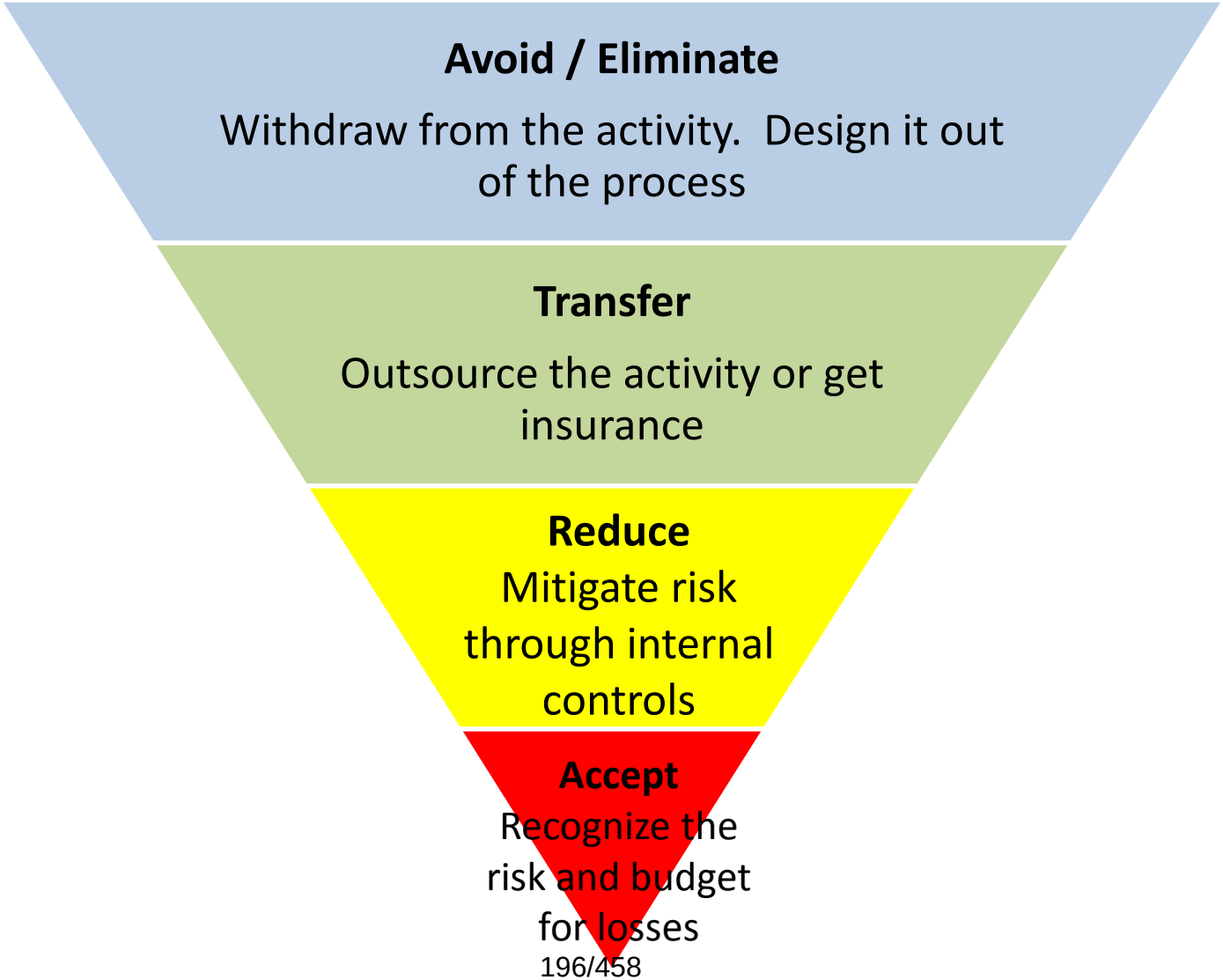


Risk Management Process

Risk Evaluation



Hierarchy of Risk Treatments



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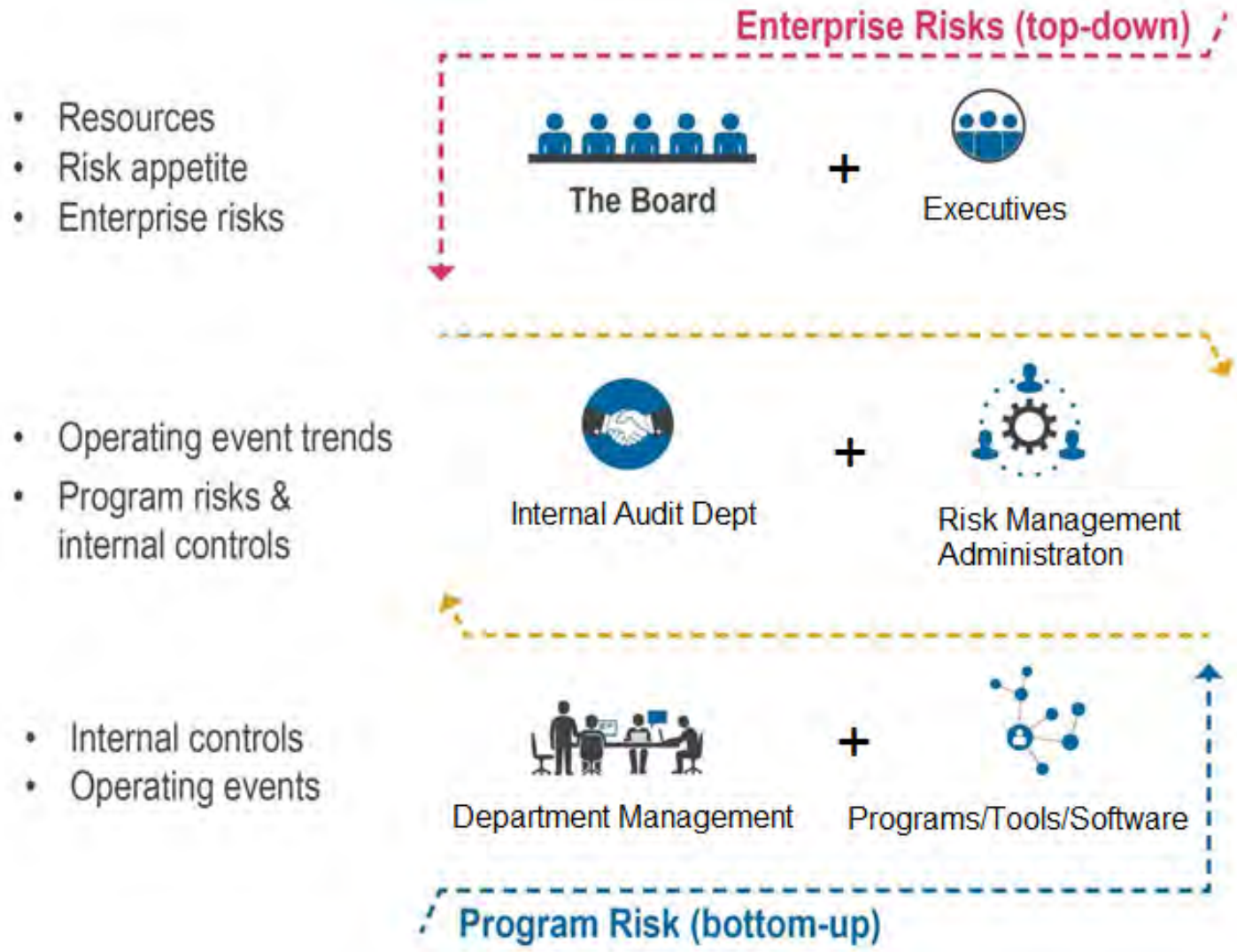
Process in Place at OCERS today

Risk Stage	Process	Optimal Process Gap
1. Risk Identification	• Completed by the Internal Audit department with assistance of each department	• Entity-wide approach to be included in identification process vs just a department by department review.
2. Risk Evaluation	• Annual Internal Audit report	• Formalize review process with committee approach • Documentation of reviews needed • Increase frequency of reviews
3. Risk Treatment Identified	• Determine how the risk is going to be handled: avoid/eliminate, accept, reduce, or transfer the risk • Develop plan to mitigate the risk exposure	• Focused/intentional decisions on risk treatment using committee approach • Periodic operational risk reviews and decisions for treatment need to be documented
4. Risk Treatment Implementation	• Department heads implement identified plan	• Periodic committee review and evaluation of mitigation/treatment plans. • Accountability to the Committee
5. Report & Risk Program Review	• On-going annual review by the Internal Audit department for effectiveness of the risk mitigation program(s)	• Systemize the reviews and document mitigation processes on a periodic basis. It needs to be a continuous process.

Governance Structure



Closing Comments

- OCERS has risk mitigation in place today
- The Operational Risk Management Program will create a more entity wide approach to risk management
- Risk Committee (Executives and Management) will be formed and work through the process discussed and address gaps identified
- Reporting package will be developed and provided to the Board

UCI Cybersecurity Policy & Research Institute

Bryan Cunningham

Presentation to the Orange County Employees Retirement System

September 13, 2017

This presentation does not constitute, and should not be treated as, legal advice or counsel

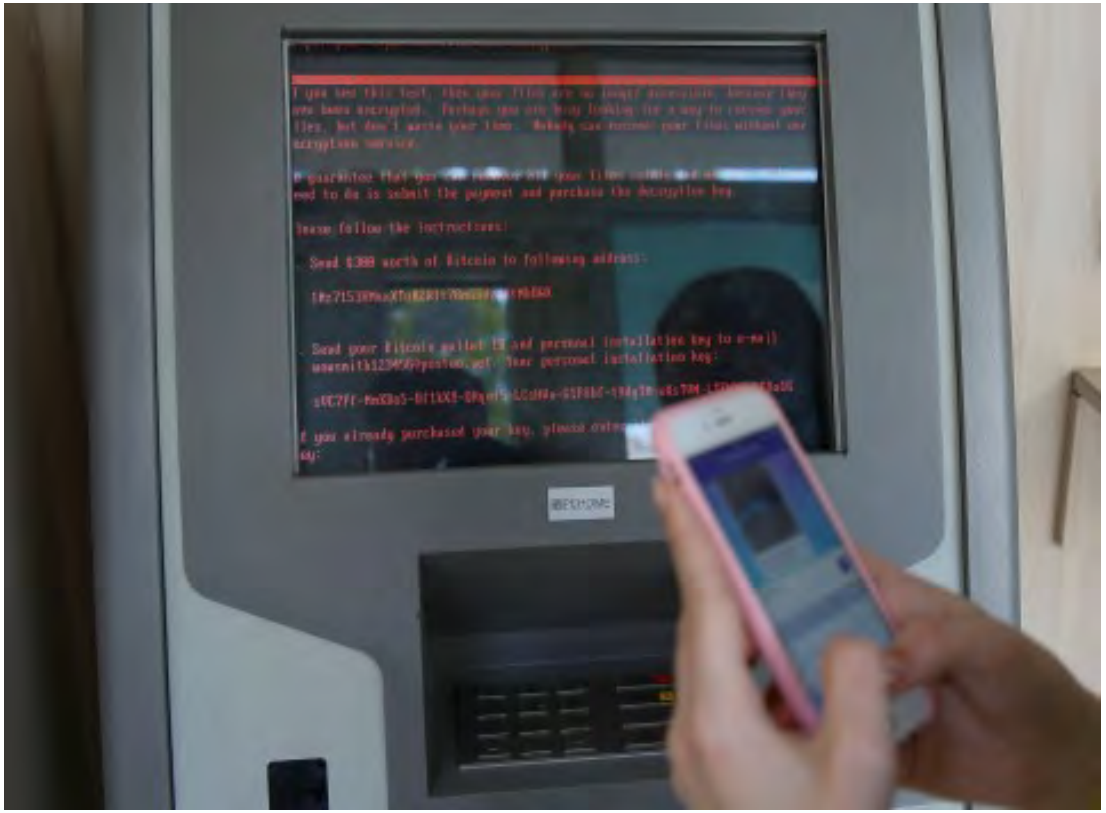
Ripped From the Headlines

- 9.7: Equifax confirms massive breach: at least ½ of all Americans (143 million)
- Breach discovered on July 29th
- One of worst breaches ever
- In what should be most trusted of all industries – along with healthcare and banking

Potential Legal Consequences

- Equifax Users vs. Non-Users
- Civil liability for failure to disclose (breach disclosure laws, securities laws)
  - Depends on investigation *bona fides*
- Deceptive/unfair trade practices
- Failure to exercise due care
- Criminal: Securities fraud/insider trading
- Issues around affected customer offerings
  - Portal/credit monitoring vs waiver of litigation
- Fraud re checking whether affected
- ***Reputational Damage May Be Incalculable***

June 2017



"To guarantee that you can recover all your files safely…all you need to do is submit the payment [$300 worth of Bitcoin] to the following address…"

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June

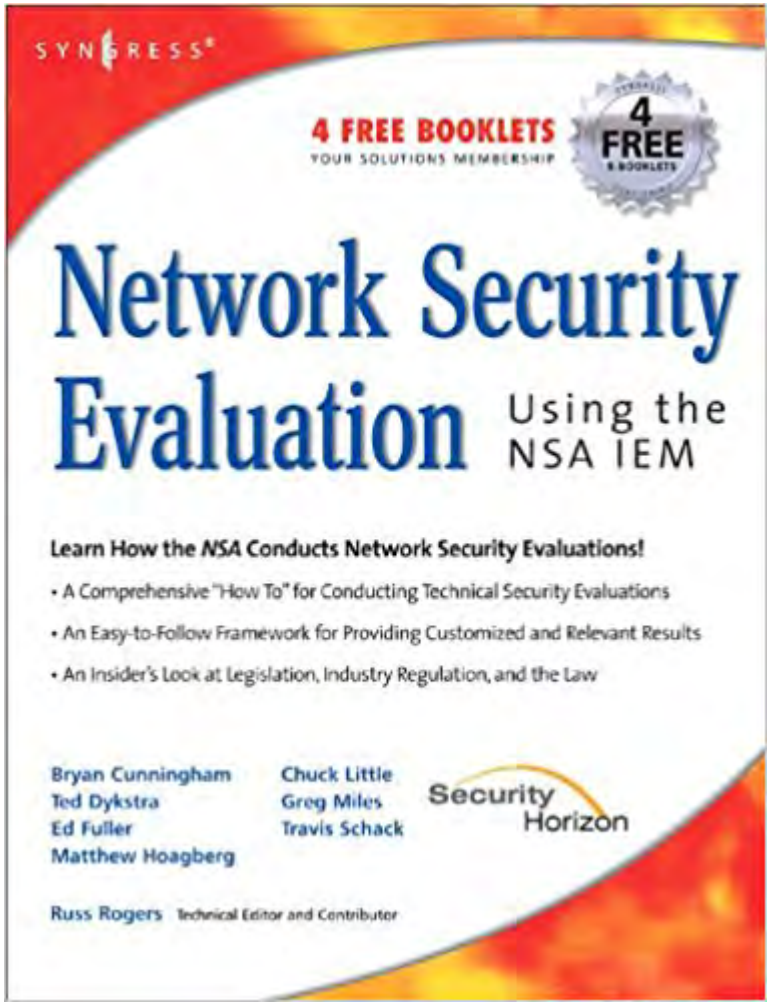
Massive cyberattack hits Europe with widespread ransom demands

By Andrew Roth June 27 at 12:15 PM
MOSCOW — A new wave of powerful cyberattacks hit Europe on Tuesday in a possible reprise of a widespread ransomware assault in May that affected 150 countries, as Ukraine reported ransom demands targeting the government and key infrastructure . . . . The Russian oil giant Rosneft and a subsidiary [was] also hit . . . . **The virus even hit systems monitoring radiation at the site of the former Chernobyl nuclear power plant, where computers running Windows were temporarily knocked offline.**

But the damage was worst in Ukraine, which first reported Tuesday's cyberattacks, saying they targeted government ministries, banks, utilities and other important infrastructure and companies nationwide, **demanding ransoms from government employees in the cryptocurrency bitcoin.**

FBI 2016 Internet Crime Report

- Tech Support Scams: 10,000 victims/$8m
- Only about 15% report crimes
- Business Email Compromise: $360m
- Ransomware (more on this later)


SYNGRESS
4 FREE BOOKLETS
YOUR SOLUTIONS MEMBERSHIP
4 FREE
Network Security Evaluation
Using the NSA IEM
Learn How the NSA Conducts Network Security Evaluations!
• A Comprehensive "How To" for Conducting Technical Security Evaluations
• An Easy-to-Follow Framework for Providing Customized and Relevant Results
• An Insider's Look at Legislation, Industry Regulation, and the Law
Bryan Cunningham
Ted Dykstra
Ed Fuller
Matthew Hoagberg
Chuck Little
Greg Miles
Travis Schack
Security Horizon
Russ Rogers Technical Editor and Contributor

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A Brief Tour of the Cyber Horizon

- Slouching Towards War
- Hacking Democracy
- Ransomware Once & Future
- Zombies, the IoT, and Liability
- The Big Five

Slouching Towards War

Ripped From the Headlines: Russia

UK parliamentary email compromised after 'sustained and determined cyber attack'

By Simon Sharwood, APAC Editor 26 Jun 2017 at 06:08

The Parliament of the United Kingdom has admitted it experienced a “sustained and determined cyber attack” over the weekend and says <90 email accounts have been compromised as a result.

Ripped From the Headlines: Russia

New Russian Cyber Weapon Can Wipe Out Power Grids (Temporarily)
By
Ryan Young

June 24, 2017

A new cyber weapon has been created by the Russian government (with a little help from hackers) that could cause havoc with our electric systems if it gets into the wrong hands. It's a type of malware and has been given the nickname CrashOverride. So far we only know of one energy system that's been disrupted, and that was back in December in Ukraine where **hackers momentarily shut down one-fifth of all electricity generated in the city of Kiev.**

Ripped From the Headlines: North Korea

The NSA has linked the WannaCry computer worm to North Korea

The Washington Post June 14, 2017
By Ellen Nakashima

The assessment . . . is based on an analysis of tactics, techniques and targets that point with "moderate confidence" to North Korea's spy agency.

- 150 + Countries Affected
- More than 230,000 Machines Attacked *in first day*

Western Activities

- Stuxnet
- North Korea After Sony
- North Korea Missile Program?
- UC Actions vs. Russia?
- Undoubtedly Others

BUT----

Acts of War?
What Qualifies?

US Still Has No Definition for Cyber Act of War

The White House and Pentagon let it be known in 2011 that acts such as shutting down the U.S. power grid via a cyber-attack could be seen as an act of war that would bring not only a cyber-response **but perhaps "a missile down one of your smokestacks."**

Military.com, June 22, 2016, Bryant Jordan

Uncertainty Breeds Catastrophic Risk

The Attribution Problem

- **Whodunnit?**
- Attribution refers to identifying the agent responsible for a cyber attack or action.
- Attribution is key to deterrence (fear of response or prosecution can deter some bad actors).
- **However,** meaningful response can happen only when it is clear who the agent responsible for the action is.

Current Weak State of Attribution: Russia Election Hacks: Case in Point

- Initial reliance on private cybersecurity analysis
- Declassified DNI "Assessment of Russian Hacking Activities" has **literally no attribution information**
- Initial DHS/FBI JAR not only has little (one para out of 13 pages) but includes **disclaimer:**

The Disclaimer

J O I N T A N A L Y SI S R EP O R T

DISCLAIMER: *This report is provided "as is" for informational purposes only.* ***The Department of Homeland Security (DHS) does not provide any warranties of any kind regarding any information contained within.*** *DHS does not endorse any commercial product or service referenced in this advisory or otherwise. This document is distributed as* ***TLP:WHITE:*** *Subject to standard copyright rules,* ***TLP:WHITE*** *information may be distributed without restriction. For more information on the Traffic Light Protocol, see* [https://www.us-cert.gov/tlp.](https://www.us-cert.gov/tlp)

Hacking Democracy

Ripped From the Headlines

Russian hackers targeted 21 U.S. states during election: U.S. official

Reuters June 21, 2017

By Dustin Volz

WASHINGTON (Reuters) - Russian hackers targeted 21 U.S. states' election systems in last year's presidential race, a Department of Homeland Security official told Congress.

Existential Threat

- Now clear that Putin personally intended to undermine our democratic system
- Grave interference with US sovereignty
- Not the first time, but most successful
- **They'll Be Back, Better, & Bolder**

What's To Be Done

- Harden Voting Systems
  - Should be key goal of Los Angeles effort
- Strong, Clear Cyber Response to Deter
- Machon Campaign Tactic
  - Clever but risky
- Educate Voters

Ransomware Once & Future

Ransomware 1.0

- Ransomware around at least since 1989
- Since 2005, ransomware attacks outnumber data breaches
- Easily defeated:
  - **Basic cyber hygiene**
  - **Backup, backup, backup**
- Tough to get paid safely

Ransomware 2.0

- Bitcoin/Other Cryptocurrencies Make Ransomware Saf(er)
- Ransomware as a Service Democratizes Cybercrime
- **Ransomware grew 167 times**, from 4 million in 2015 to 638 million in 2016.

Ransomware as Statecraft

- WannaCry – Widely attributed to N. Korea
- UK healthcare hit hard
- Physical effects:
  - Infestation of control systems on Monday forced Honda to shut down a production facility in Japan
  - Traffic cameras in the Australian state of Victoria hit

Ransomware 3.0: Jackware

From Locking Data to Locking:

- Cars: Current and Autonomous
- Fitbits
- Hotels/Nursing Homes
- Military Vehicles
- What the Imagination Can Conjure

Zombies, the Internet of Things and Liability

Legal Liability in the Internet of Things

- Where does/should legal liability fall for security breaches enabled by IofT devices?
- For breaches where IofT devices are embedded in other devices and products?

Legal Liability in the Internet of Things

- Who owns sensitive healthcare and other data generated by IofT devices?
- Who has legal responsibility to protect the privacy and security of such data?

The Big Five

Fundamental Building Blocks of Basic Cyber Hygiene

Keys to Basic Cyber Hygiene

- **Employee Selection & Monitoring**
  - Insider Threat Prevention Program
  - Key Positions Identification (Special Trust)
  - Tricky Legal Area

Keys to Basic Cyber Hygiene

- Backups
  - Traditional Ransomware Silver Bullet
  - Cloud vs. Onsite

Keys to Basic Cyber Hygiene

- Patches and Supported Applications
  - If You Don't Wanna Cry
  - Shifts liability to software makers

Keys to Basic Cyber Hygiene

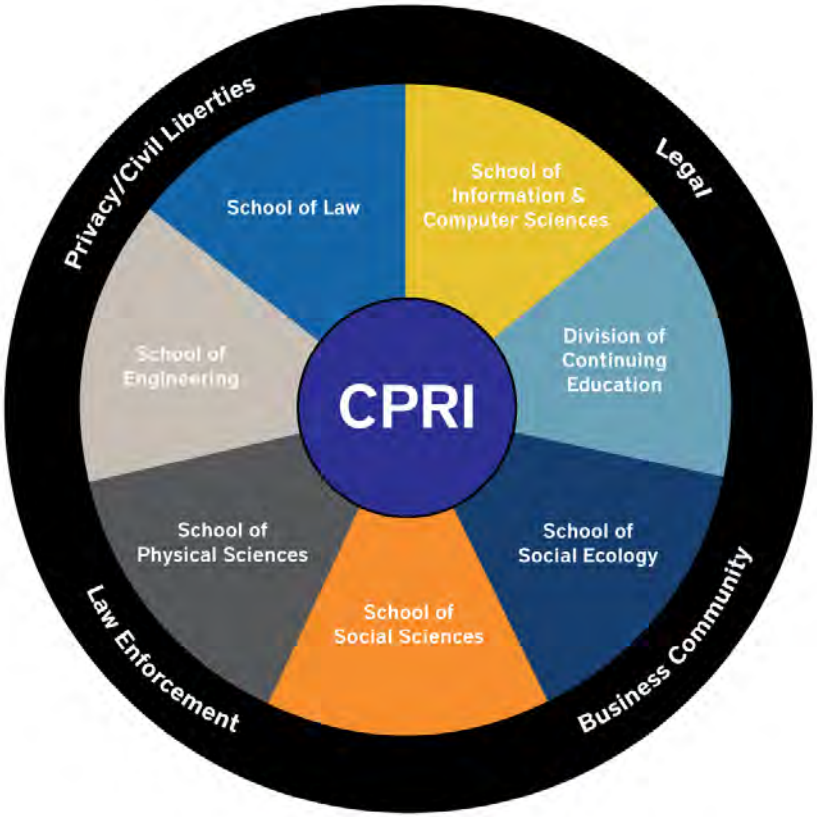
- Exfiltration Monitoring
  - Cause They're Gonna Get In
  - Technology getting much better
  - AI/Machine learning
  - Data tagging

Thoughts for Boards of Directors

- Awareness: Too late for “head in the sand”
  - Regular, substantive reports
  - Ideally, cybersecurity expertise on the Board
- Chief Information Security Officer
  - Separate position from IT staff
- Reasonable Information Security Program
  - NIST
- Outside Third-Party Assessments
  - Attorney-Client Privilege
- Insurance

UCI Cybersecurity Policy & Research Institute

Scope of Participation



CPRI's Three-Part Mission

- **Training**
  - Founding Mission: Law Enforcement Training
  - Move into Other Verticals
- **Community Engagement**
  - Cyber Victims Defense Clinic
  - High-School Curriculum Project
  - Municipalities Project
- **Research**
  - World-Class Expertise-Real World Impact
  - Attribution: **Legal Standards/More Holistic Approach**
  - Protecting the Supply Chain With Emerging Technologies
  - Government/Private Sector Information Sharing

Municipalities JPA Project

Questions

Contact

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949.824.2720

Backup Slides

International Law

- Tallinn Manual (2013): reference tool for legal advisors, policymakers, and operational planners
  - A cyber attack that constitutes a use of force is unlawful
  - An "armed conflict" must exist before the law of armed conflict will apply to a cyberattack (though international humanitarian or other law may apply)
  - There must be a provable nexus between the cyberattack and the armed conflict
  - **But no clear standard of proof for attribution of attacks established yet**
  - **Creates serious risk of miscalculation**

US Federal Criminal Law

- Indictment requires **"probable cause"** to believe a crime has been committed
- Conviction requires proof **"beyond a reasonable doubt"** that a particular individual was responsible
- No established legal standard for what meets this threshold in attributing cyber attacks
- Some common factors emerge from studying recent prosecutions

Attribution: Machines & People

- Attributing activity to machines:
  - Requires identifying computer/chain of computers used to perpetrate
  - Technical forensics: technical clues left behind in an intrusion at device level and network level
    - Network level will involve reviewing various log files; IP address
    - IP address (if unmasked) can provide idea about location → which helps identify person through law enforcement process. **These easily spoofed and often not helpful with multiple-hop attacks**
  - Honeypots: A decoy configured to look attractive to an intruder and meant to observe/monitor intruder's behavior; helps identify behavior at a later time
  - Pre-positioned instrumentation: Occurs in systems/networks that an adversary might use to launch an intrusion (reportedly was part of attribution to North Korea of attack against Sony).

Stanford's Herbert Lin

Attribution: Machines & People

- Attributing cyber activity to a human intruder
  - To assess the identity of the person behind a machine, investigators look at historical records to see if an **IP address** has been identified in the past as an originating point for hackers
  - The **nature of malware or technique used** may be unique to a particular type of hacker
  - Online discussion forums
  - Authentication; ISP details about subscribers
  - Keystroke patterns can uniquely identify a person; comparison with database
- Attributing cyber activity to ultimate responsible party
  - based on legal, policy and political judgments that take into account the relevant facts known from all sources

Stanford's Herbert Lin

Case Study: Conspiracy to hack into US Defense Contractor Systems

- A Chinese national, Su Bin, who admitted to participating in a years-long conspiracy that involved Chinese military officers hacking into the computer networks of major U.S. defense contractors in order to steal military technical data was sentenced to 46 months in federal prison in July, 2016
- The warrant documentation indicated his usage of multiple email accounts including those hosted in the US enabled them to identify him owing to the **content of these emails carrying personal data**
- The investigating officer also used profiling data about intrusions from PRC to match the behavior, i.e., using phishing emails with attachments/links, installing malware which enables access to data sets which are exfiltrated.

United States v. Su Bin

Initial Insights From Botnet Takedowns

- Key elements of proof for attribution in botnet and other complex computer fraud and abuse cases (Gameover Zeus/Silk Road): **Logs for key botnet command and control servers**
  - *Gameover Zeus*: USG relied on logs from known command and control servers to identify IP addresses with administrator access to those servers. Those IP addresses were then tied to the defendant Evegniy Bogachev through his service provider
- *Current Strontium case*: Microsoft asserts in complaint that **command and control domains will be determinative in identifying individual attackers**
- **Identifying the owner or controller of a key machine, such as a command and control server, often requires international cooperation between law enforcement agencies**
  - *Game Over Zeus* involved coordination between "nearly a dozen foreign countries and a group of elite computer security firms"
  - *Silk Road*: U.S. law enforcement used diplomatic mechanisms with Iceland to identify Silk Road servers and the site's owners and operators
- **International legal mechanisms not always available to private parties**

Case Studies: Persuasive Attribution Factors

	Physical Evidence					Witnesses				
	E-mails	Chats	Server Logs	Screen Shots	Back Records	Expert	Law Enforcement	Co-workers	Defendant's Own Statements	Verdict
Lazar			X	X			X		X	Plead Guilty
Thomas	X		X			X	X	X	X	Jury: Guilty
Keys	X	X	X	X			X	X	X	Jury: Guilty
Musacchio	X		X		X	X	X	X		Jury: Guilty
Nosal	X		X	X	X		X	X	X	Jury: Guilty

Based on a comparative analysis of key recent criminal prosecutions

Where Does This Leave Us?

- US federal criminal law beginning to develop sets of persuasive factors
- Note, though, that virtually all were driven by solid forensic computer evidence and/or cooperation from service providers/foreign governments – **not always available**
- Need for more holistic approach for cases where such evidence not available

Longer Term Steps of Our Review

- Propose model standards of proof for each category of attribution challenges
- **Larger Research Project** (depending on resources):
  - Gather large data set(s)
  - Recruit researcher to coordinate effort
  - Employ other disciplines – psychology, cultural anthropology, linguistics, cryptography, etc.
  - **Can we come up with a better, more holistic, more publicly provable attribution methodology?**

State of the Law

252/458

UCI Cybersecurity Policy & Research Institute

www.cpri.uci.edu

Law Enforcement Training

- CPRI is working with premier Southern California law enforcement agencies -- including Sheriff Hutchens' Team and LA Sheriff's Department -- and UCI's Division of Continuing Education to develop and implement **cybersecurity and digital evidence handling training for law enforcement officers**.
- 40-hour course and 1-day "basic training" course
- 1-day course will be offered approximately once a month
- **We welcome the participation of other law enforcement agencies in this effort**

Investment Forum

September 13, 2017

Molly Murphy, CFA

Welcome

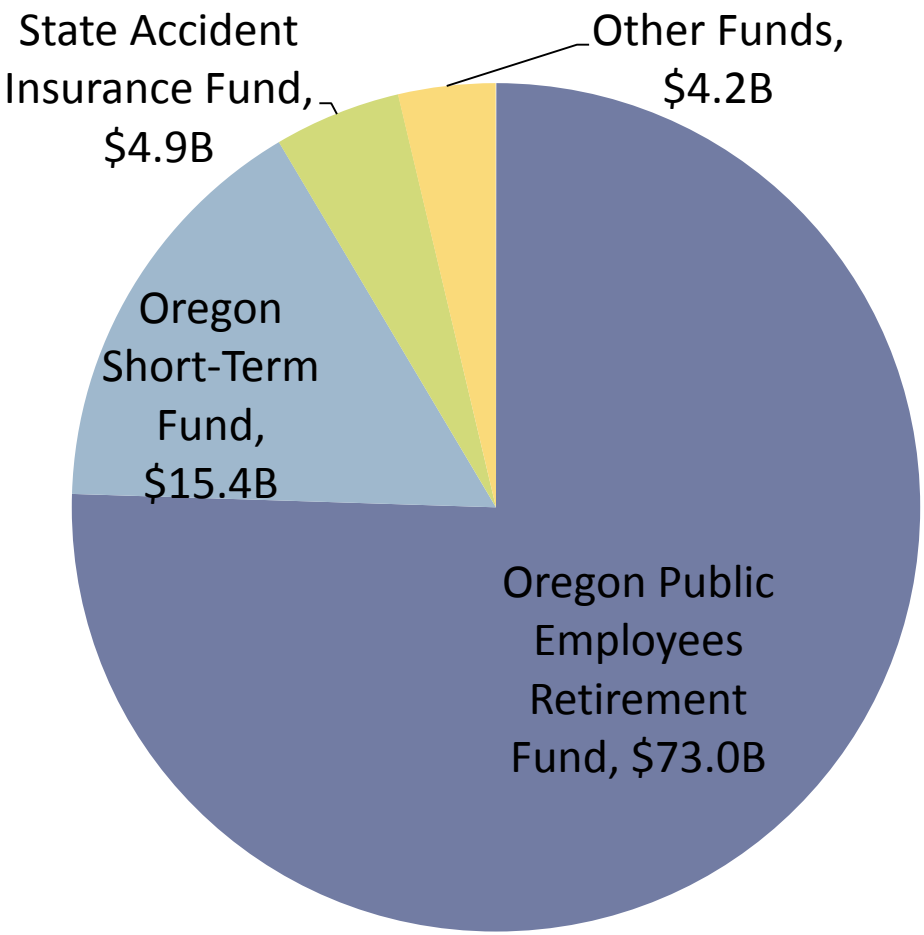
- "Return seeking, risk aware"
- Today:
  - Oregon State: Learning from a Public Pension Private Equity pioneer
  - Investment Fees: How to negotiate better transparency and how to validate your results
- Tomorrow:
  - A Look into the Future: 2018 initiatives
  - A View of the World: Bridgewater
  - Investment Risk Management: Building a risk aware culture
  - Risk Mitigation Strategies: An introduction
  - Opportunistic Investing and Best Practices: Better outcomes through preparedness

Oregon Investment Program
OCERS Strategic Planning Workshop

John D. Skjervem, CFA
Chief Investment Officer
Oregon State Treasury

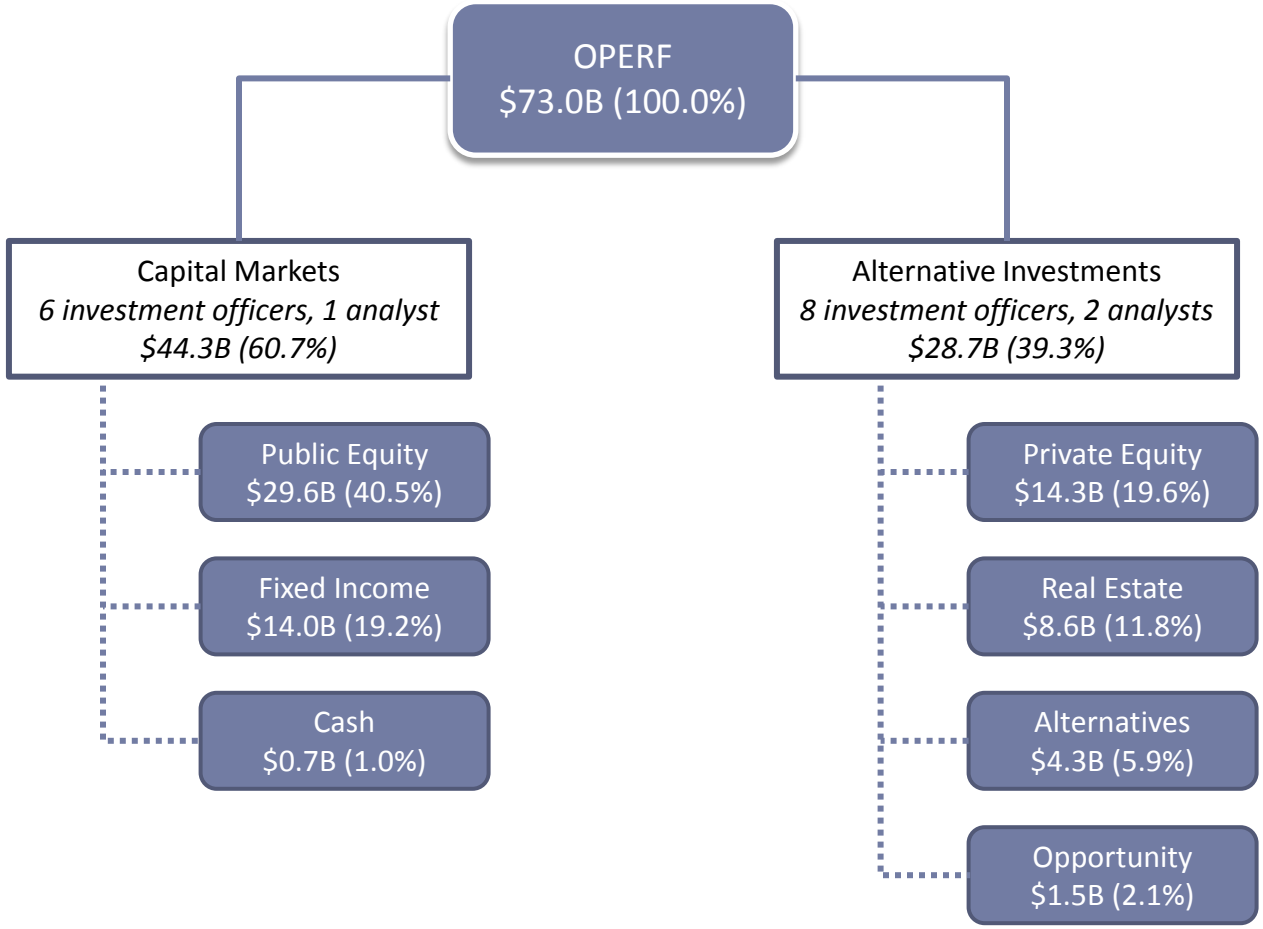
September 13, 2017

OST Investment Division Assets Under Management (as of June 30, 2017)



Total Assets: $95.5 billion

Oregon Public Employees Retirement Fund (OPERF) Asset Allocation (as of June 30, 2017)

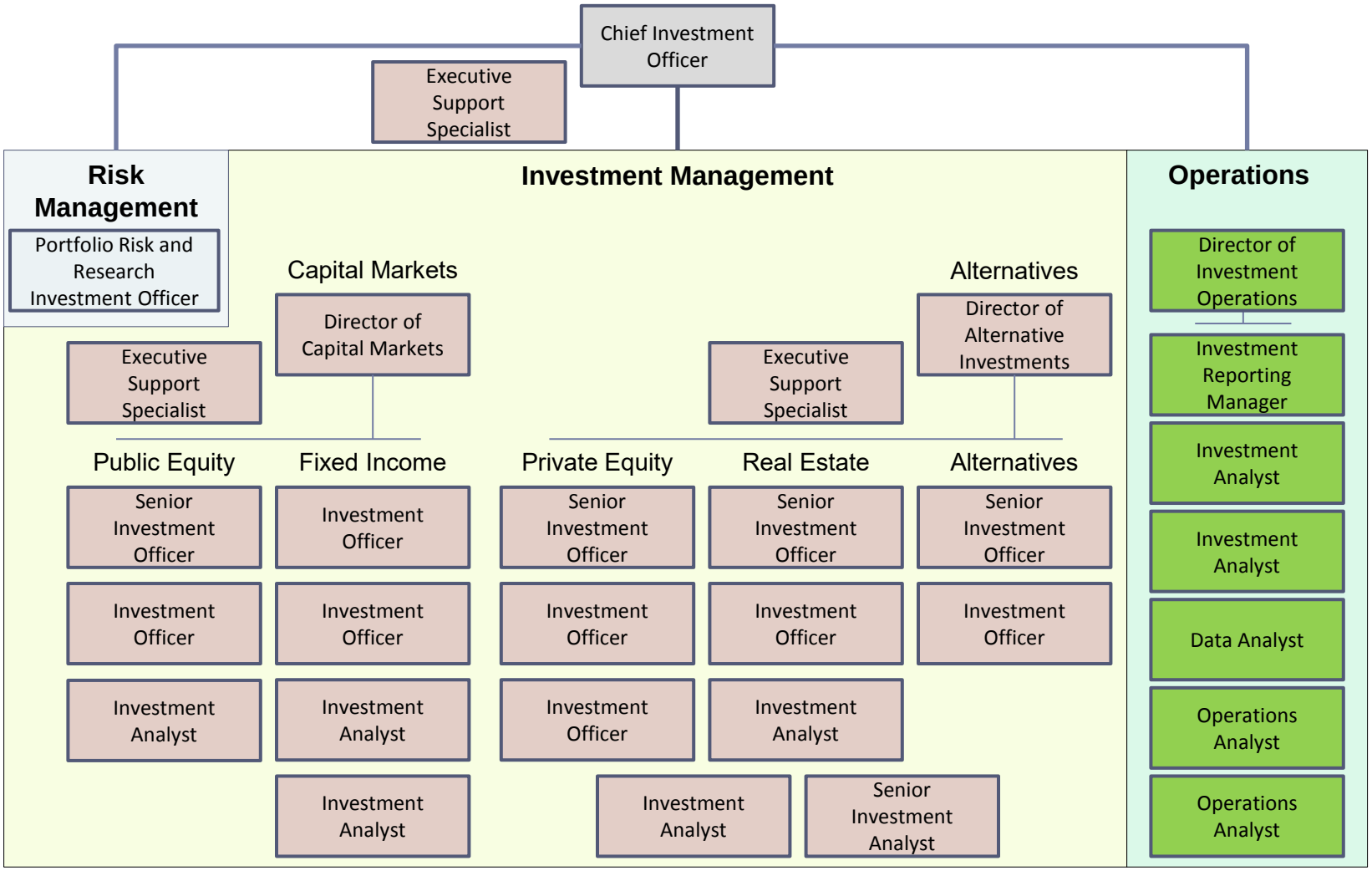


OPERF Performance & Peer Rankings
(as of June 30, 2017)

Annualized Return[1]	1-Year	3-Year	5-Year	7-Year	10-Year
Russell 3000	18.51%	9.10%	14.58%	15.34%	7.26%
S&P 500	17.90%	9.61%	14.63%	15.41%	7.18%
Russell 2000	24.60%	7.36%	13.70%	14.35%	6.92%
MSCI ACWI ex-US IMI	20.43%	1.14%	7.58%	6.94%	1.51%
MSCI Emerging Markets	23.75%	1.07%	3.96%	3.87%	1.94%
Barclays U.S. Aggregate	-0.31%	2.34%	2.48%	3.49%	4.60%
Fund Performance (Ranking[2])	**1-Year**	**3-Year**	**5-Year**	**7-Year**	**10-Year**
OPERF	**12.76% (54)**	**6.65% (11)**	**10.18% (15)**	**10.93% (7)**	**6.33% (12)**
Domestic Equity	19.72% (10)	8.55% (50)	14.34% (38)	15.14% (37)	7.14% (41)
International Equity	21.62% (30)	2.96% (20)	9.52% (13)	8.75% (13)	3.13% (1)
Fixed Income	1.63% (55)	2.39% (69)	2.50% (72)	3.36% (85)	4.47% (79)
Private Equity	15.05% (20)	11.96% (13)	14.86% (5)	15.91% (1)	11.82% (1)
Real Estate	7.32% (71)	10.40% (57)	11.86% (46)	12.82% (41)	5.58% (30)

[1] State Street for index returns.
[2] Relative to Wilshire Trust Universe Comparison Service (TUCS®) Public Funds > $10 Billion cohort.

OST Investment Division Org Chart
(as of June 30, 2017)



Thank You

John D. Skjervem, CFA
Chief Investment Officer
Oregon State Treasury

September 13, 2017

B

FOLEY

FOLEY & LARDNER LLP

INVESTMENT FEES, DISCERNING EXPENSES FROM FEES, AND WHERE DOES ONE DRAW THE LINE

OCERS BOARD OF RETIREMENT
2017 STRATEGIC PLANNING WORKSHOP
VISIONING THE FUTURE
SEPTEMBER 13-14, 2017

Presented by:
Thomas A. Hickey, III
Foley & Lardner LLP
111 Huntington Avenue
Boston, MA 02199

INVESTMENT FEES, DISCERNING EXPENSES FROM FEES, AND WHERE DOES ONE DRAW THE LINE

- Requirements of California Gov't Code Section 7514.7 (AB 2833) effective January 1, 2017
- Current "Fee Disclosure" Side Letter Paragraph (forward to Investment Manager while performing due diligence)
- ILPA template
- Negotiations with post January 1, 2017 Investment Managers

INVESTMENT FEES, DISCERNING EXPENSES FROM FEES, AND WHERE DOES ONE DRAW THE LINE

- Legacy Investment Managers (pre-January 1, 2017 Investment Managers)
- SEC's Presence Exams, Findings and Fines
- Current industry standard for payments of Settlements, Fines and Expenses related to investigations
- Och Ziff settlement with DOJ and SEC in September 2016 (Foreign Corrupt Practices Act)

INVESTMENT FEES, DISCERNING EXPENSES FROM FEES, AND WHERE DOES ONE DRAW THE LINE

- Current “Certain Fees and Expenses” Side Letter Paragraph

- Examples of fees and expenses discussions with prospective Investment Managers

    1) Private jet, first class airfare and first class hotel accommodations
    2) Fees to “affiliates” and role of the LPAC, if any
    3) “Extraordinary Expenses”

- SEC and the Trump Administration

A Look into the Future

ORANGE COUNTY

OCERS

EMPLOYEES RETIREMENT SYSTEM

September 14, 2017

Molly Murphy, CFA

2018: A Look into the Future

- Invest proactively
  - Develop investment themes
  - Create a 12-month rolling work plan
  - Prepare for the most likely outcomes
  - Allow room for surprises
- Extract more value from our ability to give away liquidity
  - Hire Illiquid Assets consultant
  - Begin building a direct private equity portfolio
  - Establish more transparency and intentionality around energy and real estate investments

2018: A Look into the Future

- Maximize use of investment industry thought leaders in the OCERS' portfolio process
- Work efficiently and effectively
  - Use more technology solutions
    - Maximize State Street custodial reporting capabilities
    - Introduce CRM technology to improve the investment manager due diligence process
  - Revamp Investment Committee materials to assist in better decision making
    - Increase investment risk awareness
    - Improve risk taking abilities

B

BRIDGEWATER

Presented to:

ORANGE COUNTY OCERS EMPLOYEES RETIREMENT SYSTEM

Global Outlook

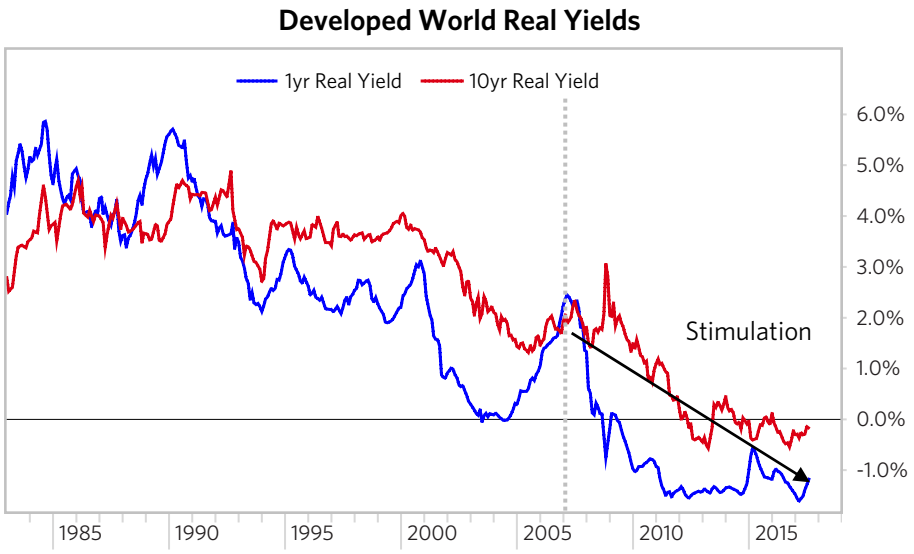
September 14, 2017

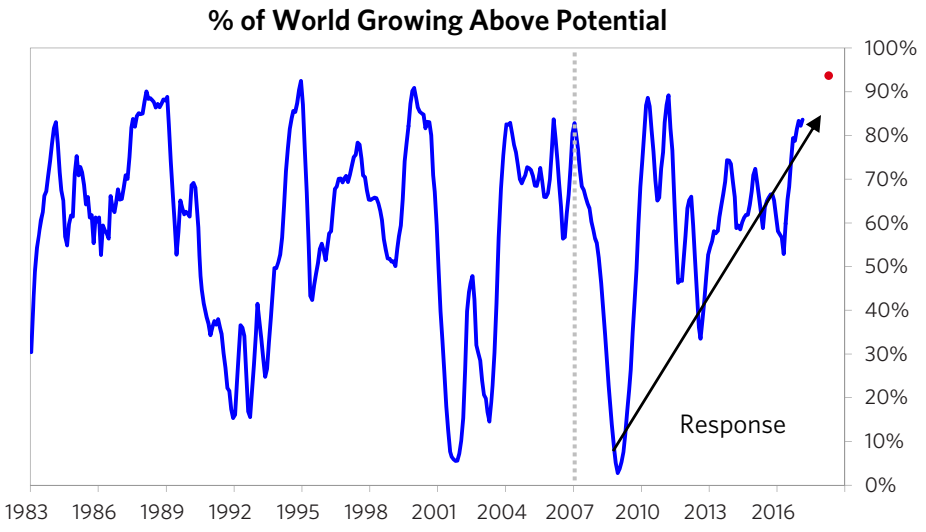
One Glendinning Place
Westport, CT 06880
(203) 226-3030
www.bridgewater.com

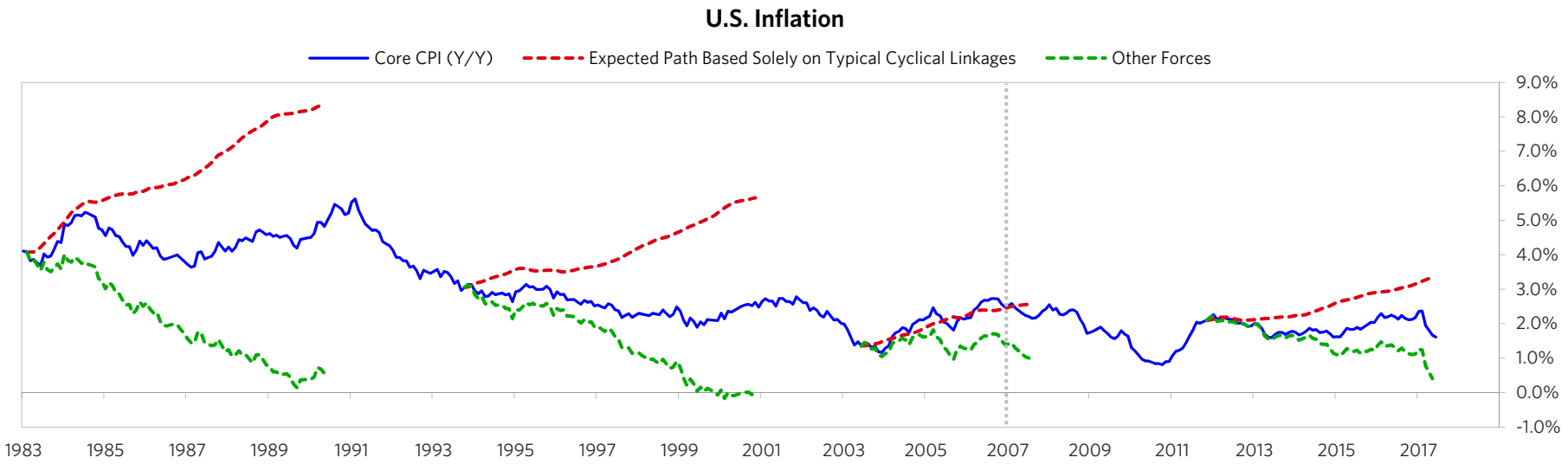
OUTLOOK

- Global growth is strong, inflation is low, and near-term conditions look good.
- There are significant tactical opportunities: long stocks, oil, and EM FX, short Europe, UK, and US bonds, and a number of attractive differential trades.
- We're in the midst of a gradual tightening.
- The next downturn will be a real mess. Secular deflationary forces, low returns, populism, and limited ability to ease are risks. Complacency is high.

CYCLICAL CONDITIONS ARE STRONGER AND INFLATION IS STILL LOW

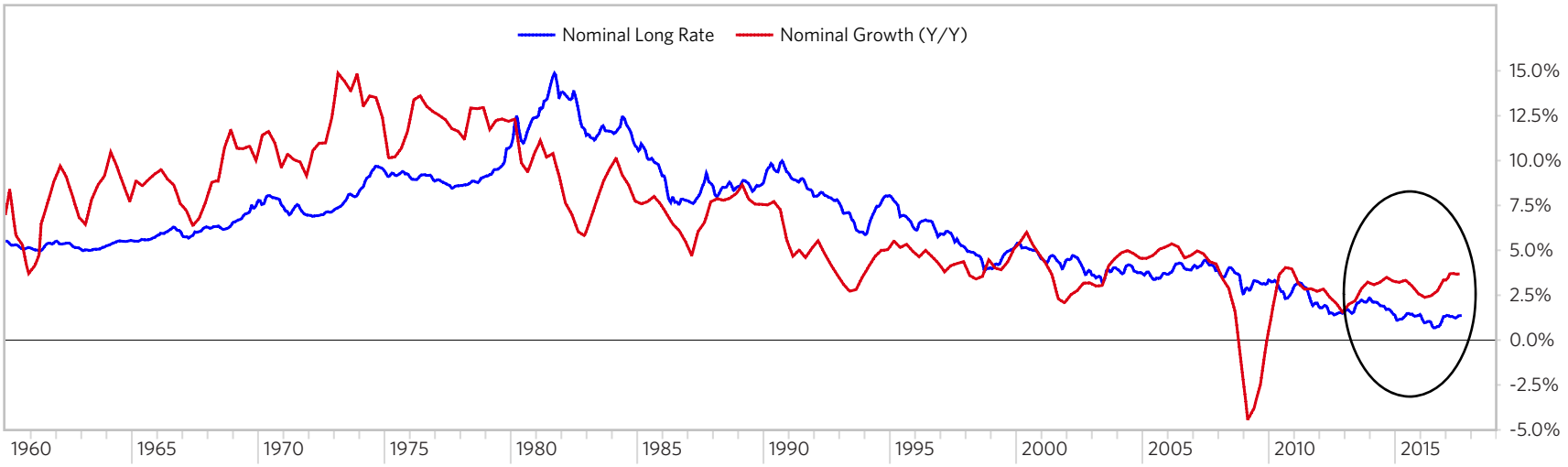




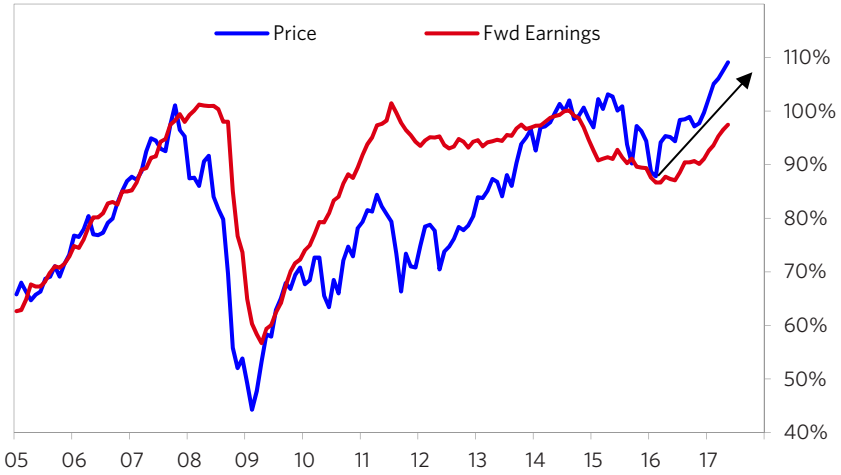


MARKETS NOT DISCOUNTING CONTINUED CYCLICAL IMPROVEMENT

Developed World



Equity Markets Registered the Pickup in Earnings, But Not More

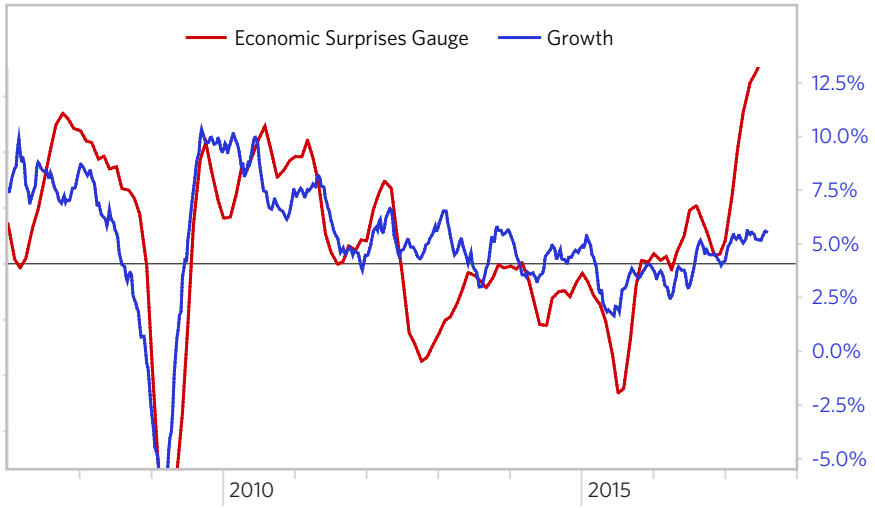


Global Equity Market Performance (since Jan 2017)

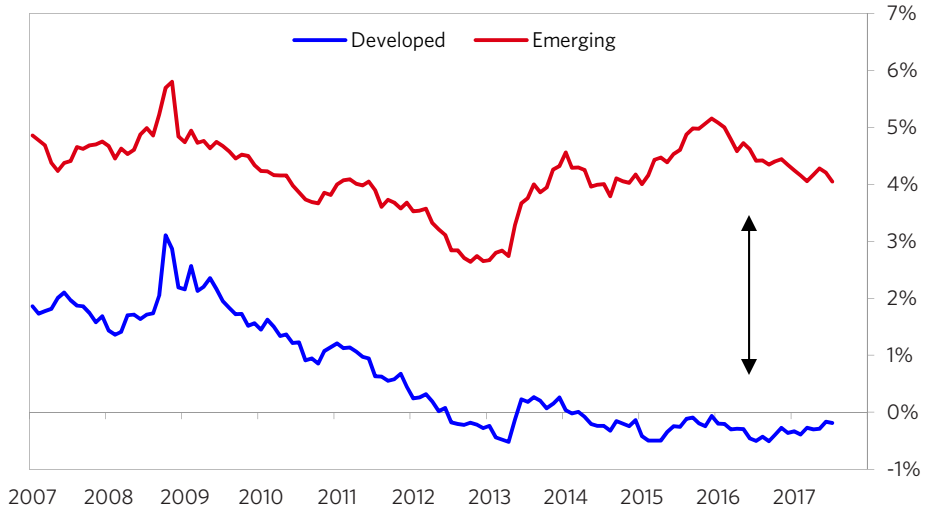
	Price Change	Due to Chng in EPS (Fwd)	Due to Chng in PE (Fwd)
WLD	6%	5%	1%
USA	5%	4%	1%
EUR	13%	5%	7%
JPN	3%	6%	-2%
GBR	6%	1%	4%
CAN	1%	3%	-2%
AUS	4%	5%	0%
Emerging	8%	8%	0%

EMERGING MARKETS ARE IN THE SWEET SPOT

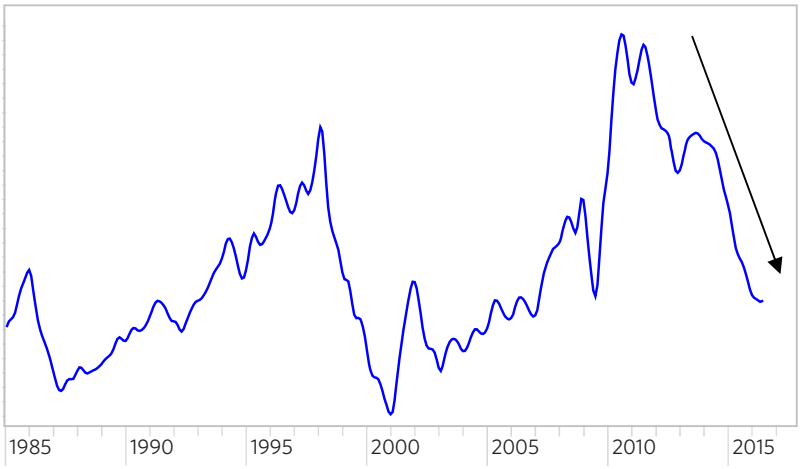
Emerging Markets



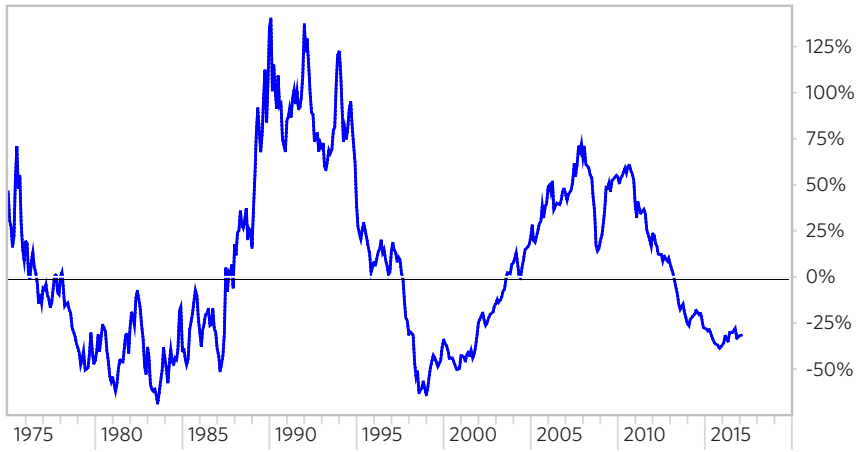
Real Yields



Global Sensitivity to Dollar Liquidity Index

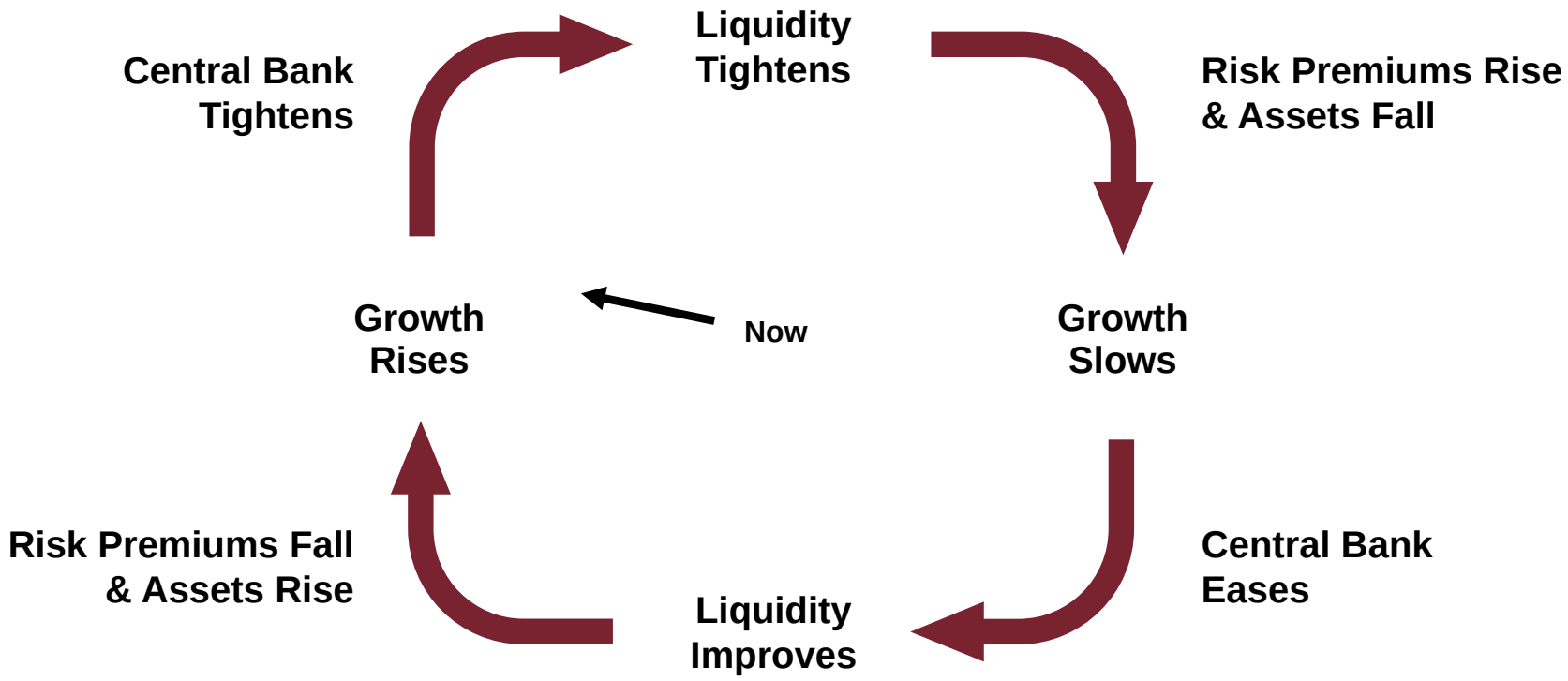


Relative EM ex-China vs Developed World Equity Returns (Unhedged, Detrended)

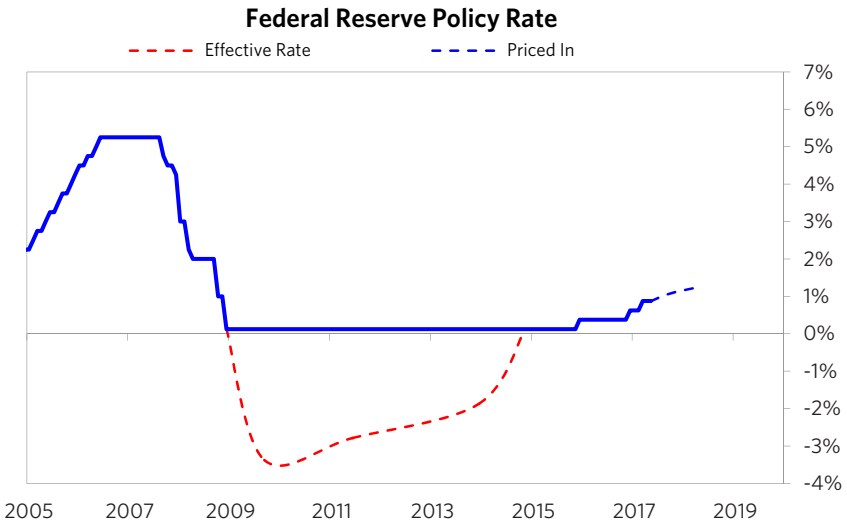


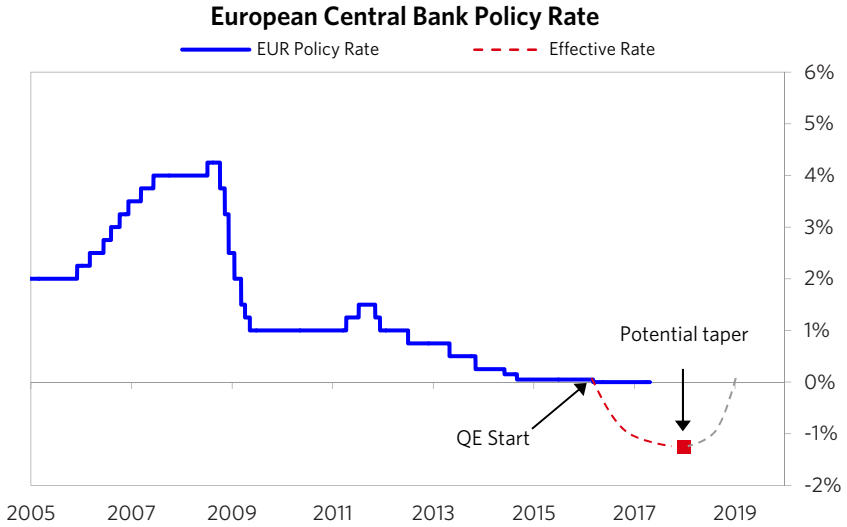
THE LIQUIDITY CYCLE IS SHIFTING

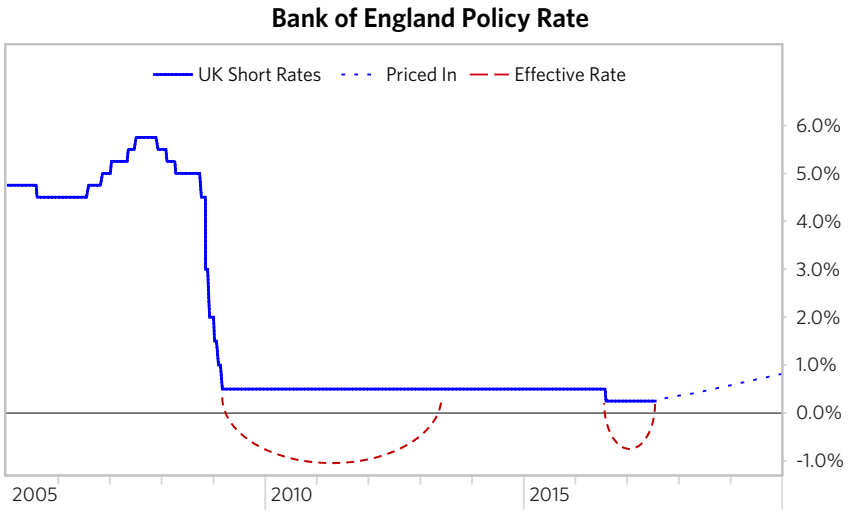
i.e., cash to assets; assets to cash



CENTRAL BANKS ARE MODESTLY TIGHTENING

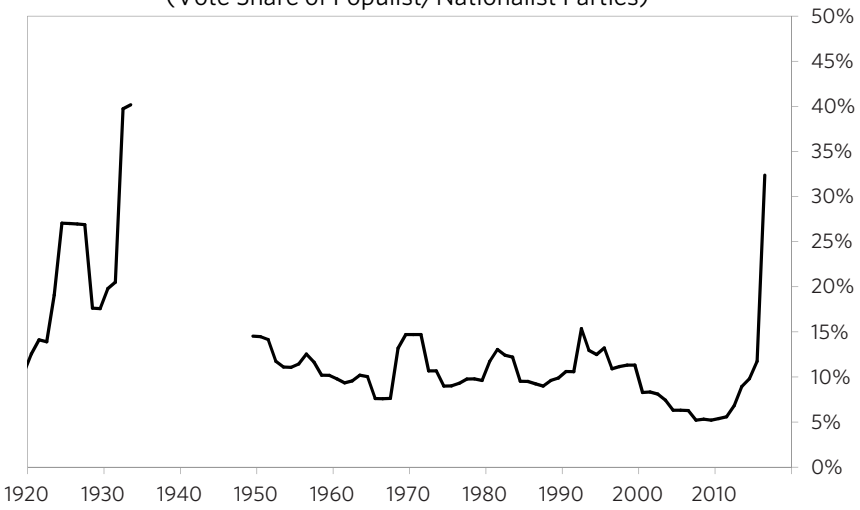




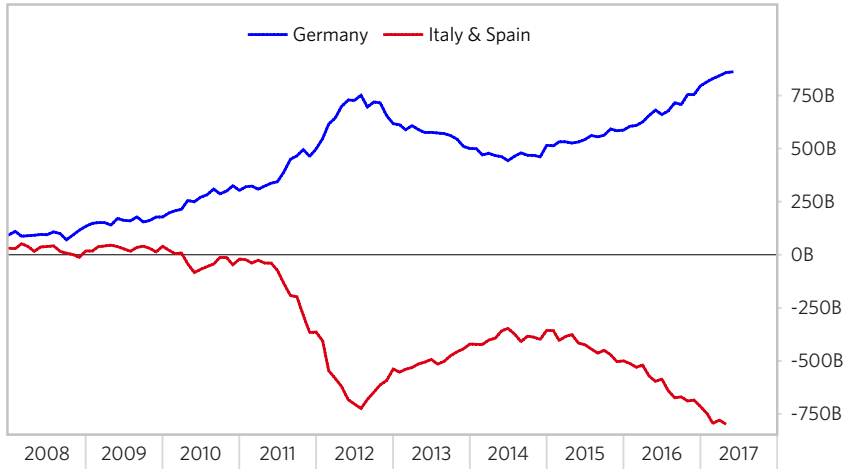


POPULISM, IMBALANCES IN EUROPE AND CHINA, AND OVERTIGHTENING ARE ALL RISKS

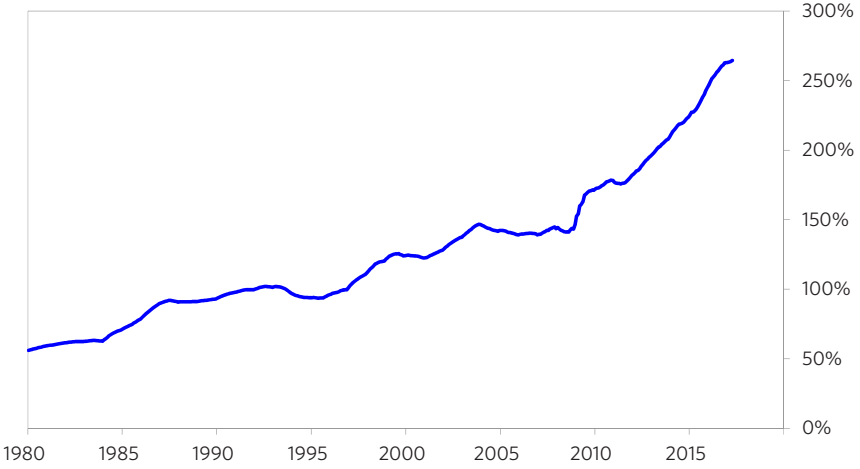
World Populism Index
(Vote Share of Populist/Nationalist Parties)



Imbalances in Europe Exist:
TARGET2 Balances

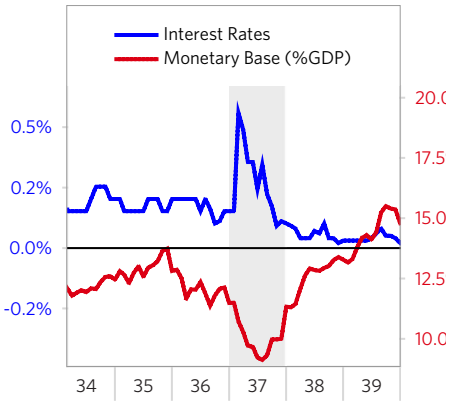


China Total Debt (% GDP)

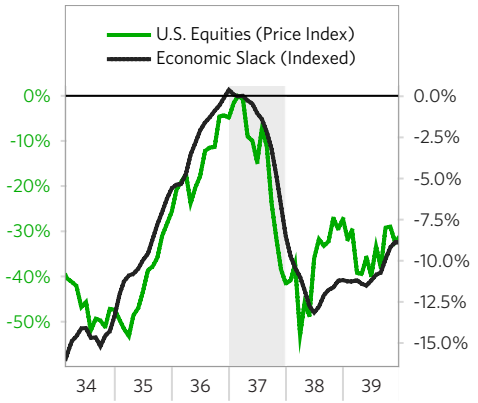


1937 Fed Tightening Analogue

U.S. Monetary Policy

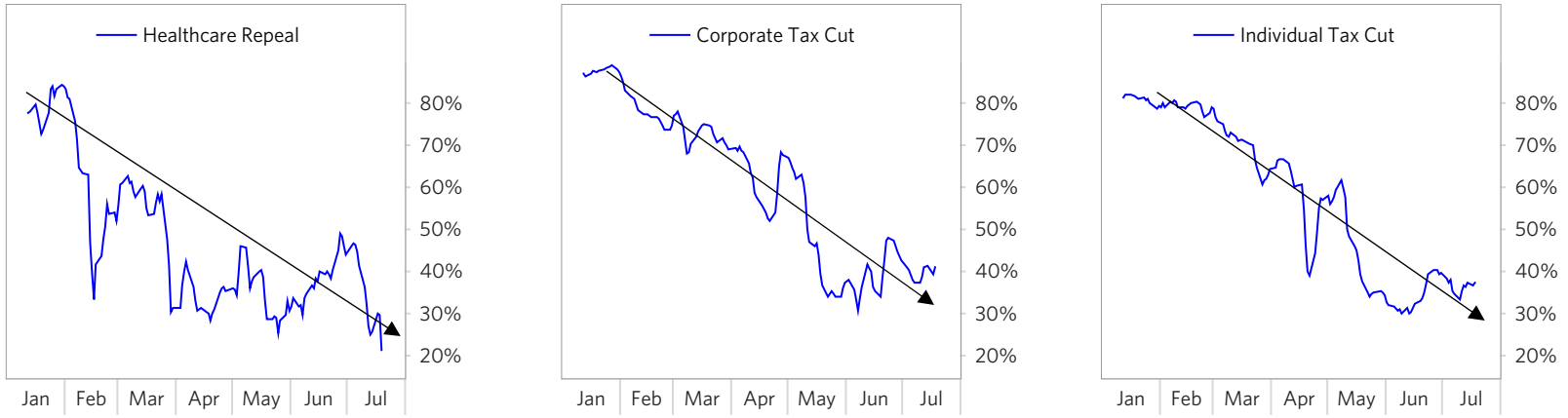


Economic & Financial Impact

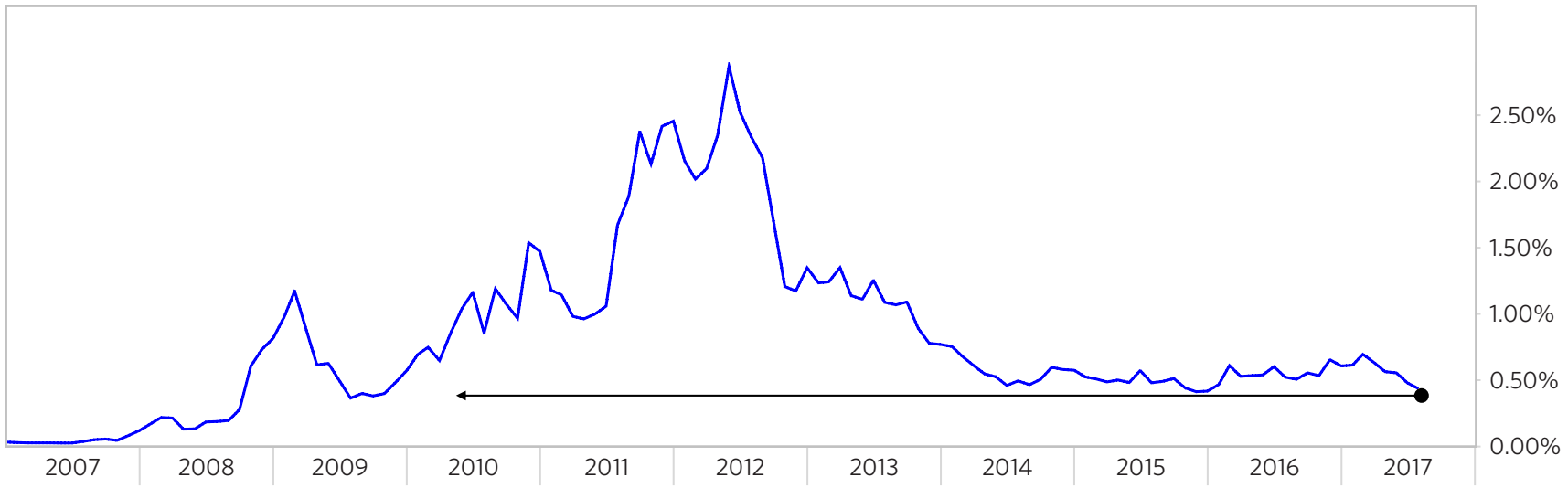


MARKET DISCOUNTING OF POPULIST RISK IN US, EUROPE WANING

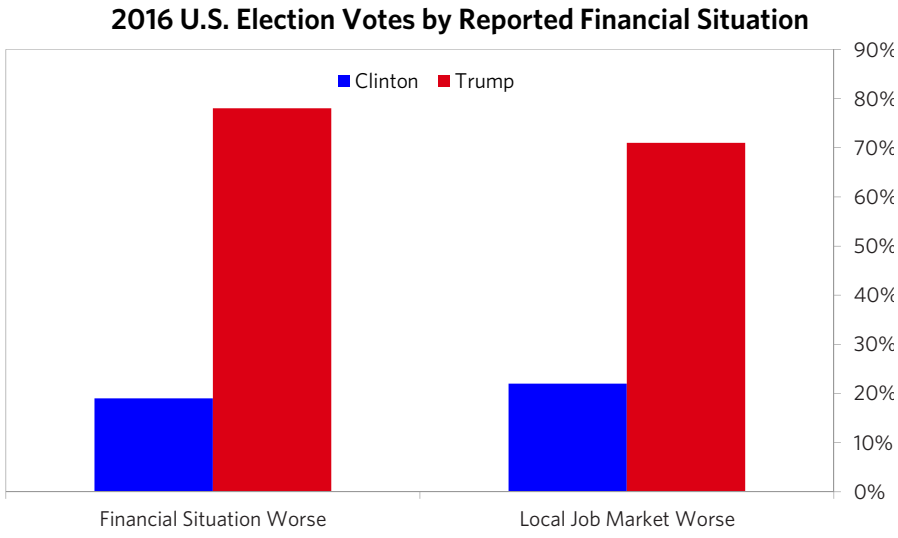
United States: Betting Market Odds on Trump Policies Approved in 2017

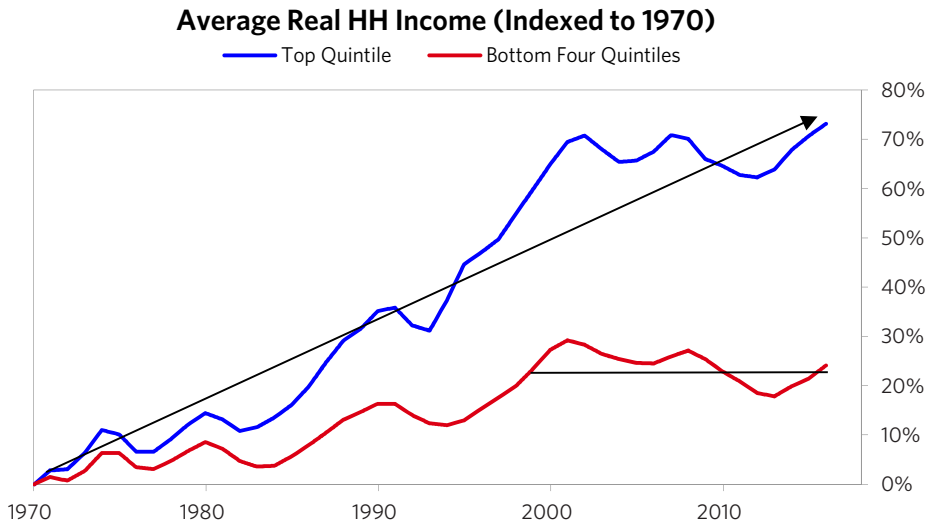


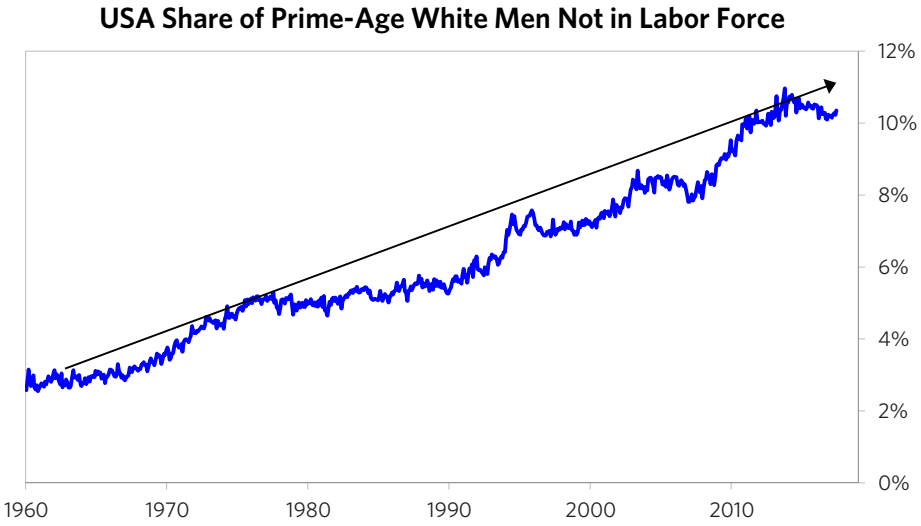
European Sovereign CDS

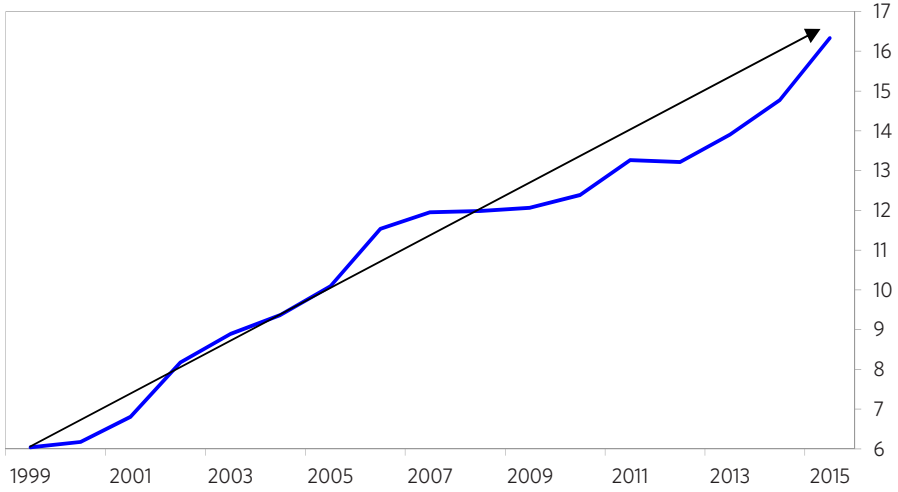


BUT THE STRUCTURAL DRIVERS STILL EXIST







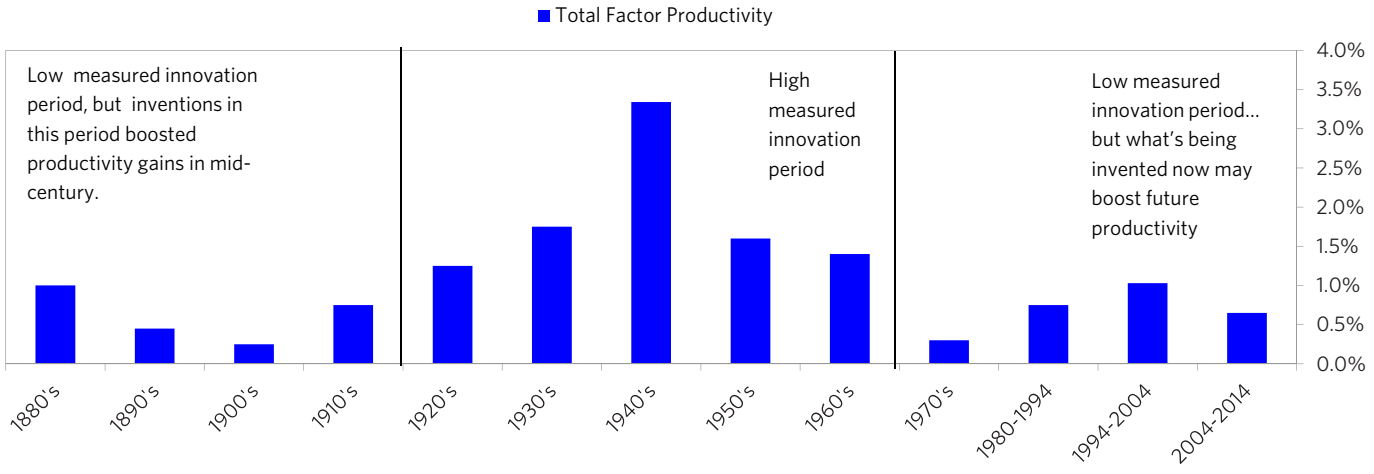


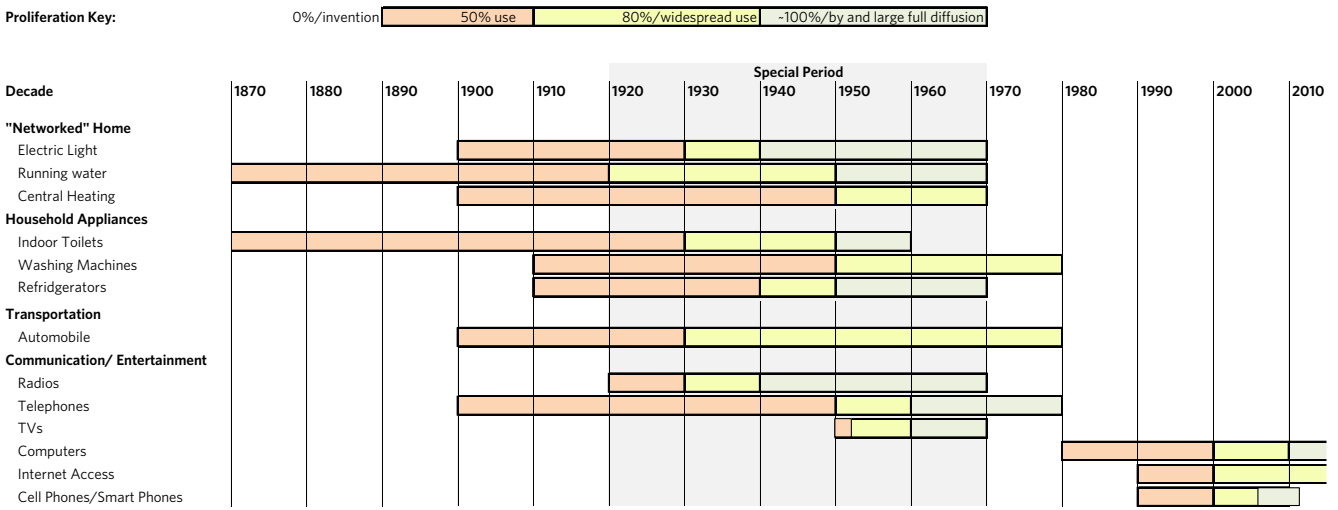
Voting data is from CNN exit polling. Drug overdose data is from the CDC.

AND THERE IS LIMITED ABILITY TO EASE FOR THE NEXT DOWNTURN

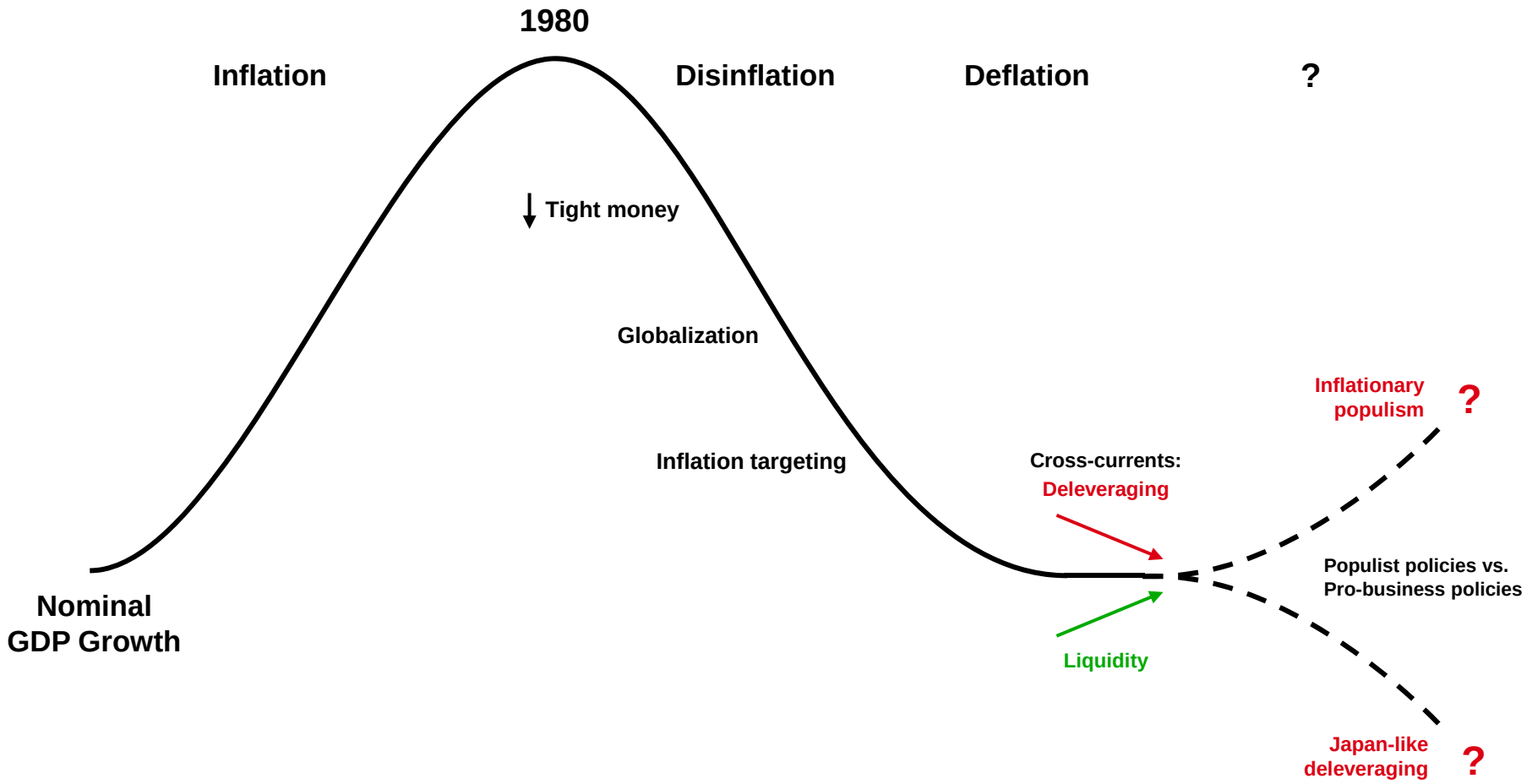
Developed World Monetary Gas in the Tank

CURRENT SHIFT IN TECHNOLOGY RAISES IMPORTANT QUESTIONS

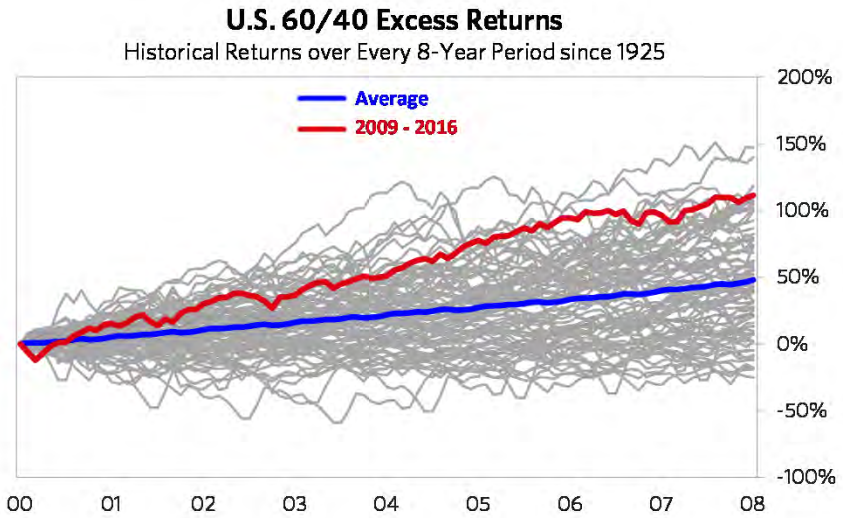


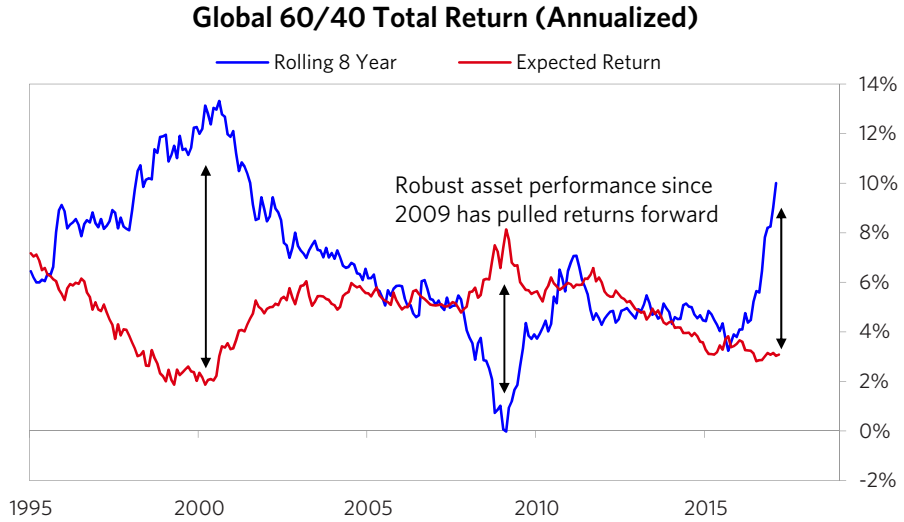


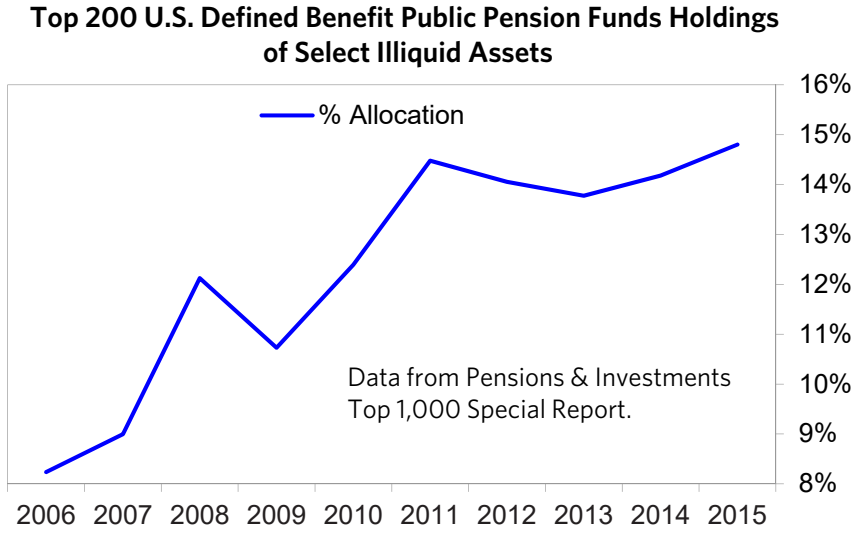
A WIDE RANGE OF POTENTIAL OUTCOMES

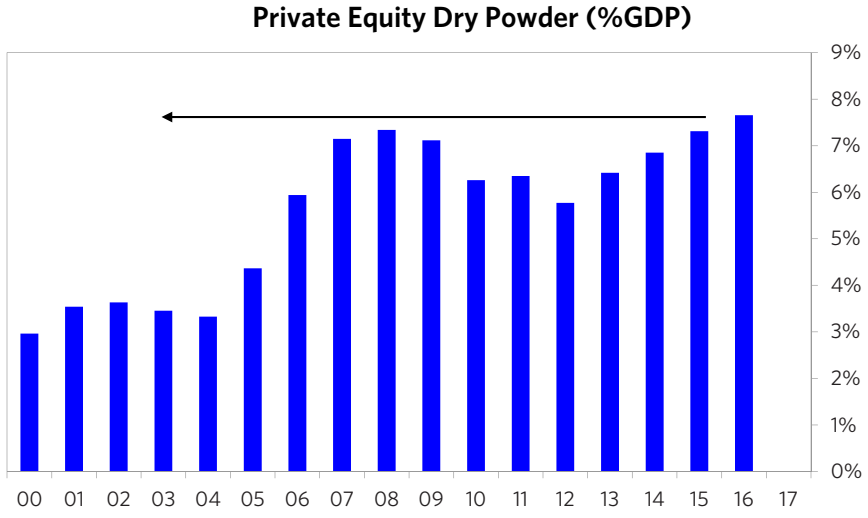


COMPLACENCY IS HIGH









The 60/40 portfolio is a 60% capital allocation to Equities and a 40% capital allocation to Nominal Bonds. Please review the "Important Disclosures and Other Information" located at the end of this presentation.

CAN PRIVATE EQUITY RETURNS BE EXTRAPOLATED?

Attributing Private Equity vs S&P 500 Performance since 2003

		Compounded Return since 2003	Ann return	Description
1	**S&P 500 Returns over Cash**	**192%**	**8.0%**	
2	+ Impact from Higher PE Firm Leverage[1]	120%	5.8%	Priv Eq run firms were on avg 60% more levered than S&P 500 over this period
3	+ Impact from Convergence of PE & Public Market Valuations[2]	78%	4.2%	Priv Eq EV/EBITDA went from a 55% discount to S&P to roughly at par
4	**S&P 500 Adj for Leverage, Valuation**	**1047%**	**19.0%**	
5	PE Gross Returns, Before Fees	1368%	21.2%	
6	Implied Additional Operational + Other Value Add	28%	1.8%	Residual (5-4 compounded) suggests small operational and other value add
7	- Drag from Manager Fee[3]	-62%	-6.7%	But PE manager fee is a large drag
8	**Private Equity Net of Fee Returns over Cash[4]**	**454%**	**13.0%**	Such that levered S&P returns are similar to PE net of fee returns (5-7 compounded)
9	**S&P 500 Adj Only for Leverage**	**543%**	**14.2%**	

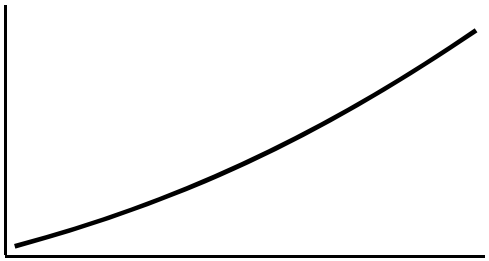
Returns comparable after matching leverage levels

Notes on PE v S&P Performance: 1: Private Equity Leverage Source: Bain Capital Annual PE Report 2017; 2: Firm leverage defined as EV/EBITDA: Private Equity Leverage Data Source: Cap IQ LCD; Public Equity Leverage Data Source: Bloomberg Best EV/EBITDA; 3: Private Equity Manager Fee: From "Replicating Private Equity with Value Investing" (Stafford 2015), roughly matches 2/20 fee structure; 4: Source: Cambridge Associates.The 60/40 portfolio is a 60% capital allocation to Equities and a 40% capital allocation to Nominal Bonds. Please review the "Important Disclosures and Other Information" located at the end of this presentation.

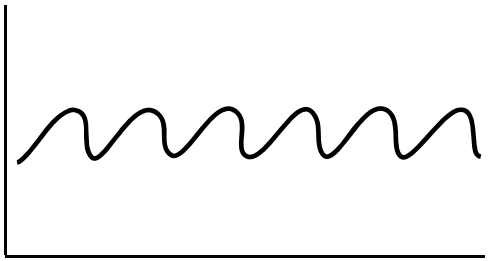
OUR SIMPLE ECONOMIC TEMPLATE

Three Big Forces

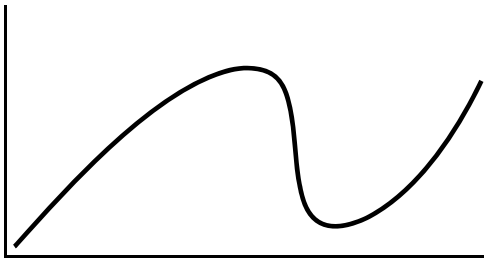
1. **Productivity**



2. **The Short-Term Debt Cycle**
   5 – 8 years



3. **The Long-Term Debt Cycle**
   50 – 75 years



Three Equilibriums

1. Debt growth is in line with the income growth that is required to service debts.

2. Economic capacity utilization is neither too high nor too low.

3. Projected returns of equities are above the projected returns of bonds which are above the projected returns of cash by appropriate risk premiums.

Two Levers

1. Monetary Policy

2. Fiscal Policy

Important Disclosures and Other Information

Please read carefully the following important disclosures and other information as they provide additional information relevant to understanding the assumptions, research and performance information presented herein. Additional information is available upon request except where the proprietary nature of the information precludes its dissemination.

IMPORTANT DISCLOSURES

Bridgewater research utilizes data and information from public, private and internal sources, including data from actual Bridgewater trades. Sources include, the Australian Bureau of Statistics, Asset International, Inc., Barclays Capital Inc., Bloomberg Finance L.P., CBRE, Inc., CEIC Data Company Ltd., Consensus Economics Inc., Costar Portfolio Strategy, Inc., Credit Market Analysis Ltd., CreditSights, Inc., Corelogic, Inc., Dealogic LLC, Ecoanalitica, Emerging Portfolio Fund Research, Inc., Empirical Research Partners, LLC, Eurasia Group Ltd., European Money Markets Institute - EMMI, Factset Research Systems, Inc., The Financial Times Limited, GaveKal Research Ltd., Global Financial Data, Inc., Harvard Business Review, Haver Analytics, Inc., The Investment Funds Institute of Canada, Intercontinental Exchange (ICE), Investment Company Institute, International Energy Agency, Investment Management Association, Markit Economics Limited, Mergent, Inc., Metals Focus Ltd, Moody's Analytics, Inc., MSCI, Inc., National Bureau of Economic Research, North Square Blue Oak, Ltd., Organisation for Economic Cooperation and Development, Pensions & Investments Research Center, RealtyTrac, Inc., RP Data Ltd, Roubini Global Economics, LLC, Rystad Energy, Inc., S&P Global Market Intelligence Inc., Sentix Gmbh, Shanghai Wind Information Co., Ltd., Spears & Associates, Inc., State Street Bank and Trust Company, Thomson Reuters, Tokyo Stock Exchange, TrimTabs Investment Research, Inc., United Nations, US Department of Commerce, World Bureau of Metal Statistics, World Economic Forum, Wood Mackenzie Limited, and 4Cast Inc. While we consider information from external sources to be reliable, we do not assume responsibility for its accuracy.

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C

Investment Risk Management

September 14, 2017

Molly Murphy, CFA

Pension Risk Management

- Benefits Mandate
  - Required to pay timely benefits
  - Often asked: Income portfolio or Total Return portfolio?
  - Not a question of income, but a question of liquidity and cash flow
- Funded Status Goal
  - Provide benefits for all current and future members
  - Requires the plan to seek risk to achieve necessary investment returns
- *Pension Conundrum: How to be a long-term risk seeker and still have cash available to pay benefits?*

Investment Risk Management

- Traditional view:
  - Looking at top level risks as well as asset category risks
  - Opinion: Asset class diversification will protect you
- New view:
  - Asset classes share certain “factor” risks and simple diversification no longer protects as well
  - Example: 2015/2016 sharp oil price decline saw most markets and active investment managers correlate heavily with crude prices. Why?
    - Equity managers bought public energy stocks
    - Fixed income managers bought energy debt
    - Hedge fund managers bought anything energy within their mandate
    - Private equity and credit managers bought private energy assets within their allowances
  - Opinion: Must look beyond asset class diversification to truly manage investment risks

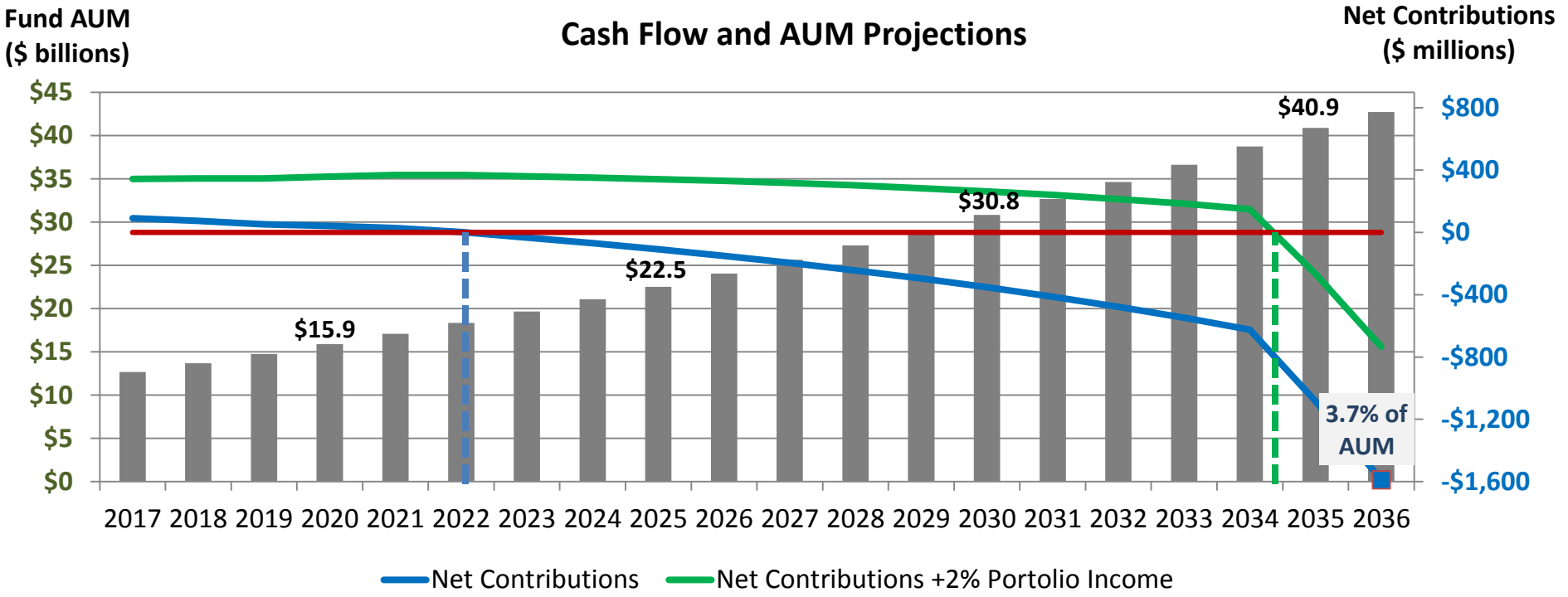
Investment Risks: Common and Not So Common

- Market
  - Equity market bubbles
  - Interest rates/Inflation
- Liquidity
- Currency
- Volatility/Sensitivity
- Factor Exposures
- Product specific
  - Gates
  - Leverage
  - Liquidity terms vs. investment horizon
  - Retail investor exposure
  - Key Man

PCA Quarterly Report

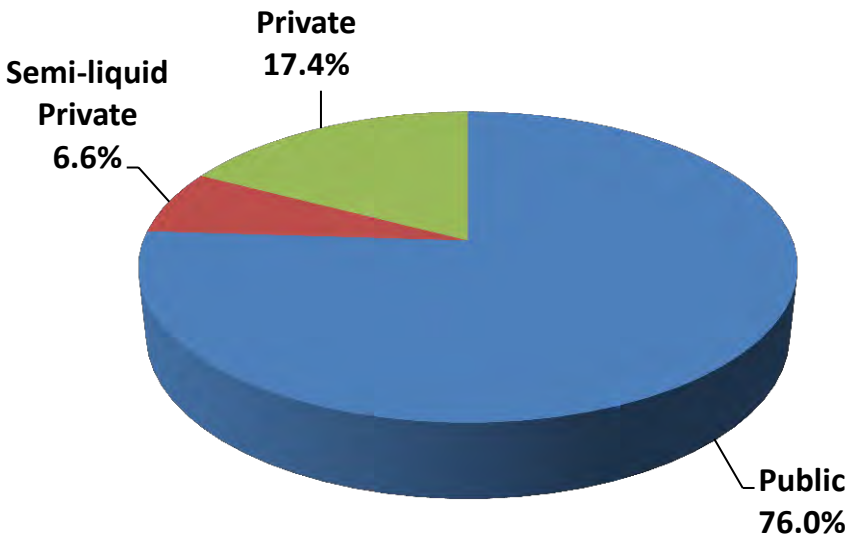
Investment Manager Due Diligence process

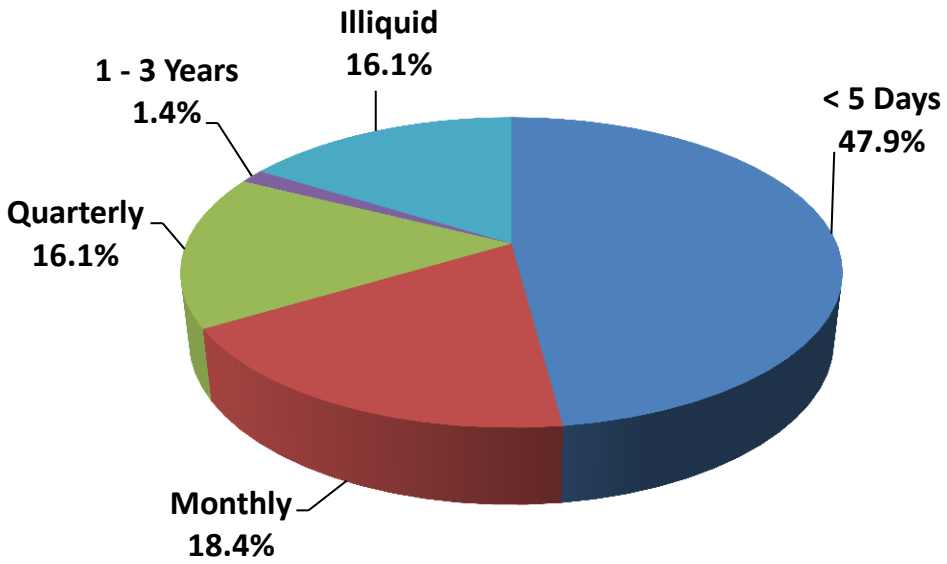
Liquidity



- OCERS will have negative net contributions in approximately 5 years
- OCERS can generate 2% structural portfolio income/cash flow with current investment strategies
- OCERS can cover anticipated outflows without lowering return expectations and/or seeking dedicated income strategies for approximately 20 years

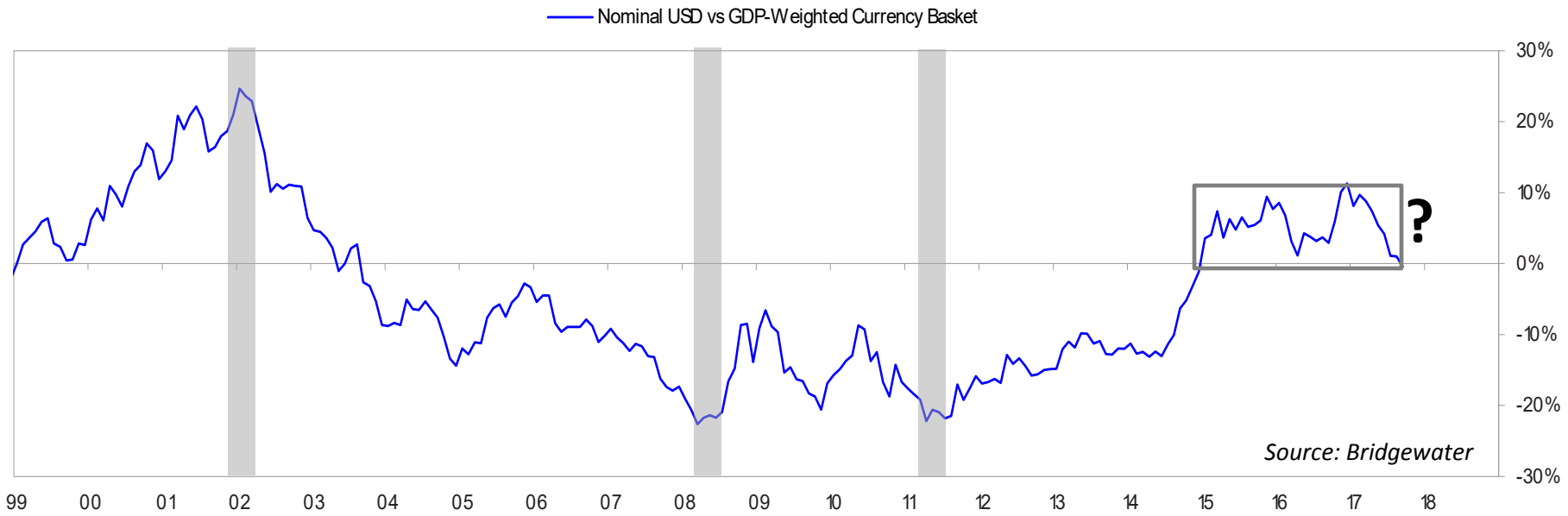
Liquidity





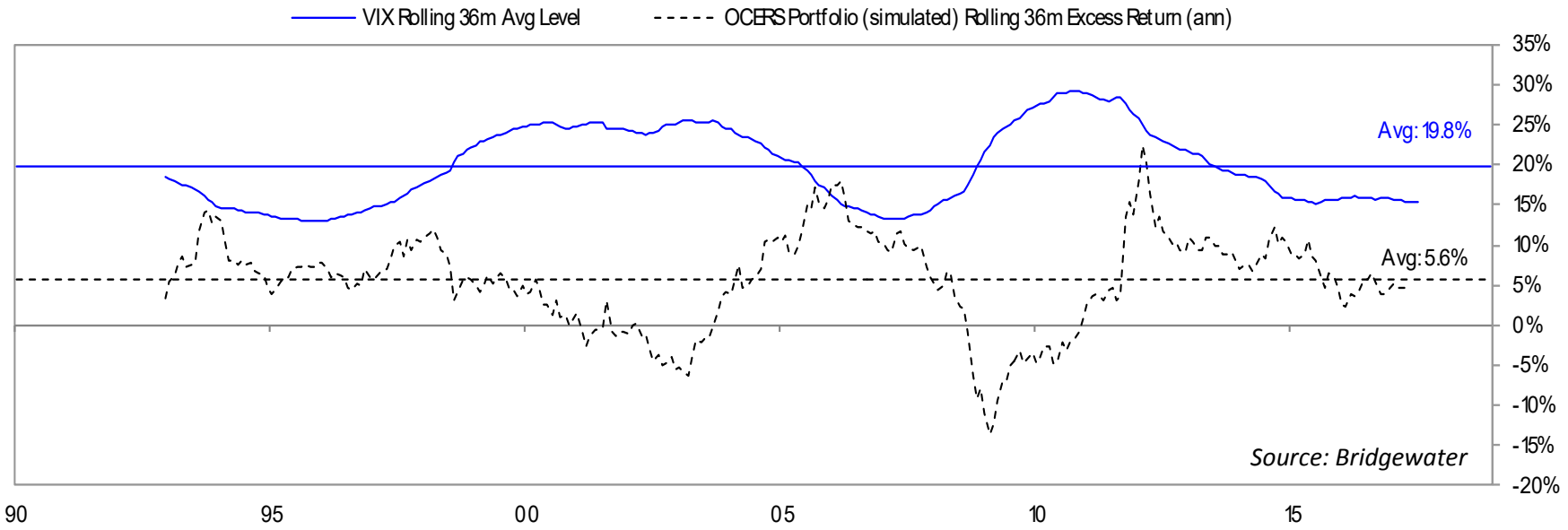
- OCERS has a modest allocation to private capital strategies that will increase slightly as private equity and real assets are maximized
- Based on OCERS plan projections, the portfolio should use its ability to take illiquidity risk in seeking return

Currency



- Currency is commonly considered a long-term zero sum game
- Currency trends are typically 5-8 years
- Hedging can be strategic or tactical
- Policies should define a strategic philosophy and whether tactical trades are permissible
- Currency risks should be monitored and reported regardless of policy position

Market Volatility and Sensitivity



- Volatility in equity markets is at 20-year lows
- Volatility would have to double to mean revert to historical averages
- Low volatility favors passive strategies while high volatility favors active strategies

Market Volatility and Sensitivity

Simulated Historical Beta (Since 1970)

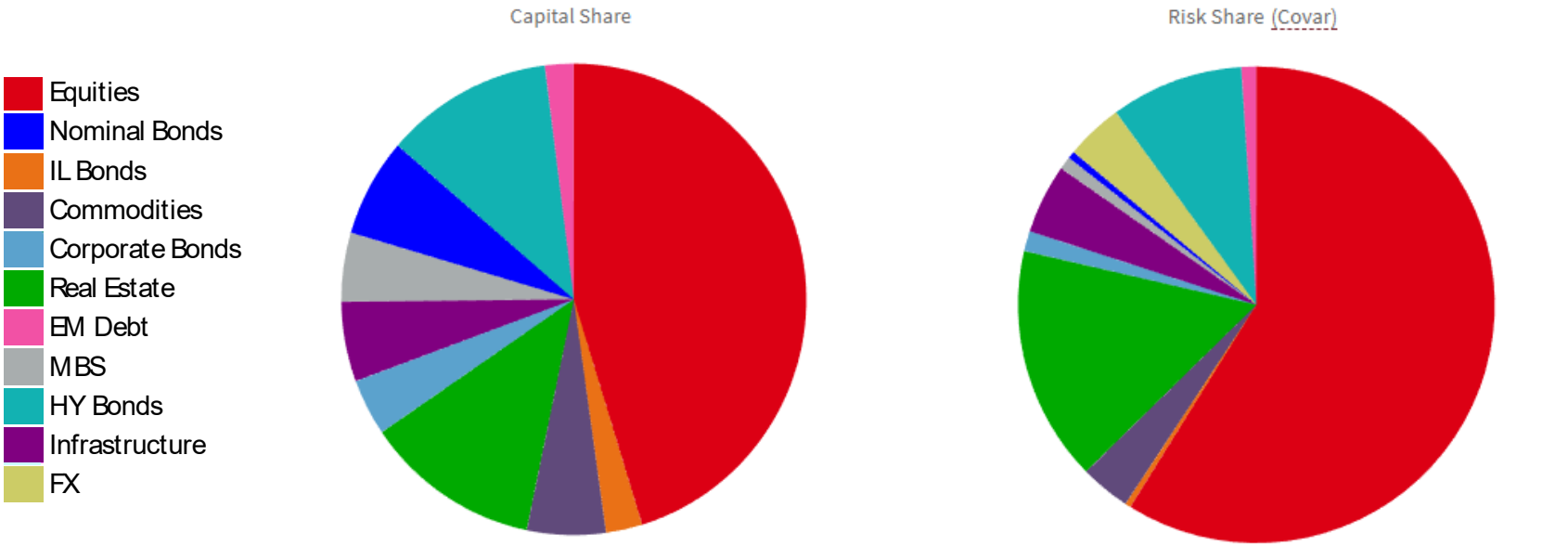
Index	Beta
MSCI ACWI (USD)	0.66
Russell 3000	0.63
GSCI Commodity Index	0.11
WTI/Brent Blend (since 2014)	0.40

Source: Bridgewater, OCERS

- In rolling 12-month periods, if global equity markets go up by $1.00, the OCERS portfolio moves up approximately $0.65 (and similarly negative if markets fall)
- The role of beta is to provide a risk marker that helps investors confirm known risks and investigate unknown risks
- Dating back to 1970, OCERS has had very little sensitivity to generic commodity prices, but sensitivity to oil has risen in recent years

Diversification vs. Factor Exposures

CAPITAL AND RISK SHARES OF OCERS PORTFOLIO



Source: Bridgewater

- Goal: To understand if any category of assets is introducing unwanted/unknown risks
- Real Estate is adding more risk than its allocation and FX (currency risk) is a factor risk borne by the portfolio without an asset allocation
- HY bonds are adding more value than risk

Next Steps

- Begin to incorporate other investment risk concepts into regular Investment Committee materials
- Build capabilities in deconstructing risk
- Review investment policies for risk aware guidelines, including but not limited to currency exposures

D

Asset Class Policy – Risk Mitigation

A strategic option for diversifying the OCERS Total Portfolio

PCA PENSION CONSULTING ALLIANCE

September 2017

Table of Contents

Overview & Role

- **Risk Mitigation Discussion**

High-level Thoughts

- To obtain the required return, the OCERS Total Portfolio must rely upon *Economic Growth Risk*

- Like most institutional portfolios, OCERS is meaningfully exposed to *Economic Growth Risk*

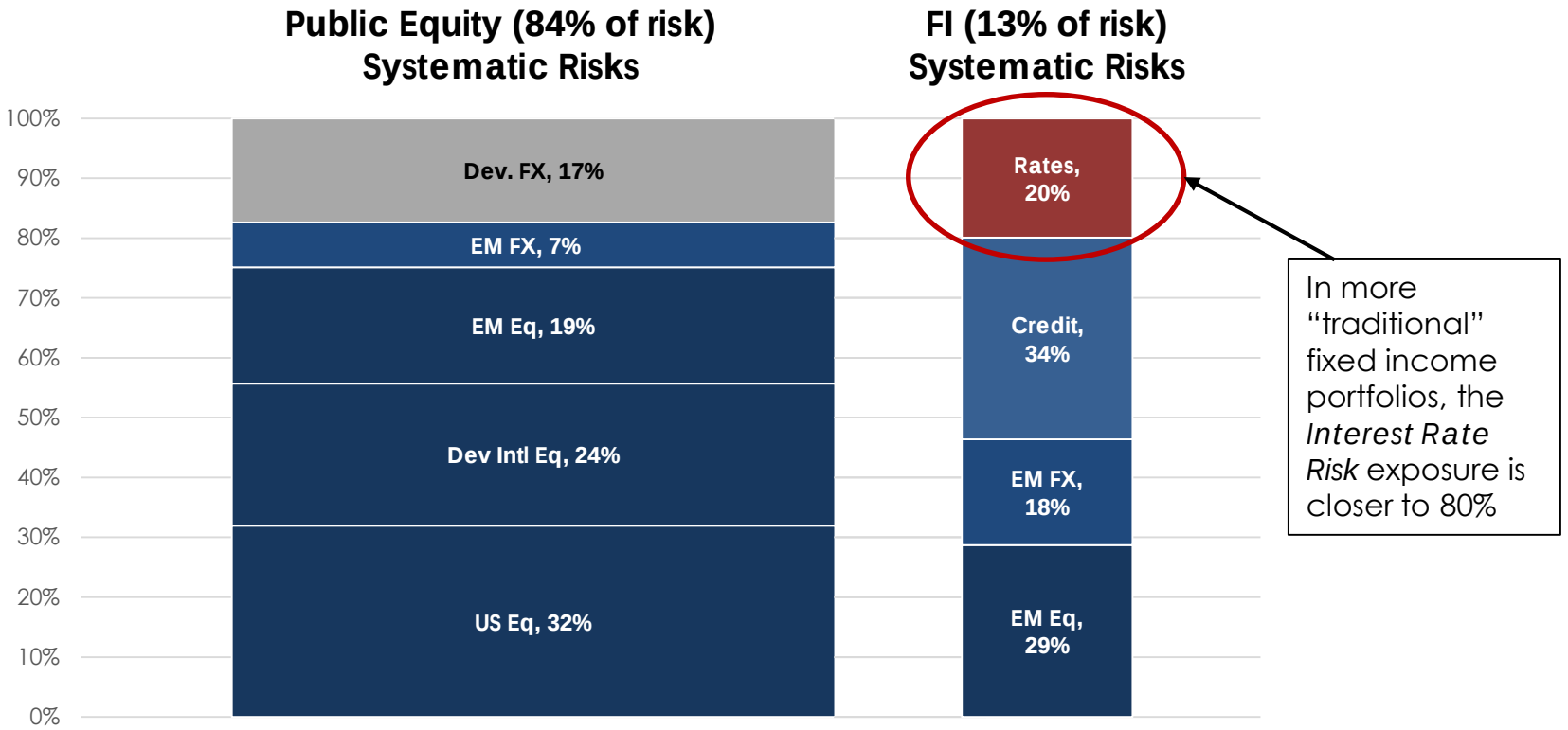
- This amount of exposure is both required and reasonable:
  - Required: - it is the only reliable source of strong long-term real returns
    - to meet portfolio return assumption
  - Reasonable: - OCERS is a long-term investor and can accept illiquidity and volatility

- Goal is to achieve return assumption with the least amount of risk

- Incorporating a Risk Mitigation class may aid in that goal

Current Risk Exposures of OCERS's Liquid Portfolio

- Liquid portfolio dominated by Growth Risk (blue), DM FX (gray), & Rates (red)
  - >99% of Public Equity portfolio risk is explained by systematic factors
  - ≈80% of Fixed Income portfolio risk is explained by systematic factors
    - OCERS Fixed Income Portfolio = core + credit composites



Source: PCA Risk Models (OLS regressions; 3-years ending 6/30/17)
See Appendix for factor descriptions

Risk Mitigation Class – It Is Not an Asset Class

- A **functional** strategic class
  - Functional = class name describes its purpose, not asset type
- Risk Mitigation class would be explicitly constructed to be void of static exposures to equity/credit risk (i.e., *Economic Growth Risk*)
- The class's primary goal/function would be to protect the OCERS portfolio during severe equity bear markets (e.g., >15% drawdowns)
- Secondary goal is to produce an uncorrelated positive real return in the long-term
- As a strategic class, it is not reliant upon market timing/tactical decisions to prove fruitful

Risk Mitigation Class – It Is Not an Asset Class

- OCERS (as a plan sponsor) and its Total Portfolio are procyclical with one another
  - During the worst periods (e.g., Great Financial Crisis), both the portfolio and plan sponsor (i.e., tax revenue) suffer
  - During the best periods, both the portfolio and plan sponsor excel

- A Risk Mitigation class seeks to offset some of the challenges
  - Moderate total portfolio drawdown
  - Provide a source of liquidity for rebalancing or benefit payments
  - Improve long-term compound return
    - Due to lower drawdown, less volatility, and rebalancing

- While OCERS is currently net cash-flow positive, the utility of a Risk Mitigation class is increased when net cash-flow negative
  - Being early (and getting comfortable) with the class is judicious

Components & Sizing

- **Risk Mitigation Discussion**

Components/Strategies

- Investment industry is notorious for developing and marketing products that promise "uncorrelated returns"
  - Large portions of these offerings are, in most instances, not suitable for a variety of reasons:
    1. Discretionary (i.e., reliant upon manager skill)
    2. Based on backtests and/or lack economic intuition
    3. Illiquid
    4. Positive correlation with equities during drawdowns
    5. Negative expected long-term return

    See Appendix for more detail

- Strategies that are appropriate for an effective Risk Mitigation class should possess several important features:
  - Positive expected long-term return
  - Negative correlation with equities during drawdowns
    - Supported by history and economic intuition
  - Systematic and/or naïvely implemented
  - Liquid and volatile enough to be impactful (i.e., equity-like volatility)
  - Cost effective (fees)

Components/Strategies

- A wide variety of strategies can be considered for the class
- It is not required that every utilized strategy posses each attribute, but the class as a whole should demonstrate them in aggregate

Strategy*	Positive Expected Return?	Negative Conditional Correlation to Equities?	Systematic / Naïve Implementation?	Liquid & Scalable?	High Volatility?	Cost Effective (fees)?
Cash	✓	✓	✓	✓	☒	✓
Long U.S. Treasury Bonds	✓	✓	✓	✓	✓	✓
CTAs/Systematic Trend Following	✓	✓	✓	✓	✓	✓
Liquid Alternative Risk Premia	✓	varies	✓	✓	varies	✓
Market Neutral Strategies	varies	varies	varies	varies	varies	varies
Gold	☒	varies	✓	✓	varies	✓
Global Macro	varies	varies	varies	varies	varies	varies
Buying Put Options	☒	✓	✓	✓	varies	✓
Dedicated Short Selling	☒	✓	varies	varies	✓	varies
Reinsurance, Royalties, etc.	✓	☒	☒	☒	☒	✓

*Not an exhaustive list | See Appendix for strategy descriptions

Components/Strategies – Initial Class Structure

- For an initial RMS class construct, it is best to focus on two tenets:
  - Simplicity
  - Utilization of current managers (if appropriate)

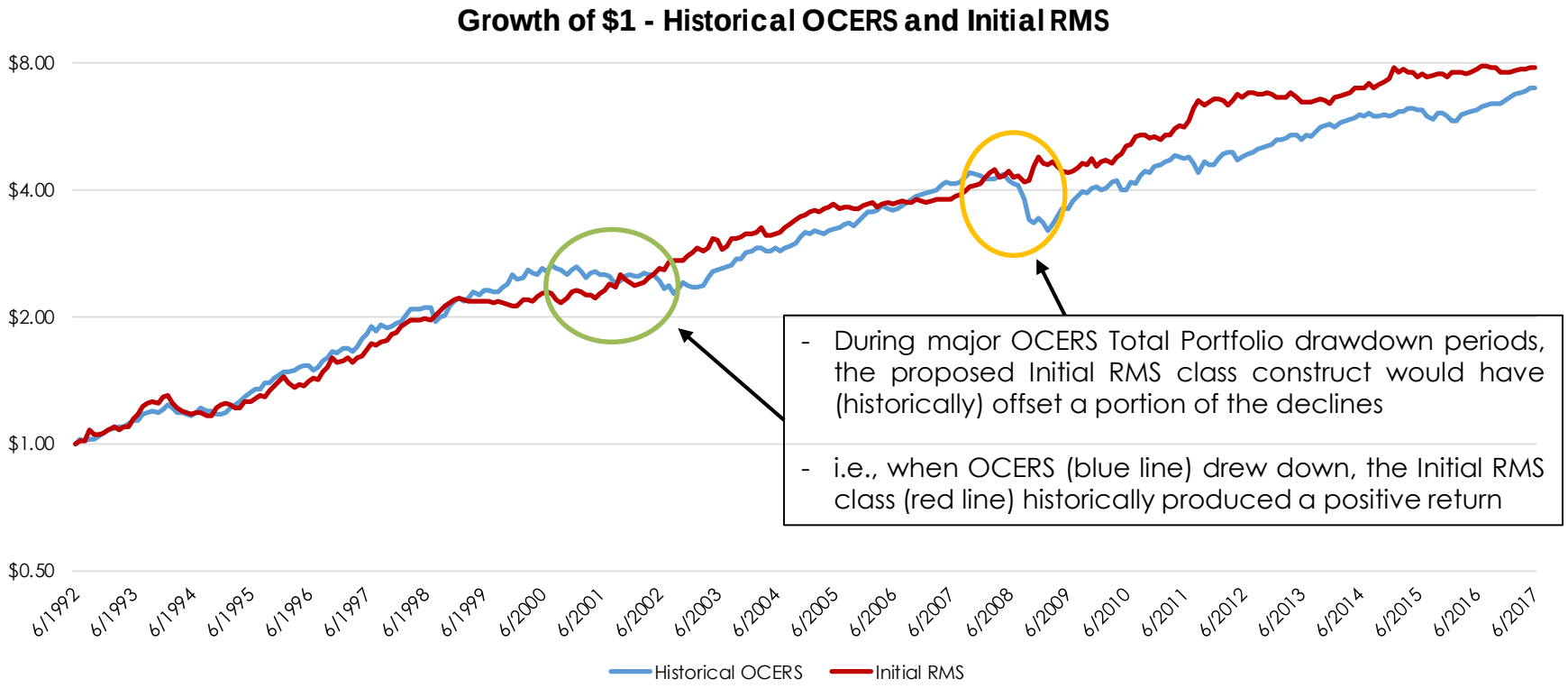
- Transferring the Bridgewater and D.E. Shaw strategies into this class is appropriate

- Adding Long U.S. Treasury Bonds as the second component is recommended by OCERS Staff, PCA, and Meketa

- A 50% Long U.S. Treasury Bonds / 50% Bridgewater & D.E. Shaw structure would likely be an effective first construct (at approved 5% port. weight)

- This structure would be further refined in the future
  - As the Board receives additional strategy education
  - As the RMS class receives a greater weight in the Total Portfolio

Components/Strategies – Initial Class Structure



- During major OCERS Total Portfolio drawdown periods, the proposed Initial RMS class construct would have (historically) offset a portion of the declines
- i.e., when OCERS (blue line) drew down, the Initial RMS class (red line) historically produced a positive return

	Historical OCERS	Initial RMS
25 Year Return	8.1%	8.6%
25 Year Volatility	7.4%	7.1%
Max Drawdown	-27.4%	-10.4%
Return During Tech Bubble Drawdown	-14.6%	19.6%
Return During GFC Drawdown	-27.4%	13.6%

Initial RMS Class = 50% Bloomberg Barclays U.S. Government: Long Index and 50% Bridgewater & D.E. Shaw
Bridgewater & D.E. Shaw weights: 6/1992-2013 = 100% Bridgewater | 2014-6/2017 = 75% Bridgewater & 25% D.E. Shaw (current OCERS weights)
Initial RMS Class history uses Bridgewater Pure Alpha 12% Volatility Composite (net) and actual OCERS D.E. Shaw returns (net)
Past performance of a strategy is not necessarily indicative of future results

Components/Strategies – Initial Class Structure

- The proposed initial RMS class construct has produced a strong long-term return on a historical basis

- This level of return (8%+ annualized) has had two material tailwinds:
  - Bond bull market (i.e., falling interest rates)
  - More inefficient markets for Bridgewater and D.E. Shaw to add value (compared to today)

- On a forward-looking basis, the proposed initial class construct may have a materially lower return (and higher volatility)

- Forward-looking initial RMS class assumptions*:
  - 10-year compound return = 4.5%
  - Annual volatility = 9.2%

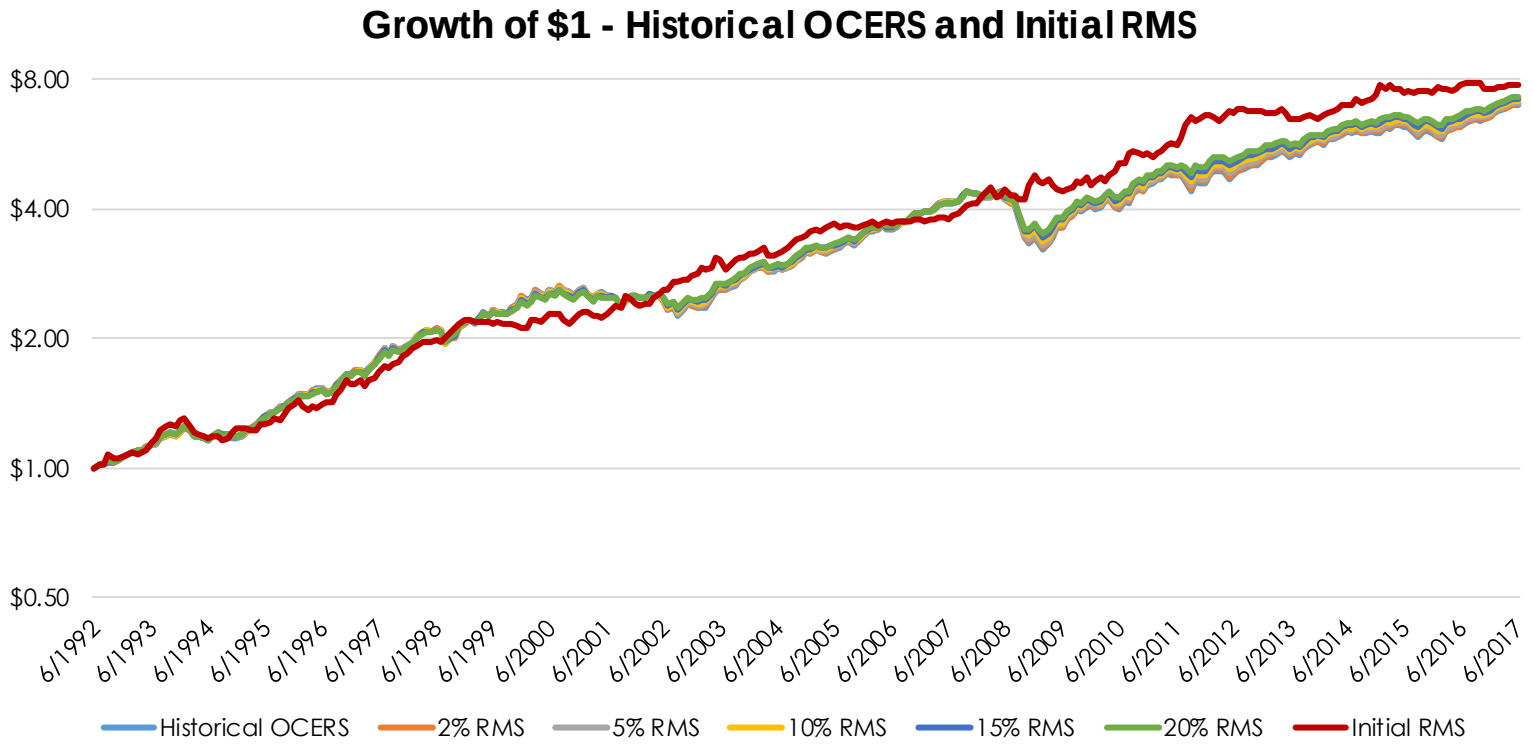
*Based on the following mean-variance assumptions:
- Bridgewater Pure Alpha = 5.0% compound return and 12.0% annual volatility
- D.E. Shaw = 4.25% compound return and 7% annual volatility
- Long U.S. Treasury Bonds = 3.25% compound return and 16.0% annual volatility
- 0 correlation across all three strategies

To be Effective, Two Conditions Need to be Met

- Size
  - Regardless of class structure, the potential benefits are limited by the size of the allocation to the class
- Volatility
  - Regardless of how much capital is allocated to the class, it won't provide any assistance if it is not volatile enough
- Decisions pertaining to size (i.e., amount of capital) and volatility are required in order for the class to matter at the Total Portfolio level
- At a 5% allocation, the benefits will be marginal at best
- In future strategic allocation reviews, OCERS may want to explore increasing the allocation

Class Sizing

- The graphics below detail the historical performance of OCERS, the proposed initial RMS class, and OCERS with various sizes of this RMS class



	Historical OCERS	With 2% RMS	With 5% RMS	With 10% RMS	With 15% RMS	With 20% RMS	Initial RMS
25 Year Return	8.1%	8.1%	8.1%	8.2%	8.2%	8.3%	8.6%
25 Year Volatility	7.4%	7.3%	7.1%	6.8%	6.5%	6.2%	7.1%
Max Drawdown	-27.4%	-26.7%	-25.6%	-23.9%	-22.1%	-20.6%	-10.4%

Initial RMS Class = 50% Bloomberg Barclays U.S. Government: Long Index and 50% Bridgewater & D.E. Shaw
Bridgewater & D.E. Shaw weights: 6/1992-2013 = 100% Bridgewater | 2014-6/2017 = 75% Bridgewater & 25% D.E. Shaw (current OCERS weights)
Initial RMS Class history uses Bridgewater Pure Alpha 12% Volatility Composite (net) and actual OCERS D.E. Shaw returns (net)
Past performance of a strategy is not necessarily indicative of future results

Managing Expectations

- **Risk Mitigation Discussion**

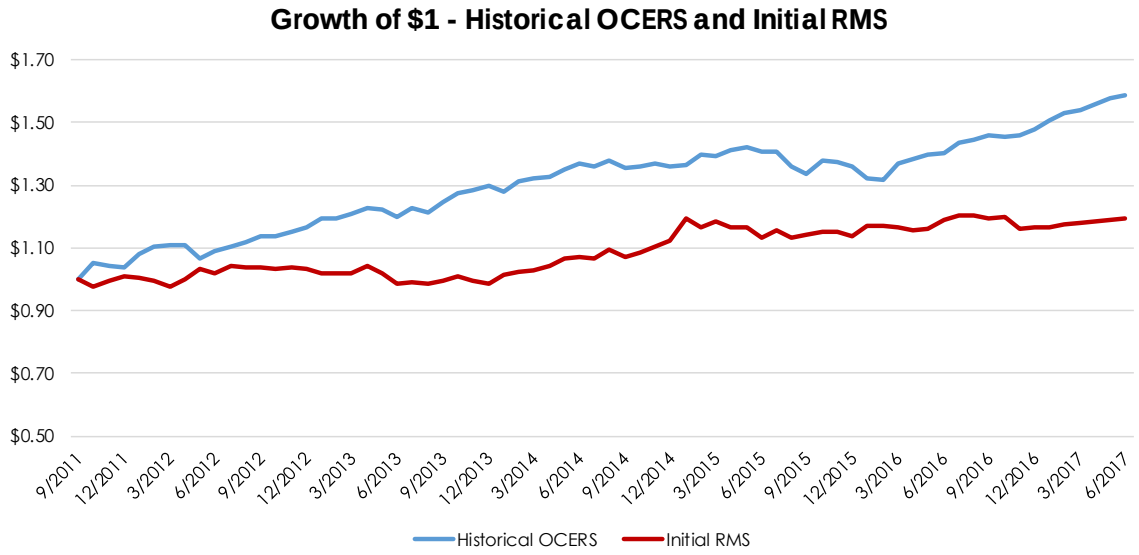
Managing Expectations

- With the exception of cash, all investment strategies have risks
- If well designed and implemented, the risks of the Risk Mitigation class should be different than *Economic Growth Risk*
  - *Interest Rate Risk* will likely be a meaningful risk
- In order to be reactive and impactful, the class must be fairly volatile by design (>10% volatility)
  - As such, material negative returns (>15% drawdowns) are possible
  - This is not an absolute return class
- The Risk Mitigation class is not an insurance policy
  - While designed to have insurance-like attributes, it is also designed to have a positive expected return (not a negative expected return)
- The class is meant to protect in large, sustained bear markets not minor drawdowns

Managing Expectations

- During strong growth-oriented markets, the RMS class is expected to lag the rest of the OCERS Total Portfolio

- Incorporating an RMS class is expected to moderate both the right and left tails of the OCERS Total Portfolio return distribution
  - Modestly lag peers during strong risk-on markets
  - Modestly outperform peers during material market drawdowns



Example:

- Since the last material market drawdown (≈3Q 2011), the OCERS Total Portfolio has produced an 8.3% annualized return

- The proposed initial RMS construct produced a 3.1% annualized return during that same timeframe

Initial RMS Class = 50% Bloomberg Barclays U.S. Government: Long Index and 50% Bridgewater & D.E. Shaw
Bridgewater & D.E. Shaw weights: 9/2011-2013 = 100% Bridgewater | 2014-6/2017 = 75% Bridgewater & 25% D.E. Shaw (current OCERS weights)
Initial RMS Class history uses Bridgewater Pure Alpha 12% Volatility Composite (net) and actual OCERS D.E. Shaw returns (net)
Past performance of a strategy is not necessarily indicative of future results

Managing Expectations

- Several potential components/strategies are not easily benchmarked
  - In turn, the aggregate class does not have a perfect benchmark
- Moreover, the benchmark mismatch is further compounded when comparing short-term results
- The class should be constructed to be "as simple as possible but as complex as necessary"
- Board will have oversight; staff/consultants will manage the day-to-day
- Aggregate class review/judgement should be focused on the long-term and behavior during equity bear market situations

Appendix

- **Risk Mitigation Discussion**

Appendix: Potential RMS Strategy Descriptions

Cash

- Investments in short-term securities/accounts that can quickly be used, redeemed, or converted for transactional purposes
  - Generally viewed as risk-free (with the exception of foreign exchange risk)

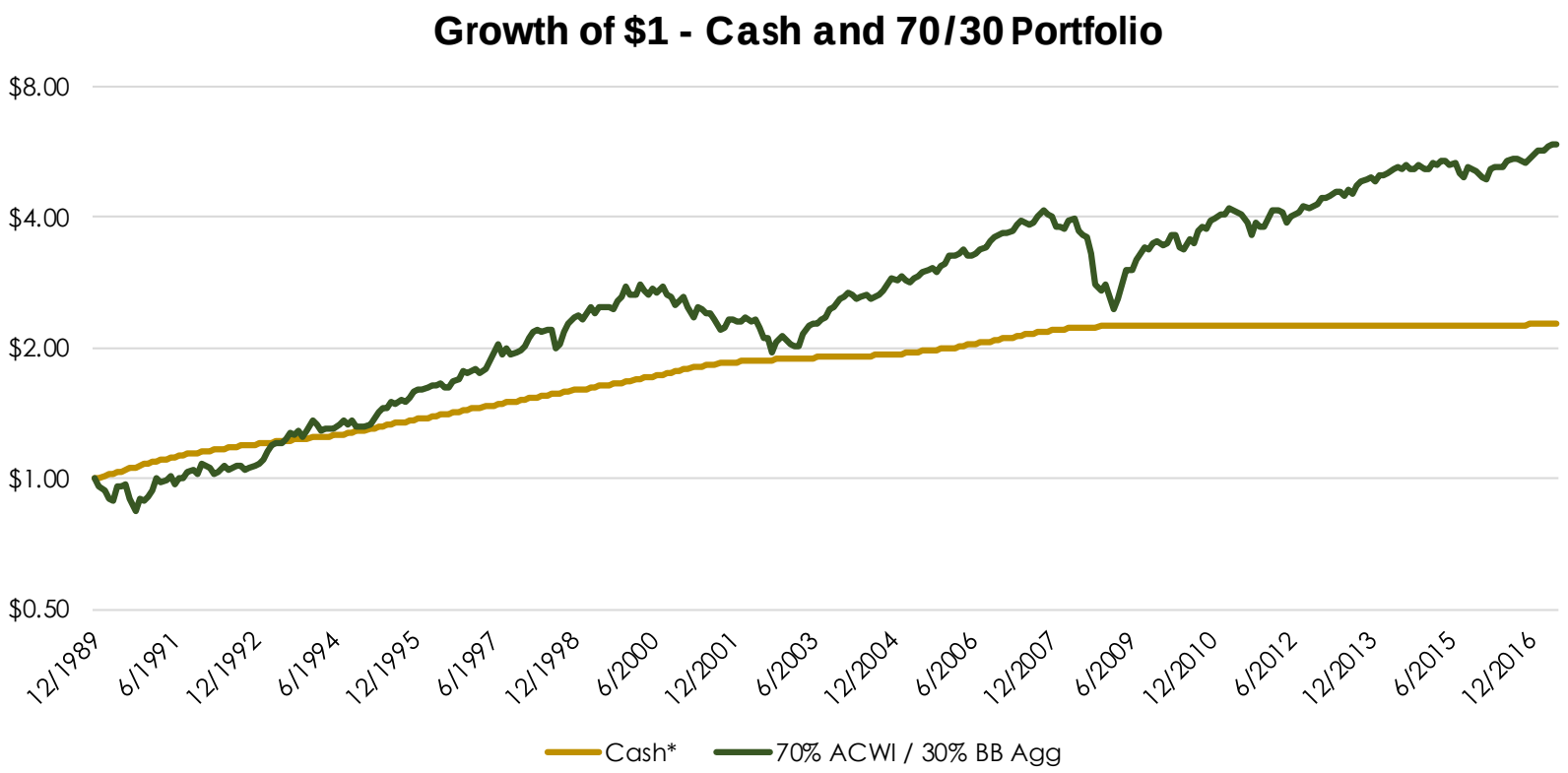
- Typically represented by 3-month U.S. Treasury Bills

- *RMS-related Pros*:
  - By definition, cash is liquid
  - Negative returns are extremely rare
  - Near zero management costs

- *RMS-related Cons*:
  - De minimis volatility; not reactive enough to offset portfolio declines
  - Zero-to-negative expected real returns

Appendix: Potential RMS Strategy Descriptions

Cash



	Cash*	70% ACWI / 30% BB Agg
Historical Return (1/1990 - 6/2017)	3.0%	6.7%
Historical Volatility (1/1990 - 6/2017)	0.7%	10.7%
Max Drawdown	0.0%	-41.1%
Return During Tech Bubble Drawdown	8.1%	-28.9%
Return During GFC Drawdown	2.8%	-41.1%

*Merrill Lynch 3-month T-Bill Index

Appendix: Potential RMS Strategy Descriptions

Long U.S. Treasury Bonds

- Investments in long-term (20+ year) U.S. Treasury Bonds
- While void of *Economic Growth* Risk, long-term U.S. Treasury Bonds have material *Interest Rate Risk*
  - Current benchmark/index duration ≈ 17-18 years
- Commonly represented by:
  - Bloomberg Barclays U.S. Government: Long Index
  - Bloomberg Barclays U.S Treasury: Long Index
- Despite material *Interest Rate Risk*, long-term U.S Treasury Bonds are not as directly impacted by monetary policy as short & intermediate bonds
  - Long end of yield curve is primarily driven by economic growth and inflation
    - Economic growth and inflation are direct inputs to monetary policy, however

Appendix: Potential RMS Strategy Descriptions

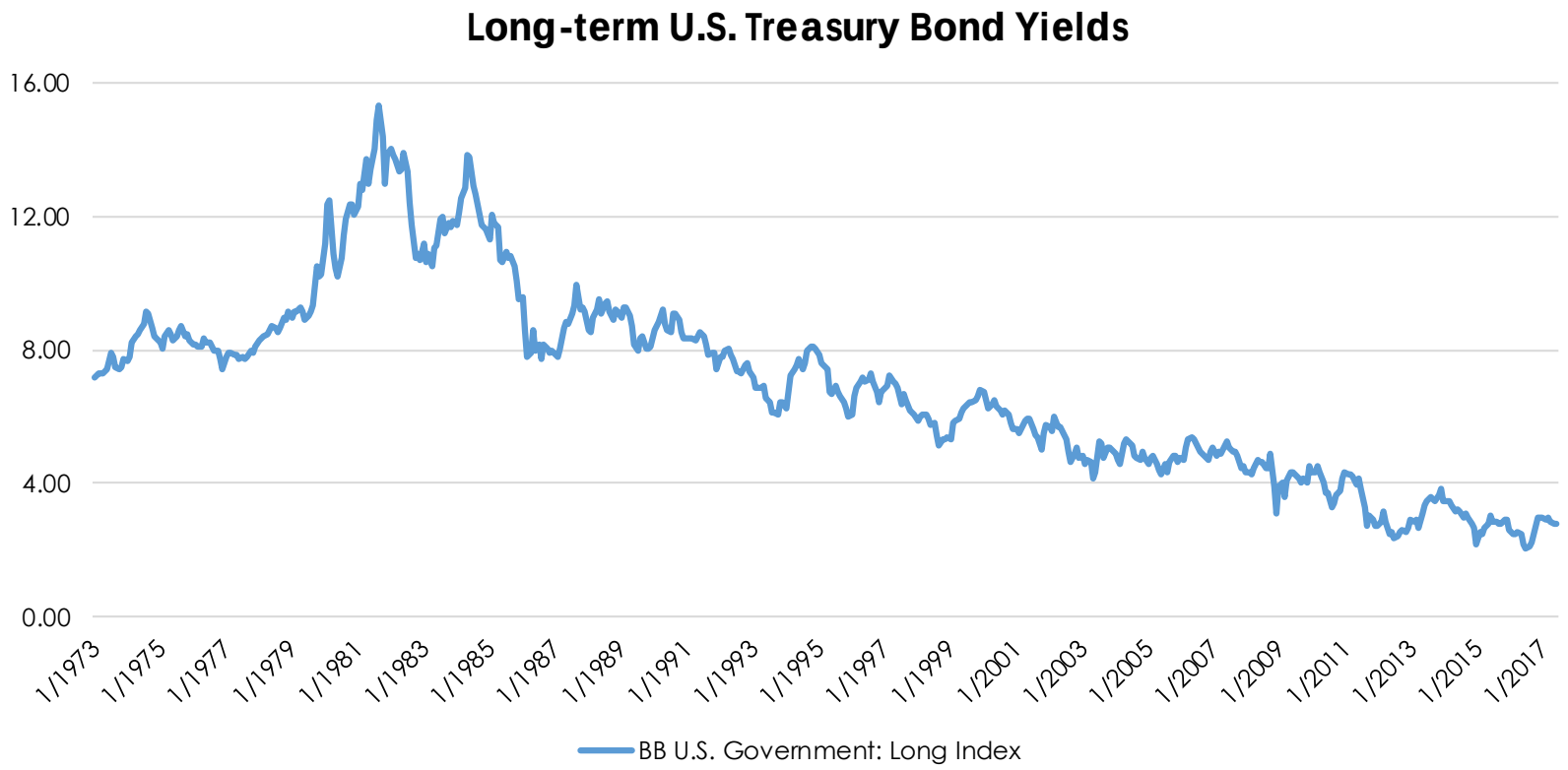
Long U.S. Treasury Bonds

- *RMS-related Pros*:
  - Extremely liquid (especially during crisis situations)
  - Scalable; no foreseeable capacity limitations
  - Strong reactive movements during crisis situations (i.e., volatile)
    - Can be seen as the "first responder" during crisis situations
  - Positive expected long-term real returns
  - Near zero management costs

- *RMS-related Cons*:
  - Unlikely to protect during market drawdowns that coincide with high inflation
    - e.g., stagflation (high unemployment and high inflation)

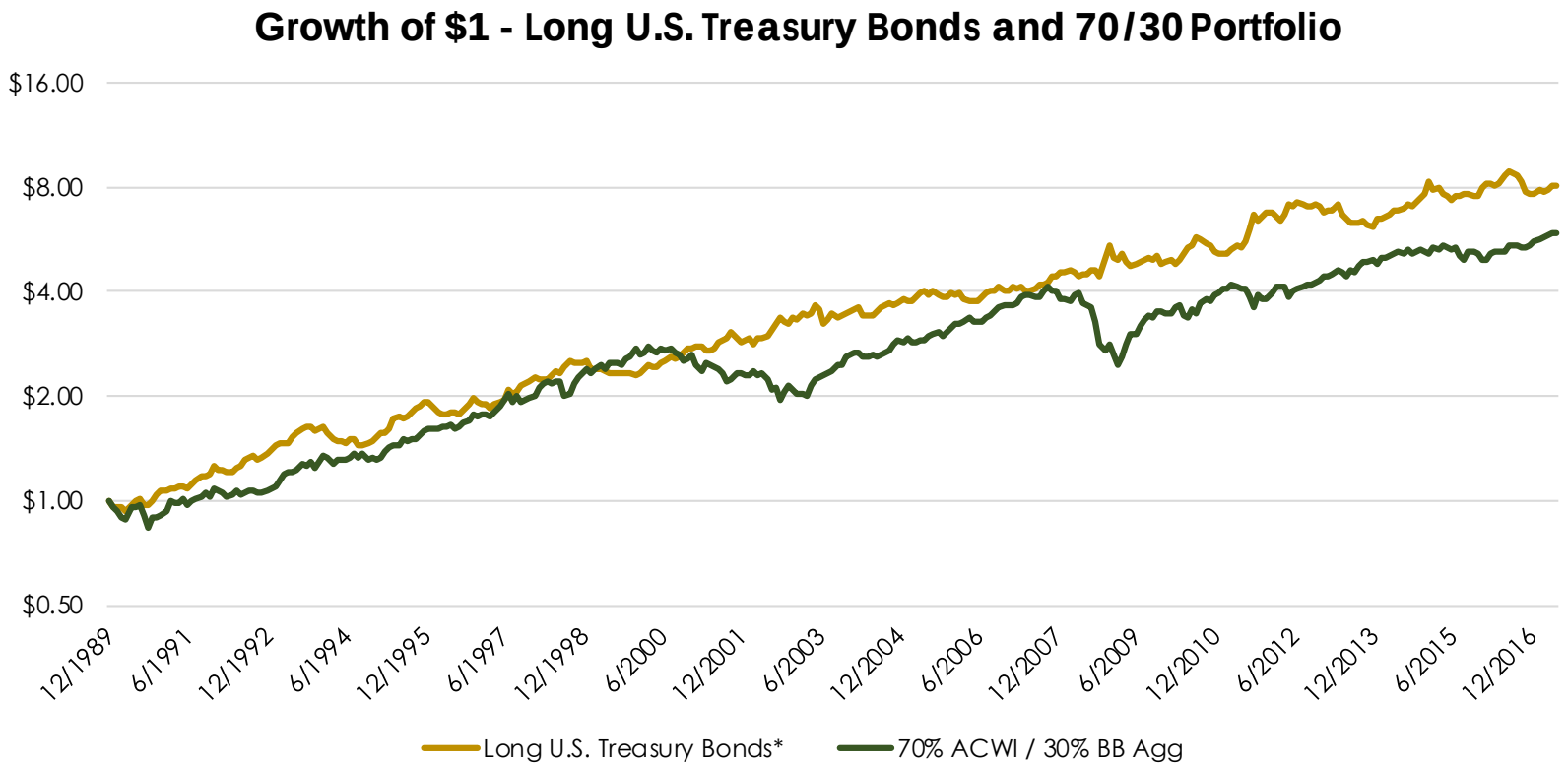
Appendix: Potential RMS Strategy Descriptions

Long U.S. Treasury Bonds



Appendix: Potential RMS Strategy Descriptions

Long U.S. Treasury Bonds



	Long U.S. Treasury Bonds*	70% ACWI / 30% BB Agg
Historical Return (1/1990 - 6/2017)	7.9%	6.7%
Historical Volatility (1/1990 - 6/2017)	9.7%	10.7%
Max Drawdown	-15.5%	-41.1%
Return During Tech Bubble Drawdown	29.6%	-28.9%
Return During GFC Drawdown	16.0%	-41.1%

*BB U.S. Government: Long Index

Appendix: Potential RMS Strategy Descriptions

CTAs/Systematic Trend Following

- Fairly synonymous terms:
  - Commodity Trading Advisors (CTAs)
  - Trend Following
  - Managed Futures

- Strategies that follow pre-defined rules (i.e., systematic implementation) for trading (long and short) liquid futures and forwards contracts

- Trade futures/forwards across global equity indices, interest rates/bonds, currencies, and commodities

- Simplistic explanation: strategies that buy an asset when it has a positive return over recent history and sell an asset when it has a negative return over recent history

- Both manager-composite and rules-based indices/benchmarks

Appendix: Potential RMS Strategy Descriptions

CTAs/Systematic Trend Following

- *Momentum* and *Trend Following* are somewhat interchangeable terms
- That which has done well recently will continue to do well
- That which has done poorly recently will continue to do poorly
- Buy what is going up; sell what is going down
  - Ex: if S&P 500 has a positive 1-year return, buy/go long
  - Ex: if oil has a negative 1-year return, sell/short
- This results in a volatile yet low correlation return vs. risky assets (e.g., equities) over a full market cycle
  - Often a positive correlation during bull markets and a negative correlation during bear markets

Appendix: Potential RMS Strategy Descriptions

CTAs/Systematic Trend Following

- Long and short positions; can be entirely net long or net short at any time

- Investable universe includes all liquid investments across the globe:
  - Equities = typically broad indices such as S&P 500, Nikkei 225, etc.
  - Fixed Income = typically sovereign bonds/rates such as U.S. 10-year Treasury
  - Currencies = typically major currencies such as JPY, GBP, EUR, AUD, CAD, CHF
  - Commodities = typically energy, metals, and agriculture components

- Strategy volatilities range from roughly 8%-20% (equity ≈ 18%-20%)

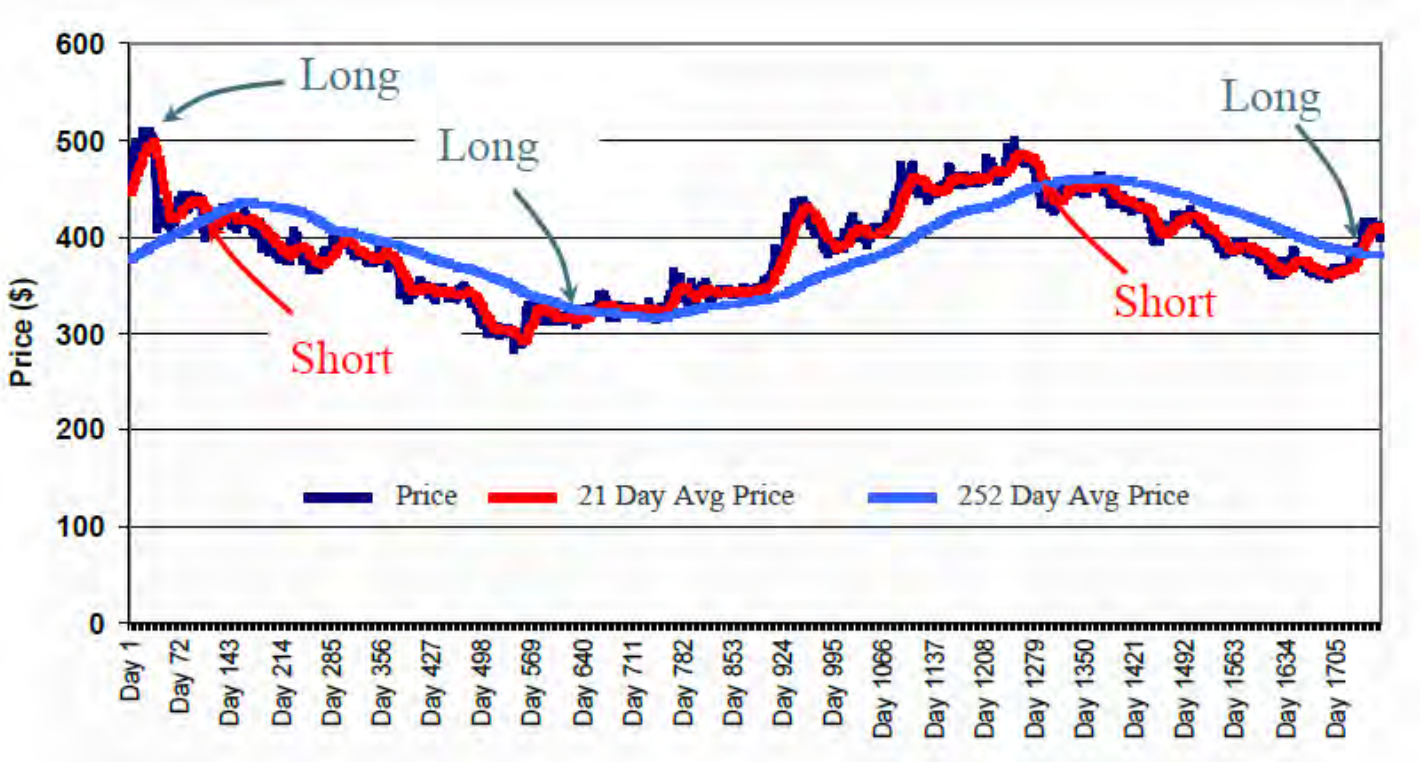
- Trend Following strategies have been utilized for decades

- Historically a 2%/20% hedge fund strategy
  - What was once thought to be "alpha" can now be obtained as "beta"

Appendix: Potential RMS Strategy Descriptions

CTAs/Systematic Trend Following

- Single Asset Example:
  - 21 day average price > 252 day average price = long position
  - 21 day average price < 252 day average price = short position



Appendix: Potential RMS Strategy Descriptions

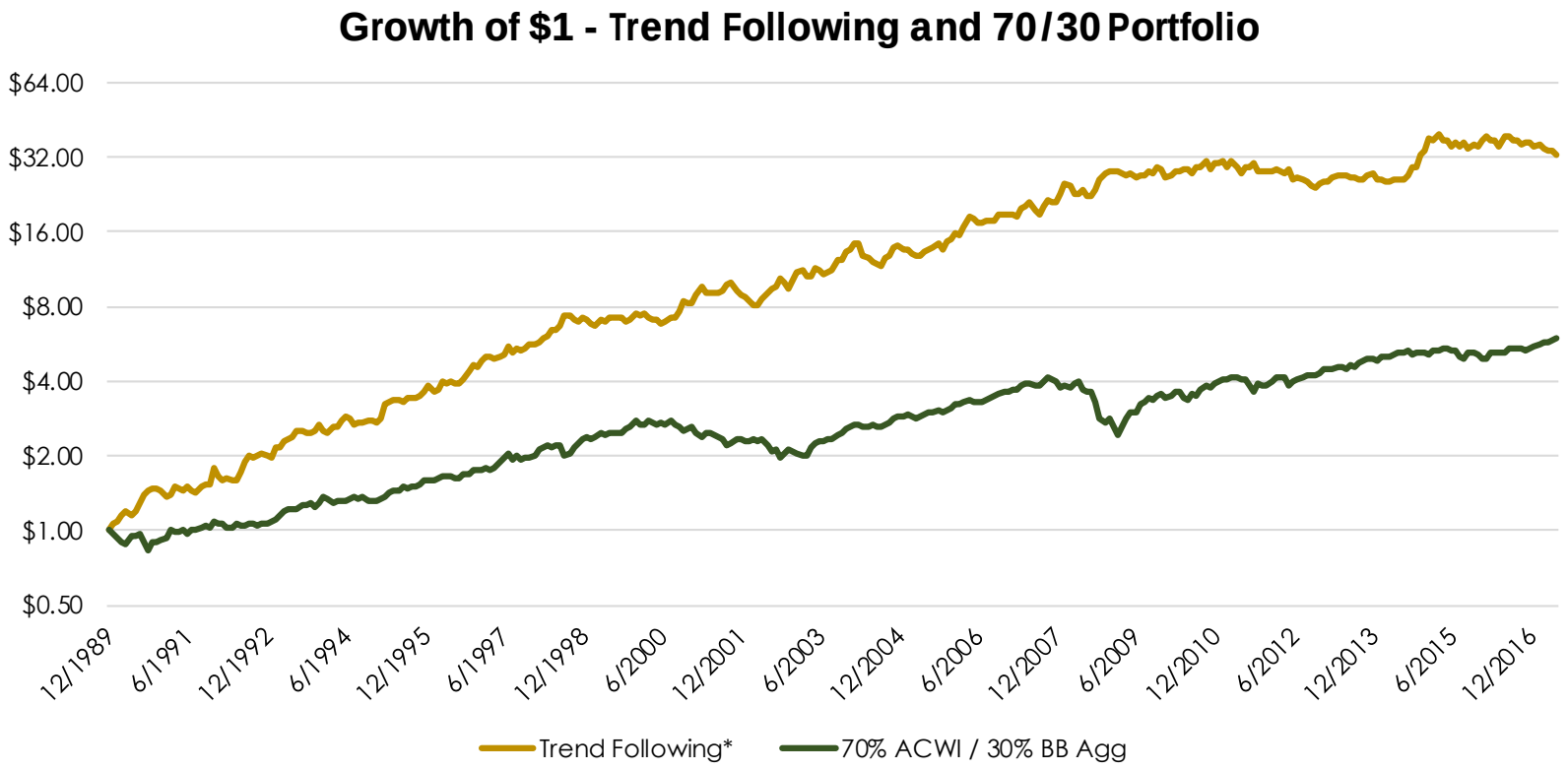
CTAs/Systematic Trend Following

- *RMS-related Pros*:
  - Liquid
  - Scalable; no foreseeable capacity limitations
  - Historically, material reactive movements during crisis situations (i.e., volatile)
    - Typically reacts to crisis situations with a lag (i.e., requires time to adjust)
  - Positive expected long-term real returns
  - Fairly low management costs (≈20-100 bps)

- *RMS-related Cons*:
  - Economic theory for why these strategies work is not settled
  - Can be positioned for "risk-on" at the onset of market declines

Appendix: Potential RMS Strategy Descriptions

CTAs/Systematic Trend Following



	Trend Following*	70% ACWI / 30% BB Agg
Historical Return (1/1990 - 6/2017)	13.6%	6.7%
Historical Volatility (1/1990 - 6/2017)	14.7%	10.7%
Max Drawdown	-21.7%	-41.1%
Return During Tech Bubble Drawdown	43.0%	-28.9%
Return During GFC Drawdown	31.4%	-41.1%

*Hybrid Track Record
1990-1997 = HFN CTA/Managed Futures Index
1998-6/2017 = Credit Suisse 15% Volatility Managed Futures Index

Appendix: Potential RMS Strategy Descriptions

Liquid Alternative Risk Premia

- Strategies that harvest alternative risk premia
  - Alternative = different than equity, credit, and interest rate risk premia
- Risk premium = a positive payment for being exposed to a risk
- Implemented in a long/short (i.e., market neutral) fashion
- Alternative Risk Premia Examples:
  - Value => Long "cheap" assets and short "expensive" assets
  - Carry => Long high-yielding assets and short low-yielding assets
  - Momentum => Long recent "winners" and short recent "losers"
  - Defensive => Long lower risk assets and short higher risk assets

Appendix: Potential RMS Strategy Descriptions

Liquid Alternative Risk Premia

- These strategies are focused more on "beta" than "alpha"
  - i.e., gaining returns from strategic risk exposures as opposed to skill
- Managers in the space are generally quantitative firms with long histories in factor investing and/or long/short strategies
- Currently, there are not any transparent/relevant indices that could be considered passive/replication approaches
- These factors/risk premiums can exist due to behavioral anomalies (i.e., mispricing) or actual risks
  - Behavioral anomalies/mispricings may eventually be corrected
  - Risk premiums are more likely to be sustainable in the future

Appendix: Potential RMS Strategy Descriptions

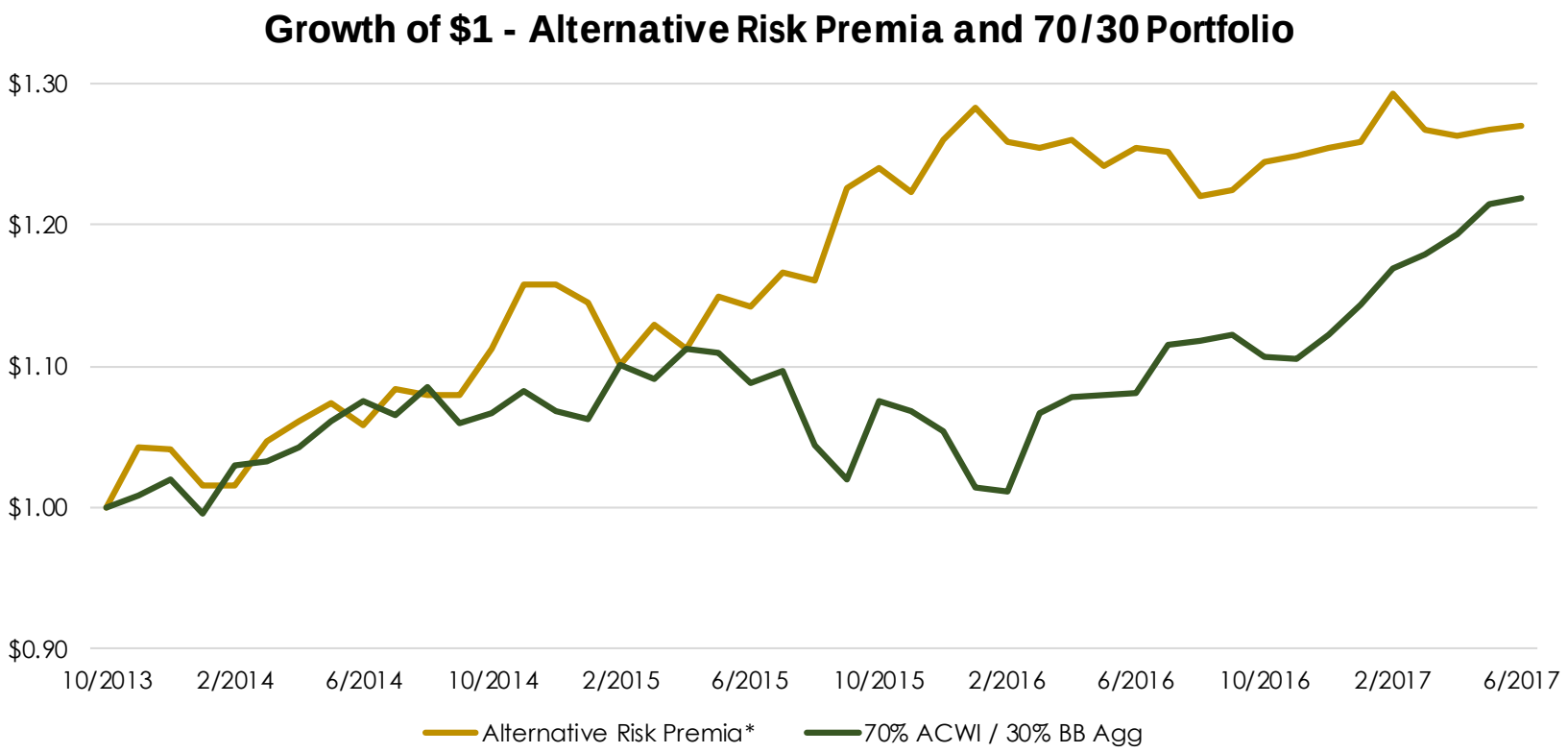
Liquid Alternative Risk Premia

- *RMS-related Pros*:
  - Generally liquid (more dependent upon vehicle structure than anything else)
  - Scalable to a certain degree
  - Positive expected long-term real returns
  - Unrelated to long-only equity and credit
  - Reasonable management costs (≈100 bps)

- *RMS-related Cons*:
  - Volatility levels can vary depending on implementation approach
  - Behavior during crisis situations is unpredictable (i.e., truly uncorrelated)
  - Economic theory behind most alternative risk premiums is not settled
    - Despite decades of academic research
  - "Live" implementations have short histories

Appendix: Potential RMS Strategy Descriptions

Liquid Alternative Risk Premia



	Alternative Risk Premia*	70% ACWI / 30% BB Agg
Historical Return (11/2013 - 6/2017)	6.7%	5.5%
Historical Volatility (11/2013 - 6/2017)	7.0%	7.3%
Max Drawdown	-5.0%	-9.1%

*AQR Style Premia Mutual Fund (I shares)

Appendix: Potential RMS Strategy Descriptions

Market Neutral Strategies

- Broad basket of strategies that harvest relative returns in a market neutral construct
  - Relative return = return difference from being long one asset and short an equivalent amount in another asset
- Can be focused on "beta" or "alpha" as sources of return
- Wide range of:
  - Liquidity
  - Markets traded
  - Volatility
  - Management fees
- A traditional hedge fund strategy (both systematic and discretionary)

Appendix: Potential RMS Strategy Descriptions

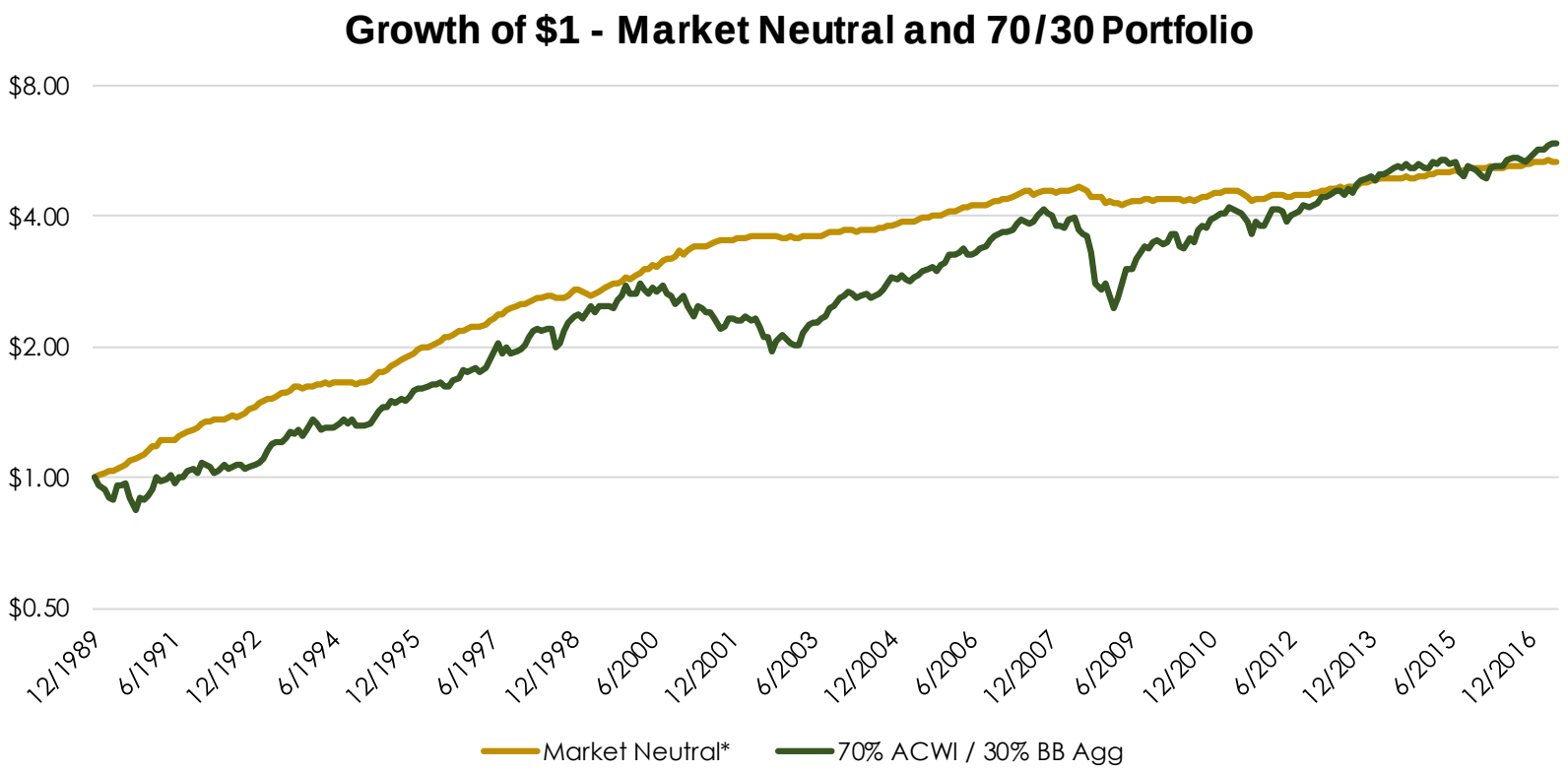
Market Neutral Strategies

- *RMS-related Pros*:
  - Potentially liquid
  - Potentially scalable
  - Unrelated to long-only equity and credit

- *RMS-related Cons*:
  - Volatility levels can vary depending on implementation approach
  - Behavior during crisis situations is unpredictable (i.e., truly uncorrelated)
  - Management costs can vary immensely
  - Expected returns can vary depending on the strategy/approach
  - Majority of approaches are niche-oriented; requires numerous managers

Appendix: Potential RMS Strategy Descriptions

Market Neutral Strategies



	Market Neutral*	70% ACWI / 30% BB Agg
Historical Return (1/1990 - 6/2017)	6.3%	6.7%
Historical Volatility (1/1990 - 6/2017)	3.1%	10.7%
Max Drawdown	-9.2%	-41.1%
Return During Tech Bubble Drawdown	13.8%	-28.9%
Return During GFC Drawdown	-6.5%	-41.1%

*HFRI Equity Market Neutral Index

Appendix: Potential RMS Strategy Descriptions

Gold

- Investments in the precious metal commodity
- Due to inherent difficulties in holding (i.e., storing) gold, implementation most commonly occurs through futures markets
- Gold is often thought of as a safe haven asset
- There is no inherent cash flow or return to strategically holding gold

Appendix: Potential RMS Strategy Descriptions

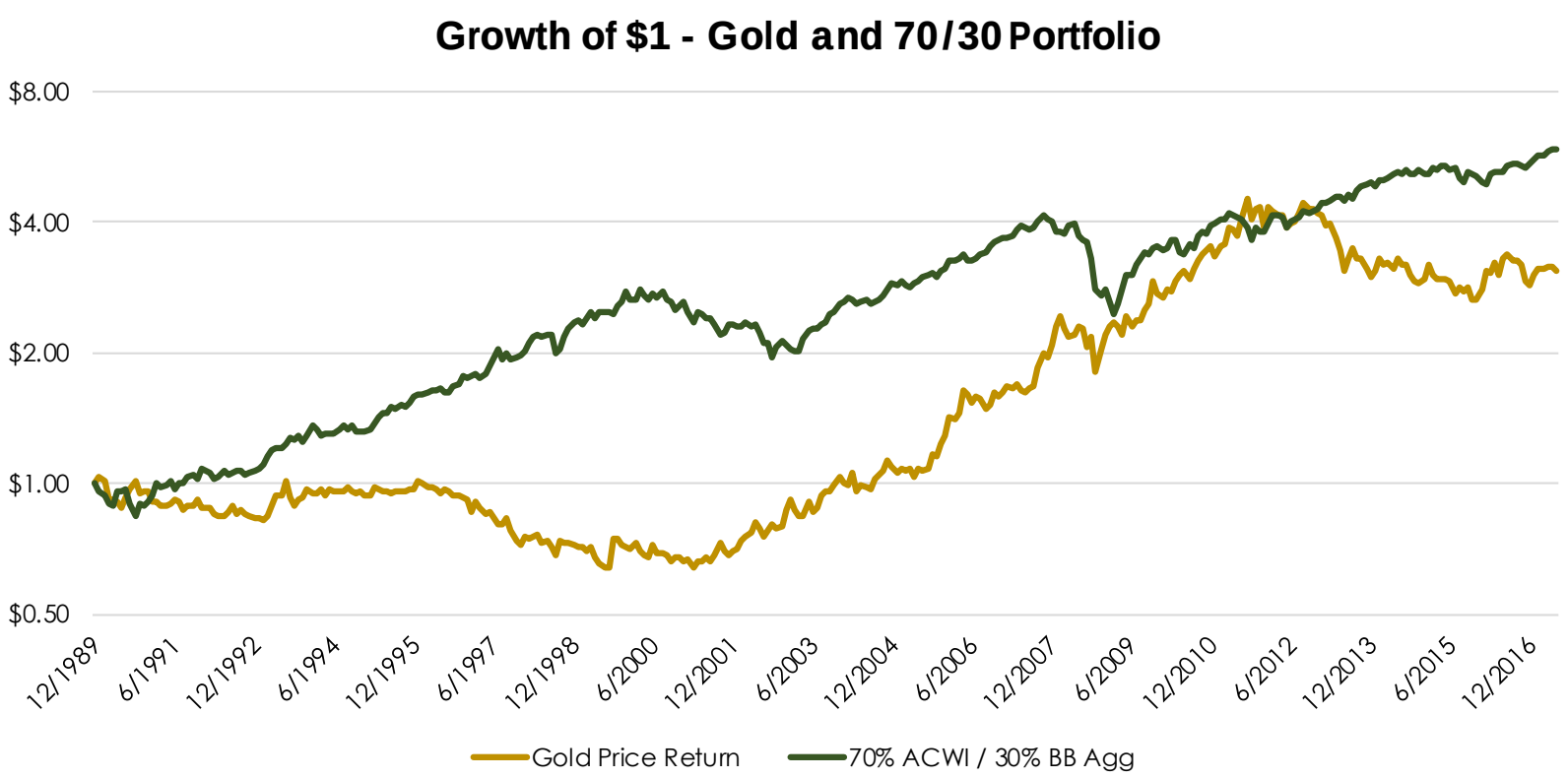
Gold

- *RMS-related Pros*:
  - Liquid
  - Scalable
  - Unrelated to long-only equity and credit
  - Near zero management costs

- *RMS-related Cons*:
  - Zero expected long-term real return
  - Behavior during crisis situations is unpredictable
  - Subject to futures market structural forces (e.g., roll yield)

Appendix: Potential RMS Strategy Descriptions

Gold



	Gold Price Return	70% ACWI / 30% BB Agg
Historical Return (1/1990 - 6/2017)	4.2%	6.7%
Historical Volatility (1/1990 - 6/2017)	15.6%	10.7%
Max Drawdown	-41.9%	-41.1%
Return During Tech Bubble Drawdown	16.4%	-28.9%
Return During GFC Drawdown	18.3%	-41.1%

Appendix: Potential RMS Strategy Descriptions

Global Macro

- Broad, unconstrained strategies that seek to predict major market moves
- Typically focused on macroeconomic events and broad asset classes
  - Depending on the manager, may also have more micro-oriented strategies (e.g., relative value/market neutral trades)
- Similar to Global Tactical Asset Allocation (GTAA) strategies but with increased flexibility, latitude, and leverage
- Can be entirely net long or net short at any given time
- Systematic and discretionary approaches
- Bridgewater Pure Alpha can be viewed as a Global Macro strategy

Appendix: Potential RMS Strategy Descriptions

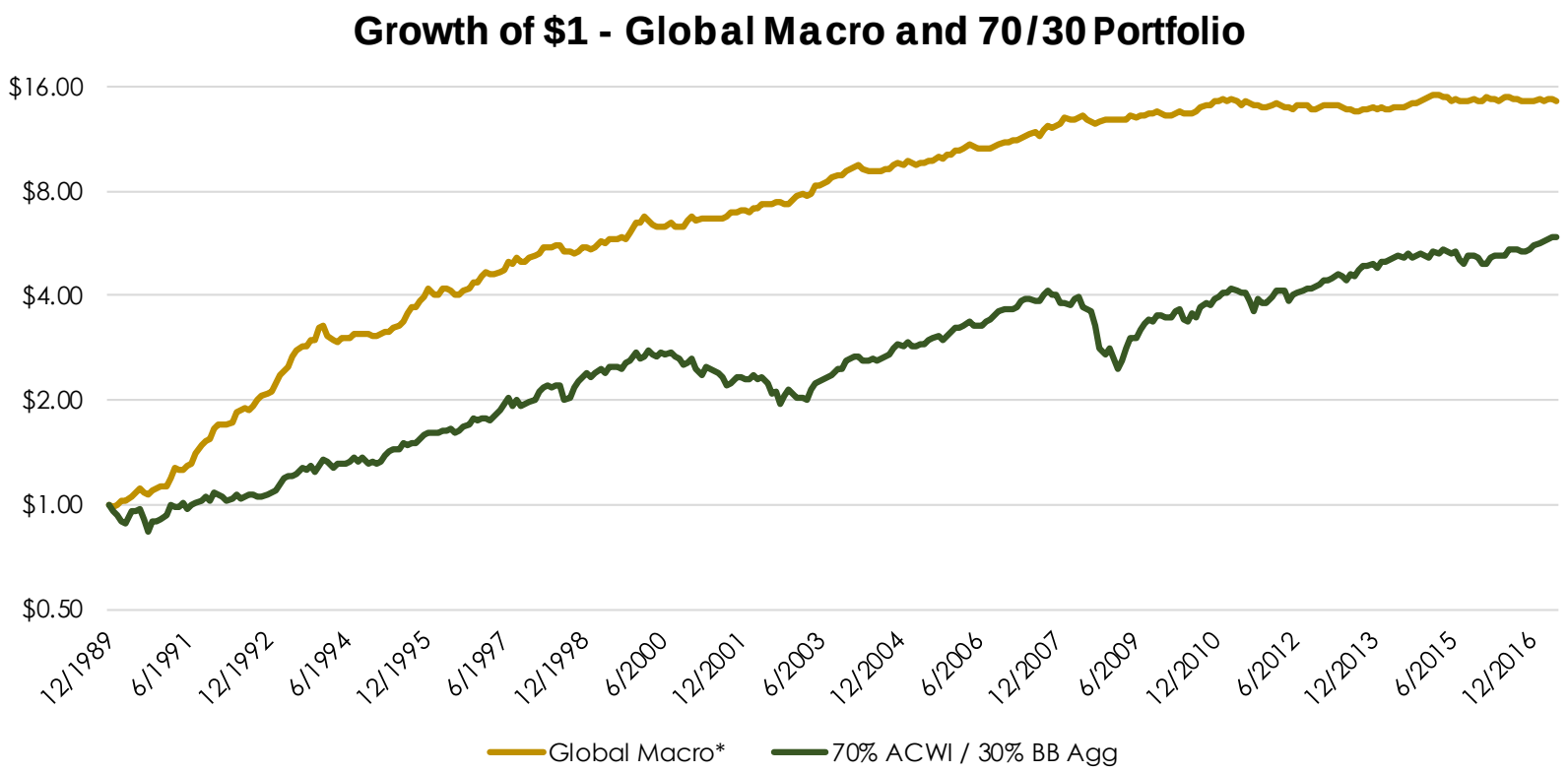
Global Macro

- *RMS-related Pros*:
  - Typically liquid (but dependent on vehicle structure)
  - Potentially scalable
  - Commonly unrelated to long-only equity and credit

- *RMS-related Cons*:
  - Expected returns can vary and are often dependent upon manager skill
  - Volatility levels can vary depending on implementation approach
  - Economic intuition behind the efficacy of these strategies is not settled
  - Behavior during crisis situations is unpredictable
  - Typically high management fees (100-200 bps plus a performance fee)

Appendix: Potential RMS Strategy Descriptions

Global Macro



	Global Macro*	70% ACWI / 30% BB Agg
Historical Return (1/1990 - 6/2017)	10.2%	6.7%
Historical Volatility (1/1990 - 6/2017)	7.2%	10.7%
Max Drawdown	-10.7%	-41.1%
Return During Tech Bubble Drawdown	15.5%	-28.9%
Return During GFC Drawdown	4.7%	-41.1%

*HFRI Macro Index

Appendix: Potential RMS Strategy Descriptions

Buying Put Options

- The most direct form of equity drawdown insurance
- Equity put options give the buyer the right to sell a specified amount of equity at a given price within a certain time frame
  - The strike price (i.e., agreed sales price) and time frame both directly influence the cost of the put option
- Extremely expensive to buy on a strategic basis
  - Negative expected nominal returns
- Given well-known difficulties in market timing, buying put options is inappropriate in all but the most dislocated market environments

Appendix: Potential RMS Strategy Descriptions

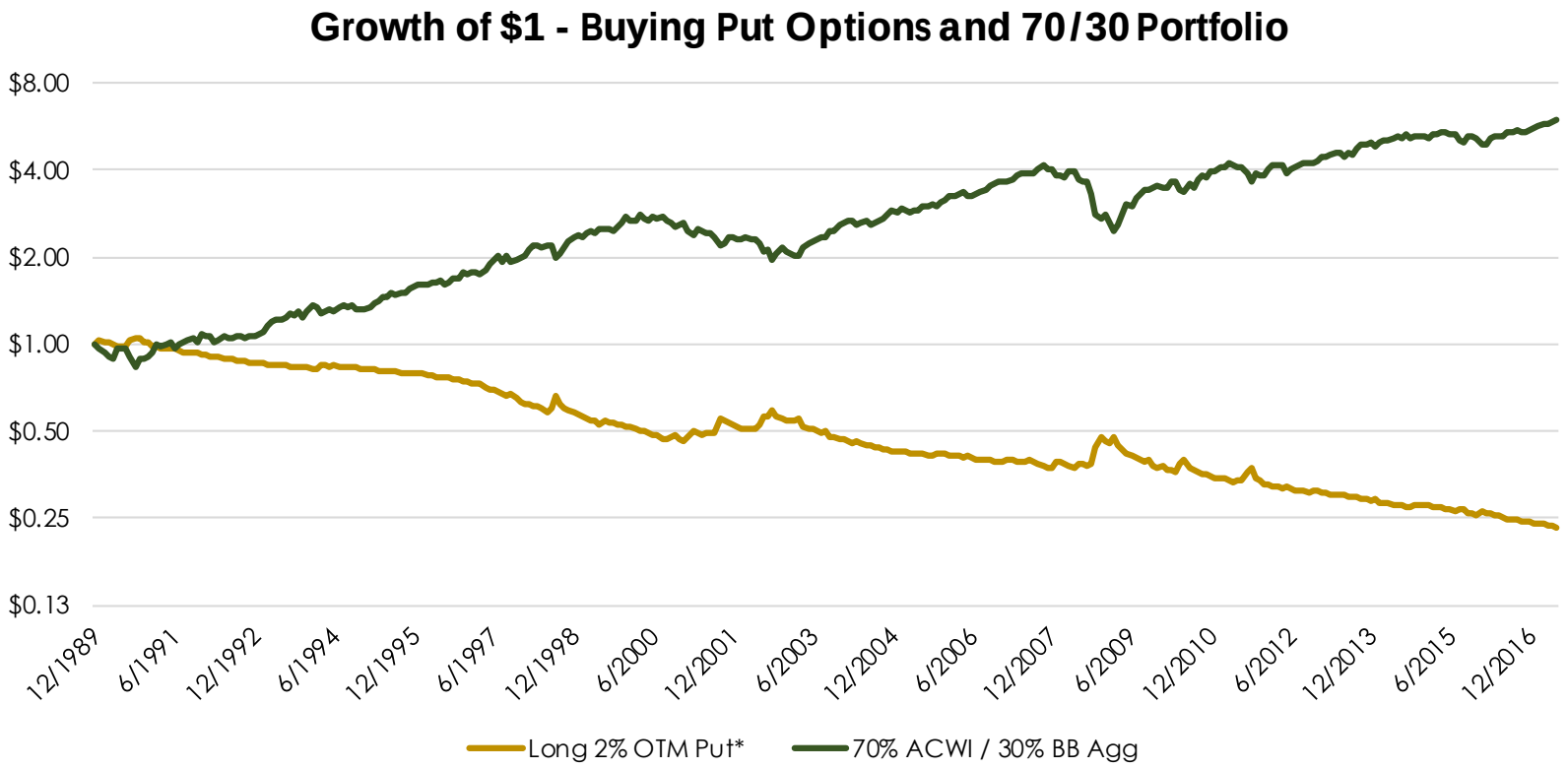
Buying Put Options

- *RMS-related Pros*:
  - Perfectly negatively correlated to equities
  - Liquid
  - Scalable
  - Potentially impactful (i.e., volatile)
  - Near zero management costs

- *RMS-related Cons*:
  - Negative expected nominal returns
    - Material portfolio drag during most environments

Appendix: Potential RMS Strategy Descriptions

Buying Put Options



	Long 2% OTM Put*	70% ACWI / 30% BB Agg
Historical Return (1/1990 - 6/2017)	-5.2%	6.7%
Historical Volatility (1/1990 - 6/2017)	7.3%	10.7%
Max Drawdown	-77.8%	-41.1%
Return During Tech Bubble Drawdown	26.4%	-28.9%
Return During GFC Drawdown	26.0%	-41.1%

*Hypothetical historical example produced by Neuberger Berman

Includes cash collateral yield and costs/payoffs of 1-month, 2% OTM S&P 500 put option purchases

Appendix: Potential RMS Strategy Descriptions

Dedicated Short Selling

- Strategies that continually sell assets (most commonly equities) short under the belief that they are overpriced

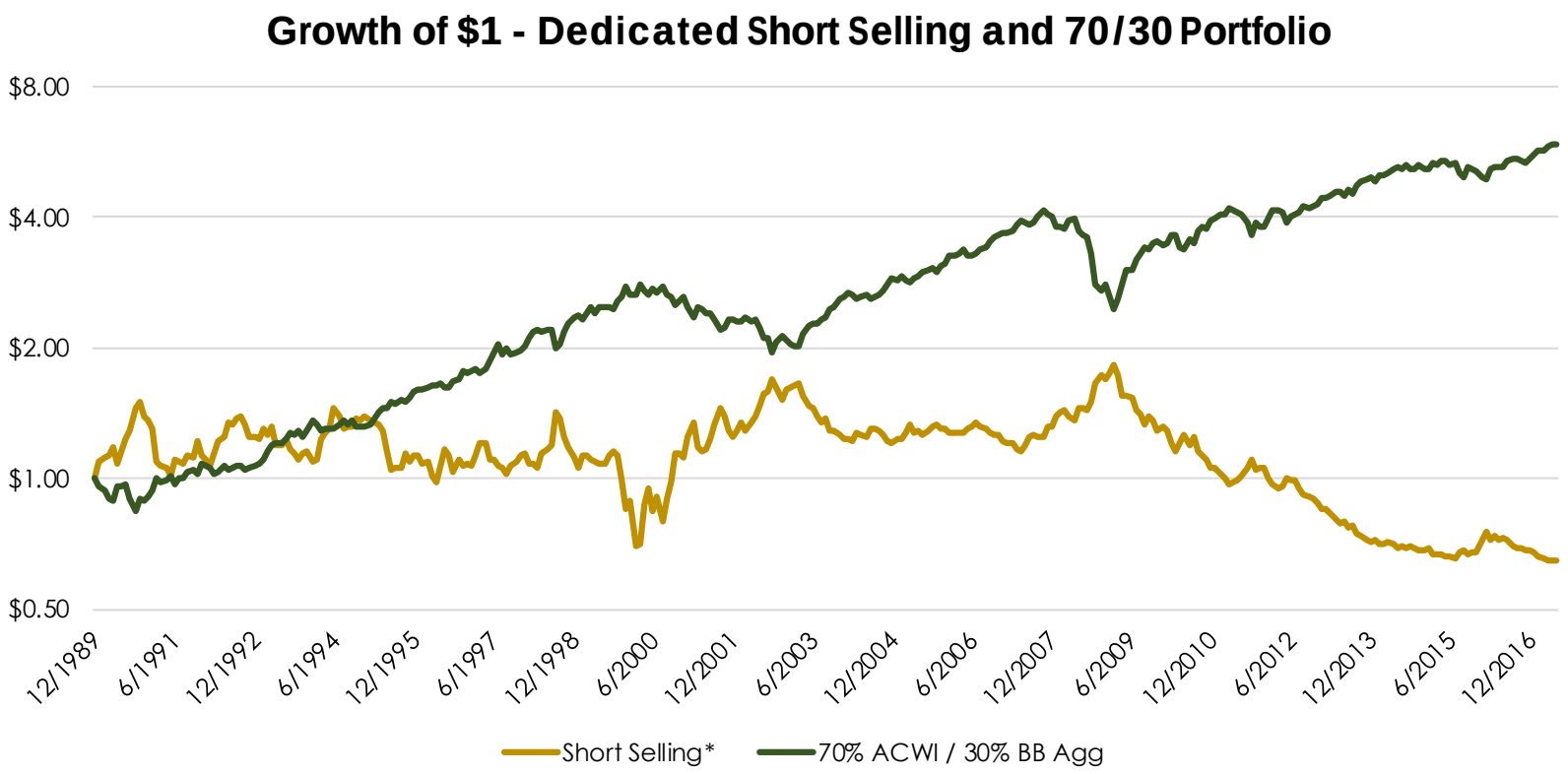
- Due to explicitly selling equities short, they are short the equity risk premium
  - Negative expected nominal return

- *RMS-related Pros*:
  - Nearly perfectly negatively correlated to equities
  - Potentially liquid and scalable
  - Potentially impactful (i.e., volatile)

- *RMS-related Cons*:
  - Negative expected nominal returns
  - Typically high management costs

Appendix: Potential RMS Strategy Descriptions

Dedicated Short Selling



	Short Selling*	70% ACWI / 30% BB Agg
Historical Return (1/1990 - 6/2017)	-1.6%	6.7%
Historical Volatility (1/1990 - 6/2017)	17.4%	10.7%
Max Drawdown	-64.7%	-41.1%
Return During Tech Bubble Drawdown	112.4%	-28.9%
Return During GFC Drawdown	46.9%	-41.1%

*HFRI Equity Hedge Short Bias Index

Appendix: Potential RMS Strategy Descriptions

Reinsurance, Royalties, Etc.

- There are a variety of "other" strategies that are beginning to receive attention from institutional investors
  - Reinsurance = buying structured insurance policies that generate premiums but are economically exposed to certain events (e.g., earthquakes)
    - Offloading of risks from a primary insurer to a different entity
  - Royalties = buying the royalty rights of a given revenue stream

- These strategies generate truly uncorrelated returns to traditional investments

- Liquidity, scalability, and volatility are typically lacking

Appendix: Potential RMS Strategy Descriptions

Reinsurance, Royalties, Etc.

- *RMS-related Pros*:
  - Positive expected real return
  - Reasonable management costs
  - Unrelated to long-only equity and credit

- *RMS-related Cons*:
  - Potentially illiquid
  - Scalability is a concern
  - Behavior during crisis situations is unpredictable (i.e., truly uncorrelated)

Appendix: Characteristics of Unsuitable RMS Strategies

- Discretionary Approaches
  - A key attribute of any strategy is its forward -looking expectations
  - Directly related to forward-looking expectations is the notion of repeatability
  - The more discretion (i.e., human influence) strategies have, the bigger the caveats with respect to repeatability (i.e., it may have just been luck)
  - Systematic strategies (when designed appropriately) are explicitly repeatable and increase the likelihood of similar experiences in the future

- Backtests
  - With advances in computational finance, it is extremely easy to design "optimal" investment strategies on a backward-looking basis
  - Backtests should be subject to skepticism and coupled with robust academic/independent research and/or out-of-sample experiences
  - Further, the hypotheses of any strategy should be grounded in economic intuition in order to support forward-looking expectations

Appendix: Characteristics of Unsuitable RMS Strategies

- Illiquidity
  - A key characteristic of an effective RMS strategy is liquidity
  - Without liquidity, an investor is unable to harvest positive returns during equity drawdowns (i.e., unable to rebalance)
    - As a result, the benefits are purely illusory

- Positive Correlation with Equities During Drawdowns
  - Correlation is a measure of linear relationship
  - Further, it treats the relationship during positive months and negative months equally
  - It is not uncommon for strategies to produce a near zero correlation with equities during full-cycles but also produce a positive correlation with equities during drawdown periods
    - i.e., similar to the notion of changing correlations / correlations moving to one
  - Focusing on a strategy's behavior (and its relationship with equities) during equity drawdown periods is paramount

Appendix: Characteristics of Unsuitable RMS Strategies

- Negative Expected Long-term Return
  - The RMS class represents a strategic class
  - As a result, tactical moves in and out of strategies will generally be avoided
  - Any strategy should therefore possess a positive expected return; otherwise, the OCERS Total Portfolio's expected return will decrease

Appendix: Sources

- Data sources:
  - Bloomberg
  - Barclays Live
  - HFR (Hedge Fund Research)
  - eVestment Alliance/HFN
  - State Street (OCERS data)
  - MPI
  - Neuberger Berman (hypothetical, gross-of-fee put option buying program example)
- Metrics calculated using:
  - MPI Stylus
  - Excel
  - R
- All replicable index returns are gross-of-fees
- All hedge fund related index returns are net-of-fees
- Bridgewater and D.E. Shaw data are net-of-fees
- OCERS composite data is considered "gross" by State Street but contains a mix of gross and net manager returns

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Opportunistic Investing and Best Practices: An Investment Case Study

September 14, 2017

Molly Murphy, CFA

363/458

What is Opportunistic Investing?

- **Investment Arc:** an asset or investment strategy is presumed to be undervalued by the market with a narrative that explains why that underpricing will correct in the near-term

- **Questions:**
  - How has OCERS been opportunistic in the past?
  - How can OCERS be opportunistic in the future?
  - How does OCERS establish a repeatable process?

Energy Case Study

- Prior to 2015, OCERS energy investments included:
  - EnerVest (2010, 2013)
  - EIG Energy (2011, 2013)
  - Kayne Anderson (2012)
- As oil prices began to plummet in 2015, OCERS made the following investments across the energy complex, more than tripling OCERS' previous allocation to energy strategies:
  - Tennenbaum (Apr 2015)
  - Brigade (May 2015)
  - EnerVest (Sep 2015)
  - Blackrock (Sep 2015)
  - Kayne Anderson Midstream Infrastructure (Nov 15)
  - Kayne Anderson Energy (Dec 15)
  - Kayne Anderson Private Energy Income (Apr 16)

Energy Case Study: The Autopsy Results

- What was good?
  - OCERS recognized a severe dislocation in oil prices due to a medium-term supply-demand imbalance in global markets
  - OCERS made a bold move in allocating substantial assets towards energy investments so that profits from price recovery would be meaningful to the pension plan
  - OCERS staged the investment, going into debt markets first and then invested into energy equity strategies later

Energy Case Study: The Autopsy Results

- What was average?
  - OCERS used its current roster of debt and hedge fund platforms initially to enter the energy credit markets, when having an energy debt specialist would have been preferred. Results as a whole have been good but manager returns have been mixed.
  - OCERS used its current roster of private energy managers to access additional upstream and midstream energy investments in Fall 2015, enabling quick approval.

Energy Case Study: The Autopsy Results

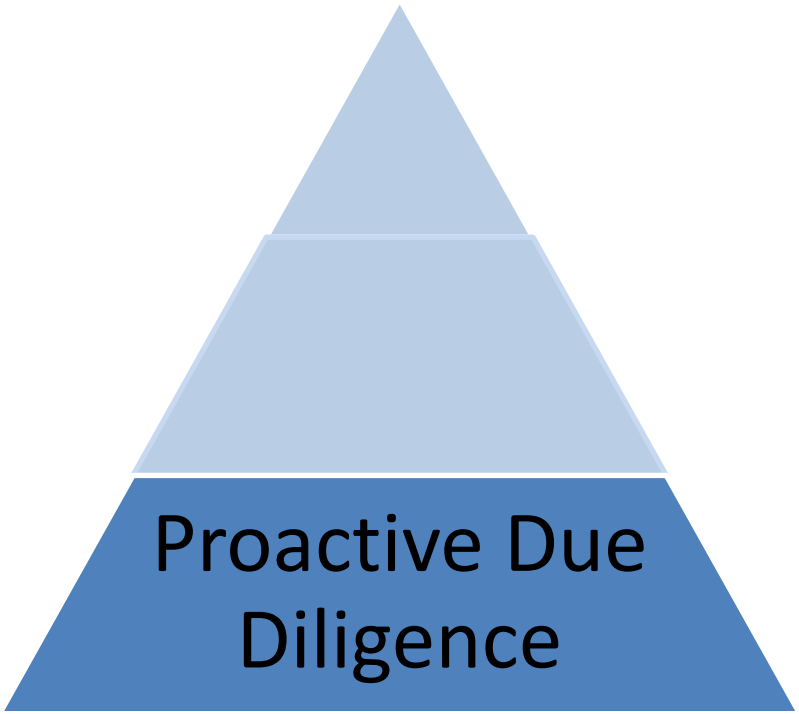
- What could have been better?
  - OCERS did not fully appreciate the differences in how funds apply leverage (EnerVest vs. KA)
  - OCERS opted for 100% public equity midstream (Kayne MLP fund) rather than introducing private midstream
    - Did not take full advantage of the undervalued assets in the energy infrastructure complex
    - Accepted public markets volatility

Energy Case Study: The Final Analysis

- The energy investments will be largely additive to OCERS performance results
- The idea was solid and the timing was near perfect.
- The execution was less than perfect:
  - Initial credit funding to managers not expert in energy
  - EnerVest employing fund level rather than project level leverage
  - Lack of private midstream investment and experience

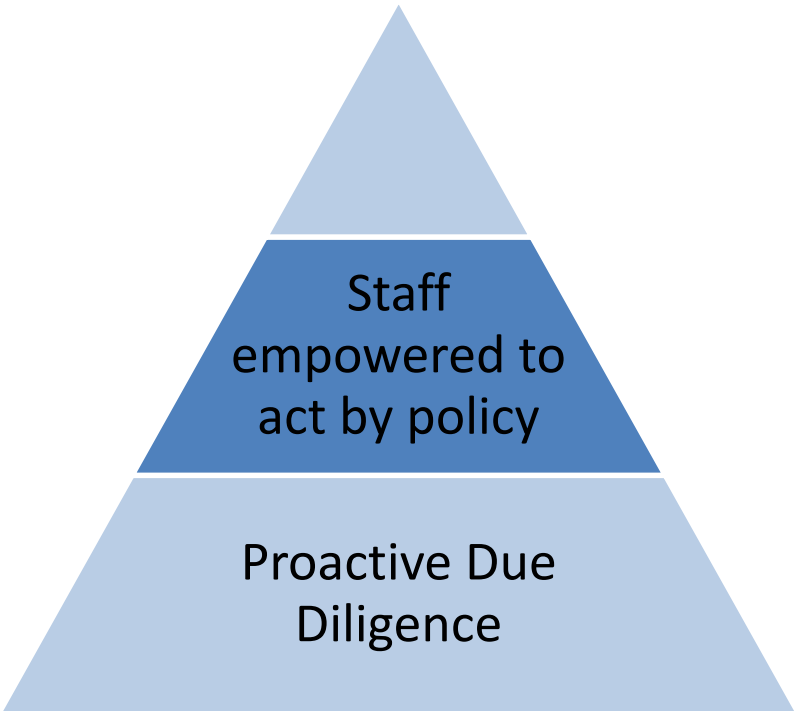
How do we take a great idea and execute it better next time? How do we create the most value when opportunities arise?

Best Practices to Opportunistic Investing



- Build internal expertise
  - Focus efforts in coordination with current market themes and work plan
  - Take a lot of investment manager meetings and proactively build a “bench team” across disciplines
- Coordinate efforts and leverage investment consultant
- Communicate work in progress with the Investment Committee so that investment ideas are proactively discussed and transparent

Best Practices to Opportunistic Investing



- Staff/CIO/Consultant implement best ideas portfolio within preapproved asset allocation and risk budget
- Dollar amounts or % allocations above a preset threshold may require additional IC approval

Best Practices to Opportunistic Investing

- Investment Committee holds staff and consultant accountable for results
- If IC has concern, options for consideration:
  - Increased surveillance or watch list status
  - Increased reporting
  - Re-underwriting of investment
  - Plan for reduction of exposure

Next Steps

- Review internal policies to achieve best practices
- Review CIO charter
- Coordinate due diligence efforts with consultants
- Identify key target areas based on valuations and economic forecasts
- BE READY

The Next Level: Strategic vs. Tactical Investing

✓ Strategic investments:

- May be private or public
- Stay in the portfolio for > 5 years with an investment premise/horizon that is equally long

- Tactical investments: NOT QUITE YET!
  - Generally expressed in public markets due to the transitory nature of the investment
  - Can be short-term (1-day to 1-year) in time horizon or medium-term (1-3 year investment premise)
  - Very important to get the entry point AND the exit point correct

ORANGE COUNTY OCERS EMPLOYEES RETIREMENT SYSTEM

Memorandum

DATE: September 7, 2017

TO: Members of the Board of Retirement

FROM: Steve Delaney, Chief Executive Officer

SUBJECT: **OCERS 2018-2020 PRELIMINARY STRATEGIC PLAN AND 2018 PRELIMINARY BUSINESS PLAN**

OCERS staff will review the proposed agency Strategic Plan (Item A), covering the period of January 1, 2018 through December 31, 2020 during the Thursday afternoon (September 14) session of the OCERS Board's Strategic Planning Workshop.

Additionally, we will review the proposed 2018 Business Plan (Item B), which is a subset of that longer term Strategic Plan.

You will find both attached.

You will also find attached the prior Strategic Plan of January 1, 2017 through December 31, 2019, as well as the 2017 Business Plan. What you will note immediately is the very different approach your staff has taken with the new revised plans. The older versions tended to contain a mixture of both strategic goals as well as general work objectives. We have worked to streamline these documents so that they more appropriately present just those goals and objectives that strategically advance this agency towards its stated Mission, Vision and Values.

Additionally the *OCERS 2018 Business Initiatives Budget Impact Estimates* matrix will be attached on Monday (September 11, 2017) to indicate any related cost impacts.

Finally, in addition to the matrix, we will provide an organizational chart on September 13, 2017 to indicate where an initiative may have a staffing impact.

The presentation is informational only, we will be looking for Board input. The 2018-20 Strategic Plan as well as the 2018 Business Plan will return to the Board on October 16 for final Board consideration and approval.

Submitted by:

Steve Delaney
Chief Executive Officer

ORANGE COUNTY OCERS EMPLOYEES RETIREMENT SYSTEM

Memorandum

Orange County Employees Retirement System
2223 East Wellington Avenue | Santa Ana | 92701

2018 BUSINESS PLAN

ORANGE COUNTY OCERS EMPLOYEES RETIREMENT SYSTEM

MISSION, VISION AND VALUES

MISSION STATEMENT:

We provide secure retirement and disability benefits with the highest standards of excellence.

VISION STATEMENT:

To be a trusted partner providing premier pension administration, distinguished by consistent, quality member experiences and prudent financial stewardship.

VALUES:

- **O**pen and Transparent
- **C**ommitment to Superior Service
- **E**ngaged and Dedicated Workforce
- **R**eliable and Accurate
- **S**ecure and Sustainable

2018 BUSINESS PLAN

2018-2020 STRATEGIC GOALS

- Fund Sustainability
- Excellent Service and Support
- Risk Management
- Talent Management

FUND SUSTAINABILITY

GOAL: STRENGTHEN THE LONG-TERM STABILITY OF THE PENSION FUND

Business Plan Initiatives

Objective: Mitigate the Risk of Significant Investment Loss
Executive Lead – Molly Murphy

1. Fund the Risk Mitigating asset class
2. Explore and evaluate investment/risk management systems

Objective: Develop an Integrated View of Pension Assets and Liabilities
Executive Leads – Molly Murphy; Gina Ratto

1. Update the asset liability study
2. Develop procedure for new employers entering the system

Objective: Employ a Governance Structure that Supports a Dynamic Investment Program
Executive Lead – Molly Murphy

1. Evaluate governance best practices (year one)

Objective: Prudent Use of Resources
Executive Leads – Molly Murphy; Brenda Shott

1. Using CEM Benchmarking, evaluate the cost and efficiency of OCERS' plan administration
2. Increase transparency of investment management fees and investigate actionable items to reduce fees in the future
3. Study and enhance private equity capabilities and activities

EXCELLENT SERVICE AND SUPPORT

GOAL: ACHIEVE EXCELLENCE IN THE SERVICE AND SUPPORT WE PROVIDE TO OUR MEMBERS AND PLAN SPONSORS

Business Plan Initiatives

Objective: Provide Accurate and Timely Benefits
Executive Leads – Suzanne Jenike; Gina Ratto

1. Develop and communicate OCERS Administrative Procedures
2. Streamline the disability determination and appeals processes
3. Streamline the benefit appeals process
4. Update and create desk manuals and procedures
5. Improve customer service standards and reduce costs (of administration?)

Objective: Provide Education to our Members and Plan Sponsors
Executive Lead – Suzanne Jenike

1. Web site redesign (year two)
2. Circular letters to employers
3. Roll out updated Summary Plan Descriptions

RISK MANAGEMENT

GOAL: CULTIVATE A RISK-INTELLIGENT ORGANIZATION

Business Plan Initiatives

Objective: Provide System and Data Security and a Robust Business Continuity Solution
Executive Lead – Jenny Sadoski

1. Implement tools to mitigate the risk of data or financial loss or information disclosure
2. Develop and implement formalized IT governance framework
3. Enhance crisis and security management program

Objective: Implement Operational Risk Management Program
Executive Lead – Brenda Shott

1. Define the scope of the Operational Risk Management Program and implement an operational risk management process
2. Determine if a risk management system is needed

Objective: Ensure a Safe and Secure Workplace and Public Service Facility
Executive Lead – Brenda Shott

1. Evaluate building security and access system and upgrade if necessary
2. Improve employee resources and training
3. Plan and Implement Facility Upgrades and Space Management projects

TALENT MANAGEMENT

GOAL: RECRUIT, RETAIN AND INSPIRE A HIGH-PERFORMING WORKFORCE

Business Plan Initiatives

Objective: Recruit and Retain a High-Performing Workforce to Meet Organizational Priorities
Executive Lead – Cynthia Hockless

1. Enhance onboarding and transitioning of new hires into the organization
2. Implement recommendations from workforce analysis
3. Develop a comprehensive and competitive compensation package

Objective: Develop and Empower Every Member of the Team
Executive Lead – Steve Delaney

1. Implement a comprehensive training program covering OCERS policies, processes and procedures
2. Recognize individual needs and career goals within OCERS
3. Create or update executive management charters
4. Create succession plans across the agency

Objective: Cultivate a Collaborative, Inclusive and Creative Culture
Executive Lead – Steve Delaney

1. Launch cultural celebration initiative

Orange County Employees Retirement System
2223 East Wellington Avenue | Santa Ana | 92701

2018-2020 STRATEGIC PLAN

ORANGE COUNTY
OCERS
EMPLOYEES RETIREMENT SYSTEM

MISSION, VISION AND VALUES

MISSION STATEMENT:

We provide secure retirement and disability benefits with the highest standards of excellence.

VISION STATEMENT:

To be a trusted partner providing premier pension administration, distinguished by consistent, quality member experiences and prudent financial stewardship.

VALUES:

- **O**pen and Transparent
- **C**ommitment to Superior Service
- **E**ngaged and Dedicated Workforce
- **R**eliable and Accurate
- **S**ecure and Sustainable

2018-2020 STRATEGIC GOALS

- Fund Sustainability
- Excellent Service and Support
- Risk Management
- Talent Management

FUND SUSTAINABILITY

STRENGTHEN THE LONG-TERM STABILITY OF THE PENSION FUND

Objective: Mitigate the risk of significant investment loss

Objective: Develop an integrated view of pension assets and liabilities

Objective: Employ a governance structure that supports a dynamic investment program

Objective: Prudent use of resources

EXCELLENT SERVICE AND SUPPORT

ACHIEVE EXCELLENCE IN THE SERVICE AND SUPPORT WE PROVIDE TO OUR MEMBERS AND PLAN SPONSORS

Objective: Provide Accurate and Timely Benefits

Objective: Provide Education to our Members and Plan Sponsors

Objective: Evaluate Functionality of Agency Work Space

RISK MANAGEMENT

CULTIVATE A RISK-INTELLIGENT ORGANIZATION

Objective: Enhance Security and Continuity of Infrastructure and Services

Objective: Implement Operational Risk Management Program

TALENT MANAGEMENT

RECRUIT, RETAIN AND INSPIRE A HIGH-PERFORMING WORKFORCE

Objective: Recruit and Retain a High-Performing Workforce to Meet Organizational Priorities

Objective: Develop and Empower Every Member of the Team

Objective: Cultivate a Collaborative, Inclusive and Creative Culture

OCERS 2018 Business Initatives Budget Impact Estimates

Strategic Plan Goal:	FUND SUSTAINABILITY		
Strategic Plan Objective:	**Mitigate the Risk of Significant Investment Loss**	**Coordinator: Molly Murphy**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Fund the Risk Mitigating asset class		
Initiative #2:	Explore and evaluate investment/risk management systems		$ 50,000
Strategic Plan Objective:	**Develop an Integrated View of Pension Assets and Liabilities**	**Coordinator: Molly Murphy**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Update the asset liability study		
Initiative #2:	Develop procedure for new employers entering the system		
Strategic Plan Objective:	**Employ a Governance Structure that Supports a Dynamic Investment Program**	**Coordinator: Molly Murphy**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Evaluate governance best practices (year one)		
Strategic Plan Objective:	**Prudent Use of Resources**	**Coordinators: Molly Murphy, Brenda Shott**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Using CEM Benchmarking, evaluate the cost and efficiency of OCERS' plan administration	$ 20,000	
Initiative #2:	Increse transparency of investment mangement fees and investigate actionable items to reduce fees in the future		
Initiative #3:	Study and enhance private equity capabilities and activities		$ 210,000
Budget Impact	**FUND SUSTAINABILITY 2018 BUSINESS INITIATIVES**	**$ 20,000**	**$ 260,000**

OCERS 2018 Business Initatives Budget Impact Estimates

Strategic Plan Goal:	Excellent Service and Support		
Strategic Plan Objective:	**Provide Accurate and Timely Benefits**	**Coordinators: Suzanne Jenike, Gina Ratto**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Develop and communicate OCERS Administrative Procedures		
Initiative #2:	Streamline the disability determination and appeals processes		$ 1,800
Initiative #3:	Streamline the benefit appeals process		
Initiative #4:	Update and create desk manuals and procedures	$ 160,000	
Inititiative #5	Improve customer service standards and reduce administration costs		
Strategic Plan Objective:	**Provide Education to our Members and Plan Sponsors**	**Coordinator: Suzanne Jenike**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Web site redesign (year two)	$ 250,000	
Initiative #2:	Circular letters to employers		
Initiative #3:	Roll out updated Summary Plan Descriptions		
Budget Impact	**EXCELLENT SERVICE AND SUPPORT 2018 BUSINESS INITIATIVES**	**$ 410,000**	**$ 1,800**

OCERS 2018 Business Initatives Budget Impact Estimates

Strategic Plan Goal:	Risk Management		
Strategic Plan Objective:	**Provide System and Data Security and a Robust Business Continuity Solution**	**Coordinators: Steve Delaney, Brenda Shott & Jenny Sadoski**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Implement tools to mitigate the risk of data or financial loss or information disclosure	$ 100,000	$ 165,000
Initiative #2:	Develop and implement formalized IT governance framework		
Initiative #3:	Enhance crisis and security management program		$ 200,000
Initiative #4:	Review, update and enhance the Disaster Recovery and Business Continuity Plans		
Strategic Plan Objective:	**Implement Operational Risk Management Program**	**Coordinator: Brenda Shott**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Define the scope of the Operational Risk Management Program and implement operational risk management process		
Initiative #2:	Determine if risk management system is necessary		$ 25,000
Strategic Plan Objective:	**Ensure a Safe and Secure Workplace and Public Service Facility**	**Coordinator: Brenda Shott**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Evaluate building security and access systems and upgrade where necessary	$ 300,000	
Initiative #2:	Improve employee resource training		
Initiative #3:	Plan and implment facility upgrades and space management projects	$ 400,000	
Budget Impact	**RISK MANAGEMENT 2018 BUSINESS INITIATIVES**	**$ 800,000**	**$ 390,000**

Strategic Plan Goal:	Talent Management		
Strategic Plan Objective:	**Recruit and Retain a High-Performing Workforce to Meet Organizational Priorities**	**Coordinator: Cynthia Hockless**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Enhance onboarding and transitioning of new hires into the organization		
Initiative #2:	Implement recommendations from workforce analysis	TBD	TBD
Initiative #3:	Develop a comprehensive and competitive compensation package	$ 125,000	
Strategic Plan Objective:	**Develop and Empower Every Member of the Team**	**Coordinator: Steve Delaney**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Recognize individual needs and career goal within OCERS		
Initiative #2:	Create succession plans across the agency		$ 30,000
Initiative #3:	Implement a comprehensive training program covering OCERS policies, processes and procedures	TBD	
Initiative #4:	Create or update executive management charters		
Strategic Plan Objective:	**Cultivate a Collaborative, Inclusive and Creative Culture**	**Coordinator: Steve Delaney**	
		Budget Impact: one time costs	**Budget Impact: on-going costs**
Initiative: #1:	Launch cultural recognition initiative	$ 10,000	
Budget Impact	**TALENT MANAGEMENT 2018 BUSINESS INITIATIVES**	**$ 135,000**	**$ 30,000**

Organizational Chart

- **Board of Retirement**
  - **Chief Executive Officer** — Steve Delaney
    - **Executive Secretary II (1)**
    - **Clerk of the Board (1) (County)**
  - **Director of Internal Audit** — David James
    - **Internal Auditor** — Mark Adviento
  - **Chief Investment Officer** — Molly Murphy
    - **Staff Specialist (1)**
    - **Private Equity (1) (OCERS)**
    - **Director of Investment Operations** — Shanta Chary
      - **Investment Officer** — David Beeson
      - **Investment Officer** — Vacant
      - **Investment Analyst** — Stina Walander-Sarkin
  - **Assistant CEO External Operations** — Suzanne Jenike
    - **Director of Member Services** — Catherine Fairley
      - **Member Services Manager** — Heidi Halbur
        - **Retirement Benefits Supervisor** — Michael Persi
          - **Accounting Technician (2)**
            - **Accounting Technician (2) (County)**
        - **Retirement Benefits Supervisor** — Teresa Panameno
          - **Office Technician (3)**
          - **Office Specialist (1)**
          - **Benefits Technician (3)**
          - **Accounting Technician (2)**
            - **Benefits Technician (1) (County)**
      - **Member Services Manager** — Adina Bercaru
        - **Retirement Benefits Supervisor** — Jonathea Tallase
          - **Senior Retirement Program Specialist (1)**
          - **Retirement Program Specialist (8)**
      - **Retirement Analyst** — Vacant
        - **Senior Staff Development Specialist** — Toishe Merida
          - **Quality Assurance Specialist (2)** — 2 Vacant
    - **Communications Manager** — Robert Kinsler
      - **Staff Specialist (1)**
    - **Disability Coordinator (1)** — Megan Cortez
      - **Disability Investigator (2)** — 1 Vacant
      - **Office Specialist (2)**
  - **General Counsel** — Gina Ratto
    - **Executive Secretary I (1)** — Vacant
    - **Deputy General Counsel** — Lee Fink
      - **Deputy Chief Counsel (Joseph Fletcher - Extra Help)**
      - **Paralegal (1)**
    - **Staff Attorney** — Dawn Matsuo
    - **Staff Attorney** — Jerry Weissburg
  - **Assistant CEO Finance & Internal Operations** — Brenda Shott
    - **Director of Finance** — Tracy Bowman
      - **Finance Manager** — *Retiree Payroll / Investments* — Darlene Huynh
        - **Sr. Accountant Auditor I (1)**
          - **Accountant Auditor I (1)**
            - **Accounting Technician (1)**
      - **Finance Manager** — *Accounts Payable / Budgeting* — Diane Dillard
        - **Accounting Technician (1)**
      - **Finance Manager** — *Contributions / Reporting* — Jennifer Reyes
        - **Accountant Auditor I (1)**
    - **Director of Administrative Services** — Cynthia Hockless
      - **Staff Specialist (1)**
      - **Staff Assistant (2)**
      - **1 Vacant**
      - **Store Clerk (1)**
      - **Contracts/ Risk & Performance Administrator** — Jim Doezie
        - **Staff Analyst (1) (OCERS - Extra Help)**
    - **Director of Information Technology** — Jenny Sadoski
      - **IT Manager** — Jon Gossard
        - **Retirement Programmer Business Analyst (1)** — Vacant
        - **Senior IT Applications Developer (2)**
      - **IT Supervisor Operations (1)** — Javier Lara
        - **Network Engineer (1)**
        - **Systems Engineer (1)**
        - **Information Technologist II (1)**
      - **Cyber Security Manager (1) (OCERS)**

County Employees
OCERS Direct Employees
Proposed New Positions

Proposed Total Budgeted EE's: 80 to 87
County – 56 OCERS Direct – 31
4 New County; 2 New OCERS; 1 New Extra Help

Updated 9/8/2017

B

STRATEGIC PLAN

FY 2017-2019

ORANGE COUNTY

OCERS

EMPLOYEES RETIREMENT SYSTEM

Mission Statement

"We provide secure retirement and disability benefits with the highest standards of excellence."

OCERS GOALS - OBJECTIVES

1. **Excellent Customer Service**

providing

2. **Timely & Accurate Benefits**

based on

3. **Secure and Reliable Data**

funded by

4. **Prudently Managed Investments**

guided by

5. **Professional Plan Administration**

EXCELLENT CUSTOMER SERVICE

1.

Benchmark 1

95% of members surveyed are satisfied with the customer service received.

Benchmark 2

No more than 5% of benefit initiations require unplanned recalculations.

Objective A – **Trained and professional staff.**

- Explore staff training to maintain industry- accepted professional standards, such as provided by the International Foundation of Employee Benefits Plans.
- Training program for staff with monthly sessions that guide to outcomes. (Benchmark 1)
- Develop comprehensive documentation of all processes, procedures and policies and make accessible to all staff. (Benchmark 2)
- Develop appropriate performance metrics benchmarking peer comparisons.

Objective B – **Move member inquiries from phone to web whenever possible.**

- Automatically populate electronic forms with system data in accordance with acceptable security controls.
- On-line input of retiree change of address or direct deposit information, in accordance with acceptable security controls.
- Create and launch education program in use of OCERS web site.

Objective C – **Clear and timely communication with members/stakeholders.**

- Capture and monitor member/stakeholder feedback at all touch points and create management reports.
- Involve stakeholder groups in delivery of communications to members.
- Create call center for effective call management with ability to measure service.

TIMELY and ACCURATE BENEFITS

2.

Objective A – **Benefits paid are accurate.**

- Formalize effective use of Internal Audits to assist with test of agency processes.
- Develop policy for deminimus adjustments.
- Details of benefit qualification standards and calculations clearly documented in OCERS Administrative Procedures (OAP)

Objective B – **Service Retired Members are paid timely, without break in cash flow.**

- Explore methods for payment within one month of retirement date.

Objective C – **Streamlined Disability Process**

- Regular review of disability process and staffing in order to implement process improvements that will streamline the disability benefit application process leading to accepted service benchmarks. (Benchmark 3)

Benchmark 3

90% of Disability claims to the Board within four months of a complete medical profile.

SECURE and RELIABLE DATA

3.

Objective A – **Move to next generation pension administration software.**

- All procedures documented to ensure continuity while providing foundation to staff.
- Data integrity review.
- Post Go-Live determine V3 impact on general administration and make necessary adjustments.

Objective B – **Ensure security of data.**

- Perform mock review of OCERS internal control system per SSAE-16 (formerly SAS 70) standards to determine status of agency internal controls. Enhance periodic vulnerability assessments on critical assets.
- Deploy advanced security technologies and ensure appropriate procedures while integrating security into our investment and business processes.
- Provide security and privacy awareness training to sensitize employees to potential security and privacy issues within their particular functional areas on an annual basis.
- Mitigate risk of fraud in OCERS Investment transactions.

EFFICIENT INVESTMENT PROGRAM

4.

Objective A – **Investment program aims to achieve and maintain a fully funded status with regard to the actuarial liability of the system.**

- Assure alignment of intermediate-term and long-term funding policies with the OCERS portfolio's investment opportunity frontiers.
- Explore investment strategies to improve or protect the system's funding status at market extremes.
- Develop and implement strategies to dynamically adjust the portfolio for business cycle risks and opportunities.
- In reviewing asset allocation consider appropriate movements to contractual income in anticipation of cash flow negative status.

Objective B – **Achieve investment return objective with appropriate level of risk.**

- Ensure adoption of appropriate benchmarks for each asset class and total fund.
- Regularly measure and evaluate investment and performance risks at the manager, asset class and total fund level.
- Annually consider timely portfolio enhancement and risk mitigation strategies.

Objective C – **Board enabled to provide clear policy guidance with timely staff implementation.**

- Coordinate Board training classes and conferences into cohesive goal-centered training curriculum.
- Conduct semi-annual Board investment education sessions.

EFFICIENT INVESTMENT PROGRAM (Continued)

- Periodic review and communication to the Board of investment –related training and courses.
- Continued improvement and standardization of investment reports.
- Annual/biennial review of portfolio decision-making delegation and procedures.

Objective D – **Establish updated and written procedures to ensure continuity and best practices for investments.**

- Ensure due diligence and risk management activities meet best practice standards.
- Establish sound due diligence processes and clear accountability for alternative investments.
- Review, update and document all investment procedures.
- Take a leadership role for best investment practices statewide and nationally.

Objective E – **Ensure optimal investment division staffing and resources.**

- Biennially review insourcing, outsourcing and other strategic management strategies.
- Develop personalized training strategies for investment staff.
- Explore incentive and retention compensation.

Objective F – **Ensure efficiency and transparency in investment management.**

- Seek optimal cost structures throughout the investment program, with special focus on cost containment strategies as the portfolio

EFFICIENT INVESTMENT PROGRAM (Continued)

becomes increasingly diversified with non-traditional asset classes and strategies.

- o Explore public sector partnerships and opportunities to share or combine management and oversight resources with other public plans.

Objective G - **Identify viable OCERS-based defined contribution investment options. ("unitization")**

- o Identify potential qualified product providers or advisors with feasible strategies.
- o Collaborate with County DC committee and staff on product design options.

PROFESSIONAL PLAN ADMINISTRATION

5.

Objective A – **Good governance model and practices clearly delineate duties and responsibilities of Board members and OCERS staff.**

- Review of Board Governance Policies and processes in 2018.

Objective B – **Stable and sustainable contribution rates.**

- Monitor system's funding policy in order to maintain fiscal responsibility and enhance contribution rate stability.
- Outreach to non-participating Orange County employers, allowing opportunity to join OCERS and build Fund base.

Objective C – **Maintain reasonable administrative costs.**

- Implement continuous improvement processes to ensure organizational structure is most efficient model.
- Research Board actions, policies and directives that may create cost for the plan, such as the annual crediting of interest to member accounts.
- Review divisional budgets to ensure cost effectiveness. (Benchmark 4)

Objective D – **Implement enterprise risk management.**

- Regular review of agency Risk Assessment matrix.
- All divisions to monitor and report on operational and strategic risks, with identification of internal controls.
- Internal Audit to test controls to ensure effectiveness.

Objective E – **Maintain effective Business Continuity Plan.**

Benchmark 4

Annual dollar per active and annuitant figure grows by no more than CPI.

- Plan must be clearly communicated and understood by management staff.
- Plan must be routinely reviewed to ensure applicable and effective for current plan administration.

Objective F – **Ensure agency is prepared for legislative impacts.**

- Develop outreach program to ensure agency input to stakeholders considering legislation that would impact the system.

Objective G – **Maintain OCERS Tax Status**

- Work with tax counsel to maintain OCERS' favorable tax status by continuing to engage in the determination letter process and implementing IRS plan changes.

LOOKING AHEAD 10 YEARS

6.

Development A – **Fund reaches $25 billion.**

Address by developing an investment team that meets the skill set needed to manage the anticipated Portfolio

Development B – **Fund moves from cash flow positive to cash flow negative.**

Address through defensive asset allocation.

Development C – **Fund has more retired members than active members.**

Address through appropriate actuarial assumptions

Development D – **Last of "baby boomer" staff exiting agency.**

Address with Succession Plan

Development E – **End of V3 useful life.**

Address with advance planning, focused on appropriate use of IT team.

Development F – **2020 75-Year OCERS Anniversary.**

Address with plan and budget in 2019

2017

Business Plan

ORANGE COUNTY

OCERS

EMPLOYEES RETIREMENT SYSTEM

Table of Contents

Business Plan Process

On an annual basis OCERS staff prepares a one year Business Plan for the Board of Retirement's (Board) consideration and adoption. The purpose of the annual Business Plan is to set department and agency-wide goals and initiatives for the upcoming year that will support and advance the longer term strategic goals of the agency and complete short term projects. The goals and initiatives included in the Business Plan are assumed to be in support of and in addition to the ongoing business activities of the agency. The Business Plan then becomes part of the foundation for developing OCERS' annual budget.

The OCERS Strategic Plan was the starting point for developing the 2017 Business Plan. Staff reviewed the goals and objectives within the rolling three-year Strategic Plan and considered tactics to be used in implementing those long term goals in the upcoming year. The Board initially reviewed staff's proposed goals and initiatives for the upcoming year in September at the annual strategic planning session. Although an official action of the Board is not taken at that meeting, staff received verbal direction from the Board to proceed with including the goals and initiatives presented at the Strategic Planning Meeting into the 2017 Business Plan

After receiving Board approval of the 2017 Business Plan, Executive Management will perform a detailed final review of all budget requests that have been submitted by department managers during the initial stages of developing both the Business Plan and the annual budget. Executive Management ensures that the funds requested are both necessary and adequate to deliver, in an effective and efficient manner, the services OCERS is committed and obligated to provide to its plan participants and sponsors as well as to achieve the Board approved goals for the upcoming year and move longer term strategic goals forward. The budget is also reviewed for compliance with expenditure limitations set by the California Government Code. The budget includes detailed expenses by category and functional area along with comparative data from previous years.

A budget workshop is held prior to the regularly scheduled Board of Retirement meeting in November. The budget workshop will give staff an opportunity to review the detailed budget proposal with Board members. Board members will have an opportunity to ask questions and provide feedback to staff on the budget before it is before them for approval.

The annual budget is then presented to the Board or Retirement in November for review and approval. Business Plan goals must be funded in the approved budget. Should the Board decide not to fund a goal or initiative in the budget that item will either be deferred or deleted from the Business Plan. Should the Board have additional questions, comments, or are in need of further information, the schedule allows for staff to return to the Board in December if necessary.

Introduction

OCERS 2017 Business Plan (the Business Plan) is organized as a list of goals and initiatives for each department at OCERS. The plan is not organized or intended to be a comprehensive financial and strategic road map for operations for 2017. Instead, the intention of the Business Plan is to set and document goals and initiatives for each department that are in addition to the everyday operations. The goals and initiatives are then incorporated into the budget process for the next year. The 2017 budget impact (not including existing staff time) for each goal/initiative has been noted when applicable. The Business Plan also contains a review of the goals approved in the 2016 Business Plan and provides a status update on how staff has progressed in achieving those goals. In addition to the stated goals from 2016, the Business Plan also includes other accomplishments in each department that resulted from either unplanned or unknown events or activities at the time of developing the 2016 Business Plan or as a result of changing priorities during the year.

Each year, as staff develops the goals and initiatives through the Business Plan Process it is important to remind ourselves what the organization's core purpose and focus is as reflected in OCERS Mission Statement. In doing so, we ensure our goals are aligned with our mission as we develop, implement and administer programs for our 21,525 active members, 15,810 retiree and beneficiary members and 5,092 deferred members.

OCERS Mission Statement

We provide secure retirement and disability benefits with the highest standards of excellence

Supporting Goals

1) **Excellent Customer**
2) **Timely & Accurate Benefits**
3) **Secure and Reliable Data**
4) **Prudently Managed Investments**
5) **Professional Plan Administration**

Included in the appendix of the 2017 Business Plan are documents that are helpful in understanding OCERS' budget development process. They are intended to provide the reader additional information about OCERS as an organization and how the 2017 Business Plan goals and initiatives fit into the annual budget process. The items included are:

A. Existing Organization Chart
B. OCERS Department Descriptions
C. Budget Authority
D. Budget Policy
E. 2016 Budget Summary
F. 21 Basis Point Test of 2016 Adopted Budget compared to Accrued Liabilities
G. Historical Actuarial Asset and Liability Data

Department Goals and Initiatives for 2017

Executive

1. Complete management calls to new retiree program (Strategic Plan (SP) Goal #1, Objective A)
2. Continue investigating Baldrige Performance Excellence Program (SP Goal #5)
   Budget impact: $1,000
3. Visit two California retirement systems for on-site review (SP Goal #5)
   Budget impact: $3,000
4. Have all OCERS managers visit another California retirement system and report on observation to management team (SP Goal #5)
   Budget impact: $5,000
5. Attend another state wide association conference to observe issues and problem resolution (Texas, Louisiana, Florida or Michigan) (SP Goal #5)
   Budget impact: $2,000
6. Arrange and conduct:
   a. Annual OCERS Board Strategic Planning Workshop (SP Goal #5)
      Budget impact: $5,000 – possible speaker costs
   b. Annual Contract Cities OCERS overview presentation (SP Goal #1, Objective C)
   c. Annual OCERS Year in Review presentation to membership audience(SP Goal #1, Objective C)
7. Implement pilot Staff Retention Award Program while studying expansion for key administrative positions (SP Goal #1, Objective A)
   Budget impact: TBD
8. Accompany investment staff on local due diligence trips (SP Goal #1, Objective A)

Information Technology

9. Redesign the OCERS Website (SP Goal #1, Objective B)
   Budget impact: $250,000
10. Procure and implement a new phone system (SP Goal #1, Objective A)
    Budget impact: $250,000
11. Enhance Information Security Program (SP Goal #3, Objective B)
    Budget impact: $100,000
12. Board room technical and safety upgrades
    Budget impact: TBD

Administrative Services

13. Implement revisions to OCERS Contracting and Vendor Management Process, including the use of a contract management system

Budget impact: $9,000

14. Continue to partner with the Legal Department to complete the Employee Handbook revisions

    Budget impact: $25,000 included in Legal Department
15. Review recommendations of completed workforce analysis with CEO and the Board and implement approved recommendations (SP Goal #3, Objective A)
16. Continue to partner with the CEO on agency wide Succession Development Plan (SP Goal #6, Objective D)

    Budget impact: $30,000
17. Investigate Education and Training database systems for tracking and reporting activity for OCERS employees (SP Goal #1, Objective A)
18. Partner with the CEO and CIO on the implementation of pilot Staff Retention Program, while studying expansion for key administrative positions
19. Investigate an agency wide volunteer internship program

Finance

20. Implement GASB 72, *Fair Value Measurement and Application*

    Budget impact: $5,300
21. Determine OPEB reporting responsibility under GASB 74, *Financial Reporting for Postemployment Benefit Plans Other Than Pension Plans* and conduct outreach efforts to applicable Plan Sponsors for GASB 75, *Accounting and Financial Reporting for Postemployment Benefits Other Than Pensions.*
22. Update Finance Policies and Desktop Procedures to document new process and procedures due to implementation of V3 (SP Goal #1, Objective A)

Member Services

23. Create retirement forms that can be downloaded from the website (SP Goal #1, Objective B)
24. Evaluate call center options (SP Goal #1, Objective A)
25. Collaborate with IT on procuring and implementing a new phone system (SP Goal #1, Objective A)
26. Create a Quality Assurance unit (potential budget impact if additional staff are needed) (SP Goal #2, Objectives A & B)
27. Collaborate with Disability to improve the efficiency of the intake of disability retirement applications – multi-year (SP Goal #2, Objective C)

Disability

28. Create disability forms that can be downloaded from the website (SP Goal #1, Objective B)

29. Collaborate with Member Services to improve the efficiency of the intake of Disability retirement applications – multi-year (SP Goal #2, Objective C)
30. Outreach – work with employers to educate employees on disability benefits and process (SP Goal #1, Objective C)

Communications

31. Continue to work on revising the Summary Plan Description (Plan Sponsor specific) – multi-year project
32. Lead the redesign of the OCERS Website utilizing the IT Department for technical support

    Budget impact: $250,000 included in IT Department
33. Redesign the newsletter to reflect the design of the new Website

Internal Audit

34. Conduct two Plan Sponsor audits
35. System key internal control review
36. Entity-wide Risk Assessment
37. Develop annual Audit Plan
38. Maintain and update Plan Sponsor Review Document

Investments

39. Implement new (Meketa-era) strategic portfolio structure changes including at least 80% of new manager lineup by year-end 2017 (SP Goal #4, Objective 4)
40. Update Investment Policy Statement and construct a new written Investment Beliefs statement (SP Goal #4, Objective D)
41. Research “crisis risk offset” or similar cycle-mitigation portfolio strategies and commence implementation of those approved by Committee (SP Goal #4, Objective A)
42. Resolve portfolio strategy for Absolute Return (hedge funds) and transition as necessary (SP Goal #4, Objective F)
43. Undertake one or more “pilot” operational due diligence reviews of approved or incumbent investment managers as necessary and appropriate (SP Goal #4, Objective D)
44. Complete 70% of the second-round on-site due diligence visits by year-end 2017, targeting full cycle completion 1H18 (SP Goal #4 Objective D)
45. Complete procurement and selection for Real Estate consultant, conduct/complete exploratory RFP for private equity consultant and other service providers as needs or opportunities arise (SP Goal #4 Objective F)
46. Initiate screening process and/or searches for Opportunistic investments if that portfolio category is established (SP Goal #4 Objective B)

47. Inaugurate annual reporting on portfolio-wide income
48. Investigate OCERS institute for trustee investment training in conjunction with other So Cal CERL plans (SP Goal #4 Objective C)
49. Seed capital to fund multi-plan procurement consortium through NCPERS and/or BLA Schwartz and SACRS CIOs (SP Goal #4 Objective F)

Legal

50. Continue to work with Member Services and Disability departments on the Administrative Rules creation process
51. Provide internal staff education/training on various topics that affect OCERS operations
52. Provide support to OCERS Communications and IT regarding legal aspects of the OCERS public Website redesign with respect to fillable electronic form templates for domestic relations orders and public records requests
53. Issue a request for information or request for proposals for securities fraud monitoring firms

2016 Business Plan Review and Status Update

Below are the list of department goals and initiatives from the 2016 Business Plan. Included with each goal is a status update (as of September 2016) of the progress towards each item.

A. Post V-3 Implementation Process Optimization and Project Assessment

In 2009, the Board approved a project to update the current pension administration system. The system selected through a competitive process was V3 from Vitech Systems Group. The project commenced in May 2010 with an original launch date of March 2013. During the lifecycle of the project, OCERS and the Vitech team worked together to overcome challenges that required extensions to the launch date. The system is anticipated to be put into production in December 2015. During 2016 OCERS staff from multiple departments will be working on several items related to the newly implemented system including the following:

- Defect remediation of items not needed for putting the system into production.
- Business process refinement based on knowledge gained after using the new system in production.
- Rebalancing the workloads of staff within individual departments based on revised business processes that reflect new system functionality.
- After business processes have been refined and workloads have been rebalanced, begin a workforce analysis which will identify; current and anticipated future supply of labor and skills, OCERS' needs currently and in the future in terms of labor, skills and competencies and gaps between the current and future supply and current and future demands.

In order to complete the above items, staff proposes continuing the use of three consultants/contactors that have been part of the V3 implementation team. The cost of such additional help in 2016 is estimated as follows:

Member Services:	$ 83,200
Finance:	$115,000
IT:	$182,600
Total:	**$380,800**

The total costs being proposed for 2016 are within the projected remaining total project dollars (this does not add to the total approved cost of the project). However, due to generally accepted accounting principles which state that once software is put into production, costs associated to the development and implementation of such software are no longer eligible to be recorded as an asset and depreciated over the useful life of the software. Therefore, the costs incurred in 2016

related to the post implementation tasks will be recorded as an expense in the current year.

- In process. See individual manager reports in sections that follow.

B. Performance Measurement and Reporting

OCERS currently has several tools and processes that are used for planning for the future of the organization, effectively and efficiently administering the plan and measuring our performance. In 2016, the executive management team will be working to tie the OCERS Strategic Plan, performance measurements and the budget together. The purpose of doing so is to make a more robust and transparent road map and progress report on how the organization is doing on moving towards its strategic goals. Some of the items that will be undertaken in connection with this agency wide goal are:

- Investigate participating in CEM's small system benchmarking survey.
- Develop a reporting mechanism that communicates the progress being made on Strategic Plan objectives as a performance measurement tool.
- Incorporate in the annual budget process performance measurements by department to bring context to the dollars being requested for the following year.

The engagement with CEM Benchmarking has begun. The Business Plan Goals for 2017 have been linked to the Strategic Plan as appropriate.

C. Operational Risk Management

Operational risk is the risk of loss resulting from inadequate or failed processes or systems, human factors or from external events. OCERS has many different methods and process by which operational risks are identified, assessed, managed, and mitigated. These processes are decentralized and in some cases completed informally. An area of improvement that is being endeavored in 2016 is to bolster the agency's operational risk management program. Staff will first begin with the development of a framework of a more formalized Operational Risk Management program (ORM). The framework, once completed will centralize and formalize how OCERS: 1) identifies the risks that originate in the business units, 2) assesses the size of operational risks, 3) monitors, controls and reports changes in operational risks, 4) mitigates operational risks and 5) calculates capital needed to protect the agency from operational risk losses.

Incorporated within the overall ORM will be the Business Continuity and Disaster Recovery Plan (BC/DR). Staff has been working on the development of an updated

BC/DR plan for the past eighteen months. In 2016, staff from all departments will be actively involved in the implementation of the drafted BC/DR plan. The newly revised plan calls for regular "table top" exercises to test the plans workability and to better prepare staff in the event that operations are disrupted and OCERS is faced with either a loss of facilities, people, or technology. The plan is considered a "living document" in that it will be continuously updated to stay in synch with OCERS current business processes, procedures and requirements.

In process. Alliant was hired by the Board as OCERS' Insurance Broker and a new Contract, Risk and Performance Administrator was hired. Both of these new additions are key resources for developing and implementing an ORM. The Business Continuity and Disaster Recovery plan continues to be implemented and a "table top" exercise was successfully executed

D. Procurement of Named Service Providers and Other Consultants

OCERS policies call for the re-procurement of certain "Named Service Providers" to occur at least every six years. Named Service Providers whose current contracts are due to be re-bid in 2016 includes:

- General Investment Consultant -Complete
- Consulting Actuary - Complete
- Alternative investments consultant;- Underway
- Real estate investment consultant; - TBD
- Custodian;-Complete
- Securities lending manager; and - TBD
- Financial auditor (selection to occur in late 2015) - Complete

The process of re-procurement of contracts such as these include the writing of a Request for Proposal, evaluation of proposals, interviews with finalists and contract negotiations. Should the incumbent not be the successful vendor in a RFP process, the transition from the old to the new vendor entails staff time and effort to ensure all old business is wrapped up and adequate transfer of knowledge to the new vendor occur. Given the number of procurements to be conducted in 2016, staff will be investing a notable amount of time on these procurements.

Executive

1. OCERS post V3 go-live review:

    - Initiate business process analysis:

      Meeting on July 22, the OCERS management team took up the question of V3, and its impact on OCERS business processes as part of our semi-annual off-site planning session. Coordinating with the staff analysis that will be conducted by an outside consultant as noted in the next goal below, as well as with our new contracts and performance management specialist, the management team will continue to advance the goal of business process improvement.

    - Staffing analysis:

      A fall 2016 goal, allowing OCERS departments time to use the new V3 system through much of the calendar year before we begin to determine impact on staffing needs. A consultant RFP was issued in August.

    - Legacy data status:

      Conducted by Sunera, this process began at the start of the year under the supervision of the OCERS Internal Audit team. While there are some findings, they are generally understood to be known issues and proposed variances. A final report to the audit committee will be presented in the fall 2016.

2. Begin annual "State of OCERS" presentation (January):

   Done. Completed at the January 19, 2016 meeting of the OCERS Board of Retirement. The detailed discussion was dependent on year end data, so the Board's directive is to continue with this annual presentation, but move it to February each year.

3. Annual visits to Orange County Legislative Delegation in Sacramento

    - Budget Impact: $1,000

4. Seek further opportunities for operational excellence including:

    - Continue research into Baldrige Program applicability to OCERS:

Ongoing. During visit to Illinois Municipal Retirement Fund (IMRF) (see below) several hours were spent with their Performance Excellence Manager in review of IMRF and use of the Baldrige Quality System to determine applicability at OCERS.

- Visit Illinois Municipal Retirement Fund:

  - Budget Impact: $2,000

  Done. CEO Delaney was on site at the IMRF offices on September 29, 2016, meeting with CEO Louis Kosiba and his executive team. A detailed review of that system's investment, member services and disability departments filled the day.

- Begin: Tie Strategic Plan, performance measures and the annual budget together:

  Ongoing preparation with specific actions in fall 2016 following hire of agency's new Contract, Risk and Performance Administrator.

- Reengage CEM Benchmarking services.

  - Budget Impact: $25,000

  Completed. With CEM Benchmarking meeting the minimum goal established by the OCERS Board (at least eight participating public employers), OCERS will once again be participating in the CEM program for Calendar Year 2016.

- Annual visit to two other California retirement systems.

  - Budget Impact: $2,000

  CEO Delaney visited the City of San Diego Employees Retirement System on September 21, 2016. A full review took place with their CEO, CIO Member Services Manager and disability review team.

  CEO Delaney will visit CalPERS late this year. A business acquaintance with the new CalPERS CEO, he will be meeting her and members of her executive team.

- Continue work on Staff Retention Program:

  I will present a modified Staff Retention Program, improved from that previously considered by the OCERS Board at their October 2015 budget workshops.

5. Create an improved Information Security Policy to prevent and manage any possible breach or hack of member and system information:

   - Budget Impact – $250,000 Included in IT Department

   An ongoing training program for OCERS staff is underway. An RFP was issued leading to the hiring of Mandiant; a security consultant. They were on site in June to review and make suggestions. A review of equipment and services will follow in the fall. Further security improvements will be developed as we enter the fall.

6. Investigate membership in Coalition for Social Security:

   CEO Delaney attended the Coalition for Social Security Conference as part of the larger National Institute for Retirement Security (NIRS) conference in the first week of March 2016. The Coalition is made up of several states and certain non-profit associations that seek to prevent a mandatory imposition of Social Security on the remaining public employers (including many in California) who have not yet agreed to provide that benefit.

   Mr. Delaney reports:

   "In my June quarterly report I informed the Board that I had placed this topic on the CALAPRS CEO Roundtable agenda in July. From that meeting I learned that no other system is following this issue at this time, and no other system is seeking membership in the Coalition.

   I believe no further action is required on this topic. I will continue to attend the annual Coalition conference as it is part of the NIRS winter conference that I attend any way, so there is no cost to adding my attendance at this short quarter day event. If movement is detected in Congress to move in the direction of mandatory Social Security I would then return to the Board to determine if, OCERS would then want to become an active member of the Coalition."

Investments

7. Launch General Consultant search in the first quarter, contract ends August 2016. Could result in higher fees in final months of 2016.

   RFP was issued in January 2016, Meketa was hired as the General consultant for a period of five years, the agreement between OCERS and Meketa became effective June 15, 2016.

8. Launch Real Estate Consultant search in the second quarter, contracts ends November 2016.

   RFP prepared and was presented to the Investment Committee at the September 28, 2016 Investment Committee meeting. Committee tabled and will revisit the RFP after asset allocation deliberations are complete.

9. Launch Hedge Fund Consultant search in the third quarter, contract ends December 2016.

   Based on the recommendation of CIO, Meketa and PCA (Risk consultant) at the Annual Strategic Planning meeting, OCERS will be transitioning out of hedge funds and presently does not expect to issue a new RFP for these services which would be subsumed by Meketa.

10. Complete asset/liability study in 1H 2016.

    Meketa has commenced the Asset Liability/Asset Allocation study and is expected to be completed by year-end.

11. Review Diversified Credit Program portfolio structure, and value added by long-short credit managers.

    Meketa and staff will review the Diversified Credit Program in conjunction with the asset/liability and asset/allocation studies.

12. Selective, enhanced "operational" due diligence for a few money managers, probably hedge funds?

    - Budget Impact: $50,000

    OCERS issued an RFP for ODD providers in May 2016, and hired Aksia and Laven as ODD providers; the contract negotiations with the two providers are ongoing.

13. OCERS institute trustee training for investments in conjunction with other California plans?

    - Budget Impact: $10,000

    OCERs sponsored “Energypalooza” last spring; and we had visitors from in-state and out of state.

14. New procurement strategy and round for private equity? This fall will be the last year of the 3 year P4 effort. Could be for a separate advisor, etc. Co-investments?

    Staff is looking for authorization for CIO to issue an RFP for private equity discretionary management. This recommendation was approved by the Investment Committee on September 28, 2016

15. Implement new benchmarks for selected asset classes/categories (e.g., absolute and real return, diversified credit?).

    NEPC completed the education sessions in the first half of 2016, OCERS eliminated the use of benchmarks that are aspirational in nature and put into effect July 1, 2016, market related benchmarks. Implementation should be completed by year-end.

16. Expanded internal risk reporting (e.g., better, stronger use of Green Package)

    OCERS issued a RFP for Strategic Portfolio and Risk Advisor and hired PCA in lieu of BRS. Staff will work with PCA on risk reporting in the future.

17. Continued efforts to establish a joint procurement legal structure.

    - Budget Impact: $50,000

    Nothing developed in 2016, although we did encounter one proposal for international legal services which is now under review

18. Stronger involvement of Investments Staff members at California pension associations.

    - Budget Impact: $2,000

    Staff attended SACRS here in Orange County earlier this year, will continue to seek attendance opportunities

Member Services

19. V3 post go-live project wrap up tasks:

    - Upon implementation of V3, restructure/reorganize MS division.

    In progress – restructure extended into 2017 to incorporate the results of the workforce analysis

    - Cross train staff; with a focus on developing desk manuals that integrate business processes to revised functionality (continues from 2015).

    In-process

    - Defect remediation.

    Completed

    - Test remaining medium and low priority defects scheduled to be delivered post go-live.

    Completed

    - Regression test new V3 build deliveries.
        - Budget Impact: $83,200 (see Agency-wide goal A)

    Completed

20. Collaborate with Disability to improve efficiency of the intake of disability retirement applications.

    In process – multi-year goal

21. Assist the Legal department with Administrative Rule creation (continues from 2015).

    Ongoing

22. Participate in ongoing DR/BC Plan.

    Completed

Communications

23. Lead the redesign of the new OCERS Web site utilizing the IT department for technical support. This will serve as the primary effort to enhance OCERS' brand identity (including communications efforts such as newsletters, videos and social media, but extending to supporting all areas of OCERS).

    Deferred

24. Redesign "At Your Service" newsletter, with design reflecting the look of the new Web site and including interactivity on the electronic version.

    Deferred

25. Participate in ongoing Disaster Recovery/Business Continuity Plan tasks.

    Completed

26. Redesign the "Summary Plan Description" to be available as employer-specific editions (multi-year project).

    In progress – multi-year goal

27. Reinstitute the internal OCERS staff newsletter.

    Completed

28. Produce a library of media and public inquiry responses.

    Completed

Disability

29. Review and update written policies and procedures to incorporate V3 functionality.

    Completed

30. Collaborate with Member Services to improve efficiency of the intake of disability retirement applications and close the knowledge gap.

    Ongoing

31. Implement any changes to the disability process as directed by the Board as a result of the presentation at October 2015 Board meeting, if applicable. - Completed

32. Participate in ongoing Disaster Recovery/Business Continuity tasks.

    Completed

33. Utilize a copy service for retrieval of medical records to ensure the member's confidentiality and minimize vulnerability to security breach.

    Under Review

Finance

34. Evaluate reporting requirements for GASB 72, Fair Value Measurement and Application and its impact on financial statements for the year ended December 31, 2016.

On-going. Staff has participated in several webinars on the subject, as well as gathered sample disclosures and presentations on the subject. Finance will also be coordinating with investment staff and State Street Bank to determine how we will obtain the different levels of fair value required by this disclosure (quoted market prices, observable inputs other than quoted market prices and unobservable inputs)

35. Begin preliminary planning of implementation of GASB 74, Financial Reporting for Postemployment Benefit Plans Other Than Pensions effective for the year ended December 31, 2017 and determine assistance needed by Plan Sponsors for implementation of GASB 75, Accounting and Financial Reporting for Postemployment Benefits Other Than Pensions effective for the year ended June 30, 2018.

    On-going. Preliminary conversations have been initiated with OCERS' external auditors and OCFA, the only Plan Sponsor determined to be directly impacted by the new pronouncements. Staff has scheduled an initial implementation planning meeting at OCFA's offices in early November 2016.

36. Work with Investments Department to issue an RFP for investment custodial services.

    Completed. State Street Bank, the incumbent custodian, was selected from three semi-finalists to continue providing OCERS with custodian bank services. Contract negotiations are currently underway.

37. V3 post go-live project wrap up tasks:

    - Upon implementation of V3, evaluate and redistribute Finance staff workload to create greater efficiency in department.
    - Defect remediation.
    - Test any remaining medium and low priority defects scheduled to be delivered post go-live.
    - Regression testing of new V3 build deliveries.

    On-going. Finance has been actively involved in identifying and resolving defects in the areas of contributions, retiree payroll, GL integration and actuarial/CAFR reporting. Assessment of workloads continues and an

evaluation of filling an open accounting technician position in Finance resulted in the position being reassigned to Member Services.

- Budget Impact: $115,000 (see Agency-wide goal A)

38. Develop "drill-down" reports for financial statements to create efficiencies in staff's financial statement analysis and the annual audit process.

    Completed. "Drill-down" reports were available and used during the current audit of the 2015 financial statements.

39. Initiate improvements in Board level financial reporting:

    - Develop user-friendly GASB 68 summary for 2016 valuation to simplify understanding of report.
    - Assist Executive Department in tying the Strategic Plan, performance measurements and the annual budget together. –

    In progress.

    A summary report of the GASB 68 valuation was presented at the August 3, 2016 Audit Committee Meeting, followed by a slide show presentation to the full Board of Retirement at the Regular Board Meeting held on August 15, 2016. Staff will continue to refine the presentation of the GASB 68 valuation based on Board feedback.

    The annual budget process has begun and strategic plan and performance measurements have been incorporated into budget requests and will be included in the formal reporting of the final budget in November 2016.

40. Continue to participate in the implementation of the BC/DR plan.

    Completed. Finance continues to be involved in the implementation of the BC/DR plan and participated in a "table top" exercise that simulated a 2-3 day business interruption and identified areas where OCERS could be better prepared, such as updating its third party vendor contact list in the event of an emergency.

Information Technology

41. V3 post go-live project wrap up tasks:
    - Assist Internal Audit and external vendor with the V3 data conversion audit.

- Development of V3 reports to support business processes.
- Development of V3 queries.
- IT Support for V3 QA testing.
- IT Support for V3 in production.
- Defect remediation
    - Test any medium and low priority defects scheduled to be fixed after go-live.
    - Regression testing of new V3 build deliveries.

On Going. OCERS IT department is providing support to OCERS Staff of the V3 system. This includes V3 system administration and configuration, V3 QA Testing in specific areas, V3 Scripting for data cleanup, and Report creation and ad-hoc data requests.

42. Review IT staffing plan including both short and long term operational and programming requirements.

In process

43. Hardware/Software Purchases (Upgrades & Replacement)

- Anti-Spam Solution

In process

- Replace Education Center laptops

In process

44. Continue development and implementation of OCERS Intranet enhancements.

- Migrate non-member documents from LibertyNet to SharePoint
- Develop document library structure for:
    - Policy documents
    - Business process documents
    - Personnel documents
    - Training documents
    - Contracts
    - Public records requests
- Create standard forms, templates, widgets and pages for departments (i.e., meetings, calendars, action items, etc.)

In process. Staff has enhanced the OCERS Intranet home page, established document controls and procedures, including versioning and advanced search capabilities, an organizational calendar, electronic form submissions for Time Off, Overtime, and Cash Out Requests (roll out scheduled in November 2016)

45. Provide technical support to Communications department staff in the redesign of OCERS Web site.

    Deferred

    - Budget Impact: $100,000 (deferred from 2015)

46. Continue the implementation of the Business Continuity and Disaster Recovery Solution.

    - Replication, co-location, backup and recovery, remote access and support.
        - Acquire and install new hardware.
        - Upgrade existing Data Center facilities equipment: (deferred from 2014).
        - Replace UPS unit, water-based fire suppression, central A/C unit for the server room and install power generator for Data Center, additional work space and supporting facilities.
    - Test BC Plan including cross training of key staff.
    - Test Business Resumption Approach Document for IT (Disaster Recovery Run Book).
    - Create BC & DR testing and review schedule.
    - Incorporate business continuity and disaster recovery processes into daily operations.

        - Budget Impact: Range from $750,000 - 2,000,000 (Year 3 of 3)

    In process. An RFP was issued and an implementation vendor, Side Path, was selected to carry out the procurement of hardware, software and services, perform the installation and testing of OCERS BC/DR data center solution.

Administrative Services

47. Continue the development and implementation of succession planning.

    In progress. 3 Managers enrolled in CALAPRS Academy, 3 Supervisors enrolled in County of Orange Leadership program. Ethics Training and Emotional Intelligence training for staff scheduled.

    - Identify career development strategies for key leadership positions.

        - Budget Impact: $40,000

48. Revise the current performance management program.

    Pending

49. Implement a Professional Retention Program for the Investments Department.

    In progress

50. Process improvement and development of the contract, risk and performance management functions which will include the addition of a new manager level position.

    In progress

    - Budget Impact: $133,600 ($84,600 salary + $49,000 benefits)
    - Manager position range: $57,000-$110,000

51. Post V-3 go live project wrap up tasks:

    - In connection with Executive's business process analysis, review the organization structure and perform a workforce analysis.

    In progress

    - Budget Impact $40,000

52. Consider options for the facility to reduce water and energy consumption.

    Pending

53. Space management projects:

    - Building modifications needed to vacate the 3rd floor.

    Completed

    - Budget Impact: $10,000

    - Legal library conversion into a conference room.

    In progress

    - Budget Impact: $15,000

Legal

54. Provide internal staff education/training on various topics that affect OCERS operations.

On going

55. Provide support to OCERS Communications and IT regarding legal aspects of the OCERS public Web site redesign with respect to fillable electronic form Web site templates for domestic relations orders and public records requests.

    Deferred

56. Issue a request for information or request for proposals for a securities fraud monitoring firms.

    Deferred

57. Continue to work with Member Services and Disability departments on the Administrative Rules creation process.

    In progress – multi-year goal

58. Provide technical support to V3 post go-live as needed.

    Completed

59. Add a paralegal position to address operational efficiencies (for the Legal and Member Services department) and risk mitigation regarding processing legal documents pertaining to member records and benefits.

    - Subpoenas
    - Child and spousal support orders
    - Domestic relations orders
    - Joinders
    - Notice of adverse interest
    - Tax levies
    - Death and beneficiary issues
    - Ad hoc member and plan sponsor requests

        - Budget Impact: $90,000 ($56K salary + $34K ben)

    Completed

60. Participate in ongoing Disaster Recovery/Business Continuity Plan tasks

    Completed

Internal Audit

61. Perform V3 data conversion audit.

- Budget impact: $255,000

Audit fieldwork completed. After inclusion of management response, the final report will be presented to the Audit Committee

62. Perform payroll audit: OCFA

Postponed as the request of OCFA management

63. Audit County payroll data transmittal to V3.

Postponed

Additional Departmental Accomplishments in 2016

Executive

- OCERS Year In Review outreach was completed in October 2016. Annually the OCERS Executive team goes out in the field to meet the executive teams of each plan sponsor, and of the majority of labor groups working with OCERS members. Additionally, the CEO accompanies the OCERS Board Chair and Vice Chair in similar presentations provided individually to the five members of the County of Orange Board of Supervisors.

- We continued regular communication outreach to the Contract Cities as requested by the OCERS Board of Retirement in 2014. A special program was hosted at OCERS in September 2016 to provide the Contract Cities with a general overview of OCERS pension liabilities and funding plan as part of an ongoing annual outreach program to Contract Cities

Investments

- Board education sessions: Dan Fuss from Loomis Sayles presented on the developments in the credit markets with a special focus on high yield. NEPC conducted a multi-month educational session on performance benchmarks and attribution. Infrastructure educational session was conducted by J.P. Morgan. CIO made a presentation on Investment Governance, Discussion on GoldenTree Litigation and potential impact by outside counsel. Jim Meketa presented his views of “big picture” and “long term” investment issues and themes. Howard Marks discussed how Oaktree assesses the markets, particularly credit markets and how fundamentals and psychology impact the market.

- Updated Proxy Policy and Investment Policy Statement.

- Conducted educational sessions and issued RFP for Alternative Income.

- Presented for approval supplemental subscriptions to Cross Ocean and Kayne Anderson Energy funds.

- Completed the RFP process for Custodian and retained State Street.

- Produced “Asset Liability” scenarios in conjunction with Meketa, PCA and Segal

- Preparing Private Equity RFP following committee authorization.

Information Technology

- Rolled out End User Security Awareness Training, providing a series of cyber and data security videos for staff to education and make staff aware of the

threats and vulnerabilities around them and how best to approach and handle them. We have also conducted the first of a series of Phishing /Spear-Phishing test of staff.

- Developed IT Helpdesk function in SharePoint to allow staff to submit helpdesk requests. System allows IT to track and report on the number and types of support request we are receiving. We are now in development of a similar IT Report/Query request system for the Programming department. The IT Helpdesk will be rolled out in November to all staff.

Member Services

- Acquired and trained transferred staff position from Finance.
- Collaborated with legal department to expedite processing on legal opinion requests; working with new paralegal position.
- Facilitated Plan Sponsor Employer Payroll training and support.
- Provided full membership support and communication on cyber security for myOCERS member self-service portal. Participated in security awareness training.
- Initiated telephone confirmations for all direct deposit requests submitted via portal and in writing.
- Resumed professional development with managers (2) and supervisory staff (2) attending CalaPERS and County leadership academies.
- Developed graphs showing the percentage of salary associated to every year of service for each of the benefit plan formulas.

Disability

- Added 3 new panel physicians
- Professional development of Supervisory staff (attended LCW Consortium, SACRS, CALAPRS)
- Participated in security awareness training

Communications

- Worked with I.T. Programming to develop a tracking system for all incoming media queries and Freedom of Information Act (FOIA) requests.
- Assumed the responsibility for document management and version control of all outbound correspondence.

- Coordinated a lunchtime presentation with the Orange County Fire Authority relating to fire safety in the workplace.

Finance

- As a result of the implementation of V3, staff gained a better understanding of how Member Services processes retiree payroll, resulting in Finance working more closely with Member Services and creating a detailed reconciliation process related to the monthly processing of retiree payroll.

- As part of taking over the processing of deduction files, Finance instituted a procedure that requires third party payroll vendors to provide control totals for deduction files in advance of processing monthly payroll. This allows staff to identify file errors proactively instead of reactively.

- Implemented an ACH/Positive Pay File log so that all ACH/Positive Pay files are reviewed independently by a Manager or above to ensure amounts and pay dates are correct prior to submission of files to bank's secure portal.

- As part of Finance's succession planning, one of our Finance Managers participated in and successfully completed the CALAPRS Manager/Supervisor Academy.

- Planned, drafted and produced the 2015 Comprehensive Annual Financial Report (CAFR), "Progress Past | Present | Future"

- Received the prestigious Certificate of Achievement for Excellence in Financial Reporting from the Government Financial Officers Association (GFOA) for OCERS' 2014 CAFR and submitted the 2015 CAFR for consideration of the same award.

- OCERS' 2014 CAFR – "Orange County's Beautiful Blue" was submitted by our graphic designer this year to the American Advertising Federation's Addy Awards and was a recipient of the Bronze Addy award.

- Staff will be submitting the 2015 CAFR for consideration of the Public Pension Coordinating Council (PPCC) Standards Award for Funding and Administration which was awarded in late 2015 for OCERS' 2014 CAFR.

- Participated in security awareness training

Administrative Services

Recruitments

- Completed 14 recruitments and screened over 865 applications
- Received over 24,000 applicant views of employment flyers on NEOGOV website
- Hired 11 new employees, 10 temporary employees and 1 contractor
- Successfully Recruited Chief Legal Officer in-house
- Promoted 2 employees and processed 4 employee transfers

On Boarding/Off-Boarding

- Conducted 9 New Hire and 2 Temporary Employee Orientations
- Created formal Temporary Employee Orientation
- Successfully Off-boarded 11 employees

Coordinated 4 onsite Trainings to include:

- Active Shooter Training
- Ethics Training
- Emotional Intelligence Training
- Sexual Harassment Training

Successfully coordinated the following Employee events:

- 2016 Take Your Child to Work Day
- 2016 California Great ShakeOut
- County Wellness Biometric screening
- Red Cross Blood Drive
- CPR/AED certification for safety committee members
- Annual Transportation Survey
- Pack-a-Pack School Supply drive – Six Points for Kids (OC Sheriff Dept)
- Operation Santa Claus

Salary/Compensation Surveys

- Completed 10 Salary Surveys

Building Maintenance/Improvements

- Installed file cage in mail room
- Space Management: Vacated 3rd floor and moved contractors and staff to 2nd floor and Converted 4 storage rooms to offices

- Worked with property management firm to rent out vacated space on the 3rd floor
- Conversion of vending machine room in 1st floor break room into mother's room
- Increased energy efficiency via reduction in water usage and LED lighting
- Researched other energy efficient options via the Energy Network and PFMG Solar
- Increased safety - carpet strip and safety sign in board room.

Managed Leave of Absence / Return to Work / Workers Comp / Ergonomics

- Intermittent Leaves of Absence (3)
- Medical Leaves of Absence and Return to Work (6)
- Return to Work Interactive Meetings (2)
- Coordinated 7 ergonomics evaluations

Internal Audit

Private Equity audit

- Identified a process improvement to help OCERS verify that management fees for private equity investments are correct,
- Identified management fees that State Street was incorrectly netting against performance returns in its monthly reporting to OCERS.

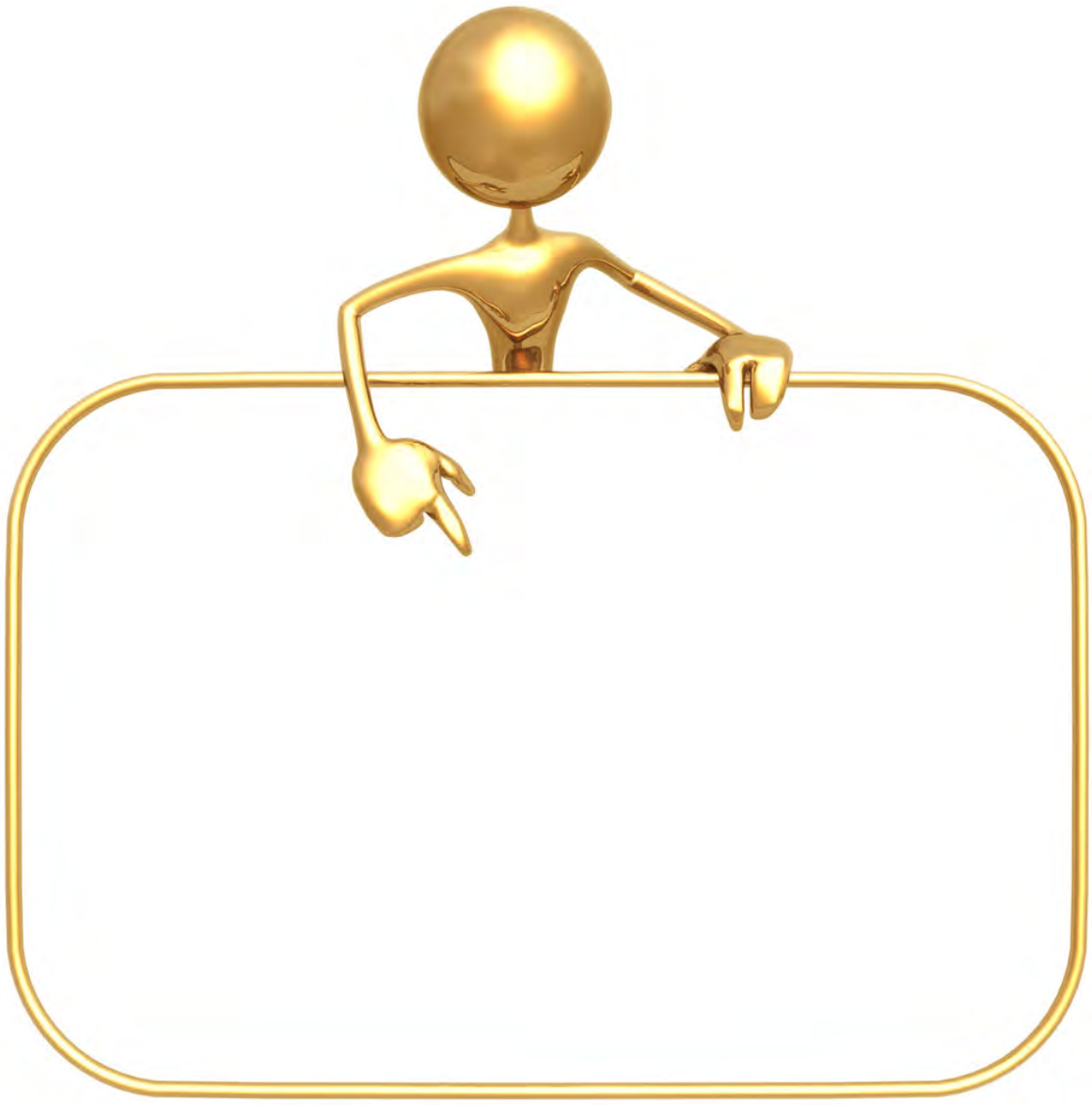
Death Match Process audit

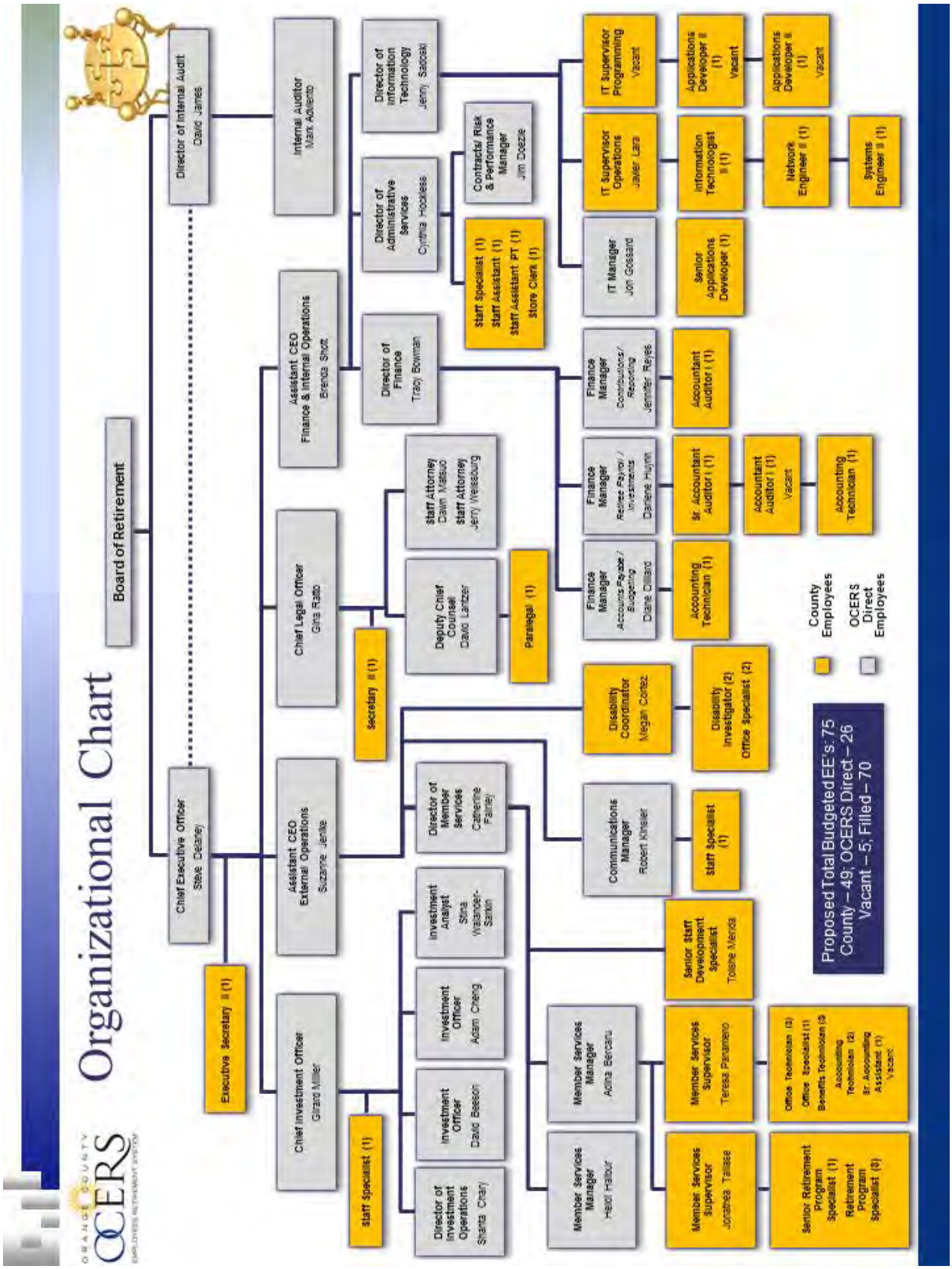
- Identified 29 deceased members who were not terminated in the pension administration system, resulting in $990,694 of refundable contributions and interest to be made to their beneficiaries,
- Identified $56,298 in benefit overpayments to be collected by OCERS,
- Made recommendations to help secure members' private demographic and banking data.

V3 Benefit Setup audit

- Identified an incorrect benefit setup in V3, resulting in re-training for Member Services staff in regards to retiring part-time members.

Appendix




Organizational Chart
ORANGE COUNTY
OCERS
Board of Retirement
Chief Executive Officer
Steve Delaney
Director of Internal Audit
David James
Executive Secretary III (1)
Assistant CEO
External Operations
Suzanne Jenike
Assistant CEO
Finance & Internal Operations
Brenda Shott
Internal Auditor
Mark Adviento
Chief Investment Officer
Girard Miller
Chief Legal Officer
Gina Ratto
Director of
Finance
Tracy Bowman
Director of
Administrative
Services
Cynthia Hockless
Director of
Information
Technology
Jenny Sadoski
Secretary III (1)
Deputy Chief
Counsel
David Lantzer
Staff Attorney
Dawn Mateo
Staff Attorney
Jenny Weseduing
Paralegal (1)
Contracts/ Risk
& Performance
Manager
Jim Doezie
Staff Specialist (1)
Staff Assistant (1)
Staff Assistant PT (1)
Store Clerk (1)
Finance
Manager
Contributions/
Recording
Jennifer Reyes
Finance
Manager
Retiree Payroll /
Investments
Darlene Huynh
Finance
Manager
Accounts Payable /
Budgeting
Diane Dillard
IT Manager
Jon Gossard
IT Supervisor
Operations
Javier Lara
IT Supervisor
Programming
Vacant
Accountant
Auditor I (1)
Sr. Accountant
Auditor I (1)
Accounting
Technician (1)
Accountant
Auditor I (1)
Vacant
Accounting
Technician (1)
Senior
Applications
Developer (1)
Information
Technologist
III (1)
Applications
Developer III
(1)
Vacant
Network
Engineer II (1)
Applications
Developer III
(1)
Vacant
Systems
Engineer II (1)
Staff Specialist (1)
Disability
Coordinator
Megan Cortez
Disability
Investigator (2)
Office Specialist (2)
Director of
Member
Services
Catherine
Fairley
Communications
Manager
Robert Kinsler
Staff Specialist
(1)
Chief Investment Officer
Girard Miller
Investment
Analyst
Sima
Waisanen-
Sarkin
Investment
Officer
Adam Cheng
Investment
Officer
David Beason
Director of
Investment
Operations
Shanta Chary
Member Services
Manager
Adria Bercaru
Member Services
Manager
Heidi Hallour
Senior Staff
Development
Specialist
Tolene Merida
Member Services
Supervisor
Teresa Panameno
Member Services
Supervisor
Jonathea Tallase
Office Technician (2)
Office Specialist (1)
Benefits Technician (3)
Accounting
Technician (2)
Sr. Accounting
Assistant (1)
Vacant
Senior Retirement
Program
Specialist (1)
Retirement
Program
Specialist (8)
Proposed Total Budgeted EE's: 75
County – 49; OCERS Direct – 26
Vacant – 5; Filled – 70
County
Employees
OCERS
Direct
Employees

OCERS Organization Description

Board of Retirement

The Board of Retirement is responsible for establishing policies governing the administration of the retirement plan, making benefit determinations, establishing investment policy for the system and monitoring execution of its policies. The Board of Retirement consists of nine members and one alternate. The Board of Supervisors of the County appoints four members of the Board of Retirement; active participants of the system elect four members, one safety and two general and an alternate; the retirees elect one member; and one member is ex-officio, the Treasurer of the County.

Executive Department

This department consists of the Chief Executive Officer (CEO) who implements and executes policies promulgated by the Board of Retirement. The Assistant CEO of Finance and Internal Operations, the Assistant CEO of External Operations, the Chief Investment Officer (CIO), Chief Legal Officer and the Director of Internal Audit assist the CEO in leading and operating the system. Two administrative staff members support the Executive department on a daily basis.

Investment Department

This department is responsible for the administration and management of the investment program, in accordance with policies, regulations, and guidelines set forth by the Board of Retirement. It is responsible for the interface with investment managers, including monitoring investment performance objectives, adherence to investment guidelines, conducting due diligence visits to investment managers, and interviewing prospective investment managers. The department is also responsible for the interface with outside investment consultants in reviewing and evaluating all investment managers' performance and investment manager fees. The CIO leads this department of five staff.

External Operations Division

This division is comprised of the following three departments;

The **Member Services** department is responsible for providing all benefit services to the members of the System. This includes benefit calculations, preparation of data to support applications for retirement, preparation of the retiree payroll, and membership counseling. The

Director of Member Services oversees this department of twenty-three employees.

The **Disability** department is responsible for the evaluation of claims for disability retirement. The Director of Member Services also oversees this division of five employees.

The **Communications** department is responsible for developing and coordinating information for members and plan sponsors through publications and newsletters. There are two employees who perform the communication functions for OCERS.

Legal Department

This department provides legal advice and representation to the Board of Retirement and the Orange County Employees Retirement System (OCERS) on a wide variety of issues affecting the Agency. Among other things, this includes issues involving disability retirements, investments, legislation, vendor contracts, and family law. The Chief Legal Officer oversees this department of Deputy Chief Counsel and two Staff Attorneys.

Internal Operations Division

The Internal Operations Division is led by the Assistant CEO of Finance and is comprised of the following three departments:

The **Finance** department is responsible for all the financial records and reports of OCERS. This includes the preparation of the Comprehensive Annual Financial Report, monthly and quarterly financial information and the annual operating budget. The Finance department also maintains OCERS' system of internal control; processes and accounts for retirement payroll and refunds of contributions and interest to members; collects and accounts for employer and members' contributions, reconciles investment portfolios and pays costs incurred for goods received and services rendered. The Finance team is managed by the Director of Finance and has nine full time staff members.

The **Administrative Services** department is responsible for providing administrative and human resources services for OCERS. Specifically, the areas of responsibility include staff and management recruitments, performance management, employee relations, employee compensation, personnel policies, and regulatory compliance, contract administration, purchasing, and facility management and maintenance. A Director of Administrative Services leads the department which includes three full time staff and a part time employee.

The **Information Technology (IT)** department is responsible for managing OCERS' network systems, personal computers, software, while providing programming and technical support on our Benefits Administration System. In addition, this department is responsible for the production of retiree payroll, file interfaces related to contributions and payroll and administering all audio/visual functions. Currently, OCERS is in the midst of implementing a new Pension Administration System. The IT department is the lead on managing the multi-year project. The Director of IT leads this division which includes nine employees.

Internal Audit Department

The Internal Audit Department assists the Board of Retirement and management in the effective discharge of their fiduciary responsibilities. This is done through audits, analysis, evaluations, recommendations, and information. Objectives of the department are to promote effective internal controls, provide assurance that the Agency's assets are safeguarded; compliance is maintained with prescribed laws, Board, and management policies; the reliability and integrity of OCERS' data is maintained; and procedures and operating efficiency are enhanced. The Internal Audit Department has a dual-reporting structure. The Director of Internal Audit reports directly to the Board's Audit Oversight Committee functionally and reports to the CEO administratively. The Director supervises one Internal Auditor.

Budget Authority

OCERS' annual budget is prepared in accordance with the California Government Code Sections 31580.2, which addresses administrative expenditures that are subjected to the 21 basis points limitation and 31596.1 for investment and other expenditures that are not subjected to the limitation. Below is an excerpt of these Code Sections.

§31580.2 Annual budget; expenses of administration; charges against earnings of fund

(a) In counties in which the board of retirement, or the board of retirement and the board of investment, have appointed personnel pursuant to Section 31522.1, 31522.5, or 31522.7, the respective board or boards shall annually adopt a budget covering the entire expense of administration of the retirement system which expense shall be charged against the earnings of the retirement fund. The expense incurred in any year may not exceed the greater of either of the following:

(1) Twenty-one hundredths of 1 percent of the accrued actuarial liability of the retirement system.

(2) Two million dollars ($2,000,000), as adjusted annually by the amount of the annual cost-of-living adjustment computed in accordance with Article 16.5 (commencing with Section 31870).

(b) Expenditures for computer software, computer hardware, and computer technology consulting services in support of these computer products shall not be considered a cost of administration of the retirement system for purposes of this section.

§31596.1 Expenses of investing moneys

The expenses of investing its moneys shall be borne solely by the system. The following types of expenses shall not be considered a cost of administration of the retirement system, but shall be considered as a reduction in earnings from those investments or a charge against the assets of the retirement system as determined by the board:

(a) The costs, as approved by the board, of actuarial valuations and services rendered pursuant to Section 31453.

(b) The compensation of any bank or trust company performing custodial services.

(c) When an investment is made in deeds of trust and mortgages, the fees stipulated in any agreement entered into with a bank or mortgage service company to service such deeds of trust and mortgages.

(d) Any fees stipulated in an agreement entered into with investment counsel for consulting or management services in connection with the administration of the board's investment program, including the system's participation in any form of investment pools managed by a third party or parties.

(e) The compensation to an attorney for services rendered pursuant to Section 31607 or legal representation rendered pursuant to Section 31529.1.

Orange County Employees Retirement System
Budget Approval Policy

BACKGROUND AND PURPOSE

1. The Board of Retirement annually adopts a budget covering the expenses of administering the retirement system. The administration expenses, as defined in Government Code Section 31580.2, incurred in any year will be charged against the earnings of the retirement fund and will not exceed 21 basis points of the actuarial accrued liability of the system.
2. The purpose of the Budget Approval Policy is to establish the process by which the OCERS annual budget is approved by the Board of Retirement.

ROLES

3. The preparation and presentation of the budget is the responsibility of the Chief Executive Officer.
4. The adoption of an annual budget is the responsibility of the Board of Retirement.

GUIDELINES

General Provisions

5. The Chief Executive Officer will present to the Board of Retirement a proposed budget for the next calendar year that supports the initiatives set out in the proposed Business Plan. The Budget will be presented during the month of November.
6. The format of the proposed budget will organize expenditures by function within OCERS as follows:
    a. Executive;
    b. Investments;
    c. Communications;
    d. Member Services;
    e. Finance;
    f. Administrative Service;

g. Disabilities;

h. Board;

i. Information Technology;

j. Legal;

k. Internal Audit; and/or

l. Such other functions that may be adopted by OCERS in the future.

7. The budget shall be broken into three broad categories of expenditures:

   a. Salaries and Benefits;

   b. Services and Supplies; and

   c. Capital Projects.

   The Capital Project budget category will include the current year costs for all capital asset purchases. Capital assets include items such as buildings, building improvements, vehicles, machinery, equipment, internally generated computer software, computer hardware and all other tangible or intangible assets that; are used in operations, cost more than $25,000 per item and have initial useful lives extending beyond a single reporting period.

   The Chief Executive Officer, or the Assistant CEO, Finance & Internal Operations, is granted authority to transfer funds within a category to accomplish the goals set forth in the Business Plan. Funds may not be moved from one category to another without approval of the Board of Retirement.

8. The value of the actuarial accrued liability (AAL) at the beginning of the budget year will be used for purposes of calculating the 21 basis point test. That value will be calculated by the system's actuary using the prior year's beginning AAL and projecting to the beginning of the budget year.

9. The Chief Executive Officer may request that the Board amend the budget for the current fiscal year by presenting reasons for the budget amendment, its expected impact, and the cost of the amendment for the remainder of the budget year.

POLICY REVIEW

10. The Board shall review this policy at least every three years to ensure that it remains relevant and appropriate.

POLICY HISTORY

11. This policy was adopted by the Board of Retirement on February 19, 2002.

12. The policy was revised on October 27, 2003, May 16, 2005, March 24, 2008, March 22, 2010, January 18, 2011, June 18, 2012, and July 20 2015.

2016 Amended Budget Summary

	Board	Executive	Investment	Comm	Legal	Member Services	Finance	Disability	Admin Services	IT	Internal Audit	Total
Personnel cost*	$15,000	$1,243,540	$1,384,807	$257,414	$1,193,631	$2,788,727	$1,178,702	$454,592	$909,589	$1,664,881	$410,203	$11,501,086
Services and supplies	460,200	168,540	40,281,854	228,600	427,150	101,450	625,642	285,350	949,620	2,069,956	361,855	45,960,217
Capital expenditures	-	-	-	-	-	-	-	-	98,000	2,000,000	-	2,098,000
2016 Budget	**475,200**	**1,412,080**	**41,666,661**	**486,014**	**1,620,781**	**2,890,177**	**1,804,344**	**739,942**	**1,957,209**	**5,734,837**	**772,058**	**59,559,303**

	Admin	Invest	Total
Personnel cost*	10,116,279	1,384,807	11,501,086
Services and supplies	5,678,363	40,281,854	45,960,217
Capital expenditures	2,098,000		2,098,000
2016 Budget	**17,892,642**	**41,666,661**	**59,559,303**

Appendix F

Orange County Employees Retirement System
Basis Points Test for Calendar Year 2015

Actuarial Accrued Liability (AAL) as of 12/31/15	17,050,357
Maximum allowed for Administrative Expenses (AAL * .21%)	35,806
Actual Administrative Expenses through 6/30/2015	8,115
Excess of Allowed Over Actual Expenses	27,691

Actual Administrative Expense as a Percentage of Projected Actuarial Accrued Liability as of 6/30/16	.05%
Actual Administrative Expense as Percentage of Projected Actuarial Accrued Liability as of 6/30/15	.04%

Administrative Expense Reconciliation	
Administrative Expense per Statement of Changes in Fiduciary Net Position	$8,789
Less administrative expense no considered per CERL section 31596.1	(674)
Administrative expense allowable under CERL section 31580.2	$8,115

Historical Actuarial Asset and Liability Data
(dollar amounts in thousands)

Valuation Summary data for OCERS	12/31/2015	12/31/2014	12/31/2013	12/31/2012	12/31/2011
Actuarial Value of Assets	$11,521,872	$11,449,911	$10,417,125	$9,469,208	$9,064,355
Actuarial Value of Liabilities	$17,050,357	$16,413,124	$15,785,042	$15,144,888	$13,522,978